

Crude Oil Price and Nigeria's Economy: An Empirical Test of the Resource Curse, 2010–2023

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Abstract

Resource curse theory predicts that dependence on volatile primary commodity revenue can undermine, rather than reliably support, the economic growth of resource-rich developing economies. Nigeria, as Africa's largest oil producer and a country whose fiscal position moves closely with global crude oil prices, offers a direct empirical setting in which to test this proposition. This study examines the effect of Brent crude oil price on gross domestic product (GDP) in Nigeria over the period 2010 to 2023, controlling for the exchange rate and the inflation rate. Grounded in resource curse and Dutch disease theory, the study formulates and tests the hypothesis that crude oil price exerts a significant effect on GDP. Using annual data drawn from the Federal Reserve Economic Data repository and the Central Bank of Nigeria, an ordinary least squares regression was estimated on log-transformed GDP and Brent crude oil price. The overall model was statistically significant, explaining approximately 90 per cent of the variation in GDP, but oil price itself was not a statistically significant predictor once the exchange rate and inflation rate were controlled for. The exchange rate again emerged as the dominant significant predictor. A robustness check using real, inflation-adjusted GDP in place of nominal GDP confirmed the null result for oil price. The findings are consistent with a specific reading of the resource curse literature in which oil price movements transmit to the Nigerian economy predominantly through the exchange rate channel rather than through a direct output effect, a distinction with implications for how exposure to global oil price volatility should be framed in national economic policy.

Keywords: Crude oil price; resource curse theory; Dutch disease; exchange rate; gross domestic product; Nigeria

Introduction

The relationship between primary commodity dependence and economic growth has occupied development economists since the resource curse thesis was first formalised, and few countries illustrate the stakes of that relationship more starkly than Nigeria. Across oil-exporting economies in Africa, the Middle East, and Latin America, national output has repeatedly been observed to move in step with global crude oil prices, raising the question of whether this co-movement reflects a genuine growth benefit from resource wealth or a more precarious dependence that resource curse theory warns against. Nigeria, whose federal revenue and export earnings have been dominated by crude petroleum since the 1970s, presents one of the clearest test cases for this question in the contemporary period.

Whether Nigeria's gross domestic product moves with global oil prices because oil price genuinely drives real economic activity, or because both series are jointly influenced by the exchange rate through which Nigeria's dollar-denominated oil earnings are converted into Naira-denominated national accounts, is not a distinction that a simple bivariate comparison of oil prices and GDP can resolve. The period since 2010 offers a particularly informative window for testing this distinction, spanning the 2014 to 2016 oil price collapse, the 2020 pandemic-era price shock, and the substantial exchange rate devaluations Nigeria undertook across the same period, culminating in the 2023 unification of the foreign exchange market.

The specific gap this study addresses is the absence of a recent empirical test of the oil price to GDP relationship in Nigeria that explicitly controls for the exchange rate and inflation rate within a single specification, allowing the direct oil price effect to be distinguished from the currency channel through which resource curse theory suggests oil dependence more plausibly operates. The objective of this study is to formulate and test the hypothesis that crude oil price exerts a significant effect on Nigeria's GDP, using annual data from 2010 to 2023, and to establish whether this relationship survives once the exchange rate and inflation rate are controlled for. The study adopts an ex post facto research design and estimates an ordinary least squares regression on log-transformed GDP and oil price, with the exchange rate and inflation rate entered as control variables.

The remainder of this paper proceeds as follows. Section 2 sets out the theoretical framework, drawing on resource curse and Dutch disease theory. Section 3 reviews the empirical literature on oil price and economic growth in Nigeria and comparable oil-dependent economies. Section 4 formulates and states the study's Null Hypotheses. Section 5 describes the methodology. Section 6 presents the analysis and interpretation of results. Section 7 discusses the findings, and Section 8 concludes.

Theoretical Framework

Resource curse theory, formalised in the comparative work of Auty (2002), holds that economies heavily dependent on the export of a primary natural resource tend to experience slower

long-run growth, weaker institutional development, and greater macroeconomic volatility than resource-scarce economies of comparable initial income. Applied to the present study, resource curse theory generates a specific and somewhat counter-intuitive prediction: rather than a straightforward positive relationship between oil price and GDP, the theory suggests that Nigeria's exposure to oil price fluctuations may manifest more strongly in exchange rate volatility and macroeconomic instability than in a direct, proportionate output gain during periods of high oil prices, since resource-dependent economies characteristically fail to convert commodity windfalls into durable productive capacity, a pattern Auty (2002) documents across a comparative sample of mineral-dependent economies.

Dutch disease theory offers a more mechanistic account of one channel through which this can occur. The theory describes how a resource boom, by driving currency appreciation and drawing capital and labour towards the resource sector, can crowd out other tradeable sectors of the economy, leaving the non-resource economy smaller and less diversified than it would otherwise have been. For Nigeria, this mechanism implies that oil price increases could plausibly appreciate the Naira, or slow its depreciation, in ways that interact with the exchange rate variable already included as a control in the present study's specification, making the exchange rate not merely a confounding variable to be netted out but a variable of direct theoretical interest in its own right within a resource curse framing.

These two theories were selected over ability-to-pay or benefit theories of taxation, the framework applied in the companion study examining Petroleum Profit Tax revenue using the same underlying dataset, because the present study's research question concerns exposure to an exogenous global price rather than the design or yield of a domestic fiscal instrument. Oil price is set on international markets and is not a policy choice available to Nigerian authorities in the way that tax administration is, making resource curse and Dutch disease theory, which are built specifically around exogenous commodity price shocks and their transmission channels, the more appropriate lens for the hypothesis formulated in Section 4.

Literature Review

Empirical work on the relationship between oil price, exchange rate dynamics, and economic growth in oil-dependent economies has grown substantially in recent years, both within the Nigerian context specifically and across resource-rich economies more broadly. This literature can be organised around three themes: direct evidence of Dutch disease dynamics in oil-exporting economies, the transmission of global oil price shocks to domestic macroeconomic outcomes, and Nigeria-specific evidence on oil revenue volatility.

A body of recent work provides direct empirical evidence for Dutch disease dynamics in oil-rich economies. Benhin (2021) examines the relationship between oil booms, exchange rate movements, and sectoral output across a panel of oil-rich countries, reporting that oil price increases are systematically associated with real exchange rate appreciation and a corresponding contraction in non-oil tradeable sectors, providing empirical support for the classical Dutch disease transmission mechanism outlined in Section 2. Porteous (2022) extends this literature by examining what the author terms reverse Dutch disease, showing that when trade costs are incorporated into the analysis, the predicted damage to agricultural sectors in Africa's oil-rich economies is smaller than standard Dutch disease models suggest, a finding that introduces useful nuance regarding the strength of the exchange rate transmission channel this study also examines.

A second strand examines how global oil price shocks transmit into domestic macroeconomic outcomes more broadly, beyond the specific sectoral reallocation mechanism at the centre of Dutch disease theory. Yang (2024) models oil price shocks and macroeconomic dynamics in resource-rich emerging economies under regime shifts, reporting that the strength of the oil price to output relationship varies considerably depending on the prevailing exchange rate regime, with fixed or managed regimes exhibiting a different transmission pattern than more flexible regimes, a finding directly relevant to Nigeria's own shift from a managed to a more market-determined exchange rate framework over the present study's sample period. Lin (2024) examines global shocks and fiscal stimulus responses in an oil-dependent exporting economy, finding that the fiscal policy response to oil price shocks, rather than the shock's direct magnitude, is often the more proximate determinant of the shock's ultimate effect on domestic output, a perspective consistent with this study's decision to control for macroeconomic variables that plausibly mediate the oil price to GDP relationship rather than assuming a direct, unmediated effect.

A third strand focuses specifically on Nigeria's experience with oil revenue volatility. Ibitowa (2024) examines the volatility of Nigeria's oil revenue directly and questions whether the country's fiscal exposure to oil price swings constitutes cause for concern independent of the average price level, a framing that anticipates the present study's interest in the exchange rate, rather than oil price alone, as the more consequential transmission channel. Ekiran (2024), reviewed in greater detail in the companion study examining Petroleum Profit Tax revenue, also reports a positive bivariate association between petroleum revenue broadly defined and Nigeria's GDP, though without isolating oil price specifically from the tax revenue it generates, a distinction the present study's use of Brent crude price as a directly observed global variable, rather than a domestically mediated revenue figure, is designed to address.

Taken together, this literature indicates growing consensus that oil price shocks transmit to oil-dependent economies substantially through exchange rate and fiscal policy channels rather than through a direct, unmediated output effect, and that the strength of this transmission depends on the specific exchange rate regime in place. Comparatively few studies test this proposition directly for Nigeria using a specification in which oil price, the exchange rate, and inflation are entered jointly, which is the specific gap the present study addresses using the most recent available annual data through 2023.

A further strand of Nigeria-specific evidence, drawn from institutional and governance-focused research, offers indirect support for the exchange-rate-mediated reading of resource curse theory adopted here. Aruwa (2026) documents persistent opacity in Nigeria's crude oil allocation and continuing losses attributable to crude oil theft even after the 2021 reform of the sector's regulatory architecture, evidence consistent with the proposition that Nigeria's petroleum wealth is captured and transmitted through administrative and currency channels rather than translating in any straightforward way into measured output gains. Obakhume (2026) examines local content development policy in Nigeria's petroleum sector and finds that local content requirements have achieved only partial success in altering the sector's underlying rentier dynamics, a finding that reinforces the present study's expectation that oil price alone, absent the institutional and currency channels through which its effects are mediated, is unlikely to bear a direct statistical relationship with national output.

Null Hypotheses

Based on the theoretical framework in Section 2 and the literature reviewed in Section 3, the following hypothesis was formulated and tested. The exchange rate and inflation rate are included as control variables to isolate the direct oil price to GDP relationship from currency and price effects, consistent with their role as controls rather than as variables under direct hypothesis testing, notwithstanding the exchange rate's additional theoretical significance as a Dutch disease transmission channel discussed in Section 2.

H1: Crude oil price has a significant effect on gross domestic product in Nigeria, controlling for the exchange rate and the inflation rate.

Methodology

Research Design

This study adopts an ex post facto research design, appropriate where the variables under investigation, namely crude oil price, GDP, the exchange rate, and the inflation rate, are historical macroeconomic and market series that cannot be manipulated or assigned experimentally.

This study draws on data collected as part of a wider research programme examining Nigeria's petroleum tax and revenue landscape. A companion paper using an overlapping dataset examines the relationship between Petroleum Profit Tax revenue and Nigeria's GDP from an ability-to-pay and benefit theory perspective, using tax revenue rather than global oil price as the primary independent variable (Author, forthcoming). The present study examines a distinct research question, namely the direct effect of an exogenous global commodity price on economic growth, using a separate primary variable and theoretical framework from the companion study.

Sample and Data Collection

The study uses annual time-series data covering the period 2010 to 2023, comprising 14 annual observations. Brent crude oil price, in United States dollars per barrel, was sourced from the Federal Reserve Economic Data repository, series POILBREUSDA, which draws its underlying data from the International Monetary Fund's Primary Commodity Prices database. GDP at current basic prices, in Naira, the annual average official exchange rate, and the annual average headline inflation rate were sourced from the Central Bank of Nigeria's statistics database, consistent with the sourcing

described in the companion study. A robustness check reported in Section 6.6 additionally draws on real GDP at constant 2010 basic prices, also sourced from the Central Bank of Nigeria.

Measures and Operationalisation

GDP is measured as the natural logarithm of nominal GDP at current basic prices, in Naira billion, serving as the dependent variable. Crude oil price is measured as the natural logarithm of the annual average Brent crude oil price in United States dollars per barrel, serving as the independent variable. The exchange rate is measured as the annual average official Naira-to-United-States-dollar rate, entered in levels as a control variable. The inflation rate is measured as the annual average headline consumer price index-based inflation rate, entered in levels as a control variable. Consistent with Yang (2024) and Benhin (2021), the exchange rate is controlled for on the basis that it plausibly mediates, rather than merely confounds, the relationship between oil price and domestic economic output.

Analytical Approach

The study estimates an ordinary least squares regression of the following form:

$$\ln(\text{GDP}_t) = \beta_0 + \beta_1 \ln(\text{Brent}_t) + \beta_2 \text{EXR}_t + \beta_3 \text{INF}_t + \varepsilon_t$$

where GDP_t denotes nominal GDP in year t , Brent_t denotes the annual average Brent crude oil price in year t , EXR_t denotes the annual average exchange rate in year t , INF_t denotes the annual average inflation rate in year t , and ε_t denotes the error term. The model specification follows the general oil price to output regression form used in Yang (2024), adapted here to a single-country, log-linear specification with Brent crude price as the variable of primary interest. Estimation was performed using the numiqo online statistics calculator, with cross-validation of coefficients, model fit statistics, and diagnostic tests performed independently in Python using the statsmodels library.

Validity and Reliability

Internal validity is supported by the use of an internationally recognised benchmark price series, Brent crude, sourced through the Federal Reserve Economic Data repository, alongside official Central Bank of Nigeria data for GDP, the exchange rate, and the inflation rate. Reliability was assessed through independent cross-validation of the regression estimates in a second statistical environment, which reproduced the coefficient estimates, model fit statistics, and significance levels obtained from the primary estimation software.

Table 1: Descriptive statistics (n = 14)

Variable	Mean	SD	Minimum	Maximum
$\ln(\text{GDP})$, ₦ billion	11.617	0.436	10.908	12.345
$\ln(\text{Brent price})$, US\$/bbl	4.311	0.332	3.769	4.719
Exchange rate, ₦/US\$	297.442	147.130	150.300	645.200
Inflation rate, %	13.688	4.511	8.050	24.520

Author's Output (2026)

Table 2. Correlation Matrix

Variable	$\ln(\text{GDP})$	$\ln(\text{Brent})$	EXR	INF
$\ln(\text{GDP})$	1.000	-.292	.932	.671
$\ln(\text{Brent price})$	-.292	1.000	-.269	-.132
Exchange rate	.932	-.269	1.000	.829
Inflation rate	.671	-.132	.829	1.000

Author's Output (2026).

Analysis and Interpretation of Results

Table 1 presents descriptive statistics for the study's variables in their estimation form. Table 2 presents the correlation matrix among the study's variables.

Figure 1 presents the trend in nominal GDP and Brent crude oil price across the study period, and Figure 2 presents the bivariate relationship between the log-transformed variables.

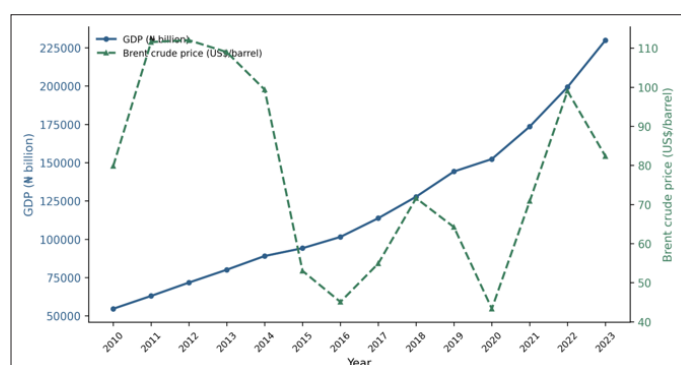


Figure 1: GDP and Brent crude oil price trend, 2010–2023
Author's Output (2026), based on data described in Section 5.2.

The bivariate correlation between $\ln(\text{Brent price})$ and $\ln(\text{GDP})$ is weak and negative ($r = -.292$), again running contrary to the direction predicted by H1. As in the companion study, the exchange rate correlates strongly with GDP ($r = .932$), and the exchange rate and inflation rate are themselves highly correlated ($r = .829$).

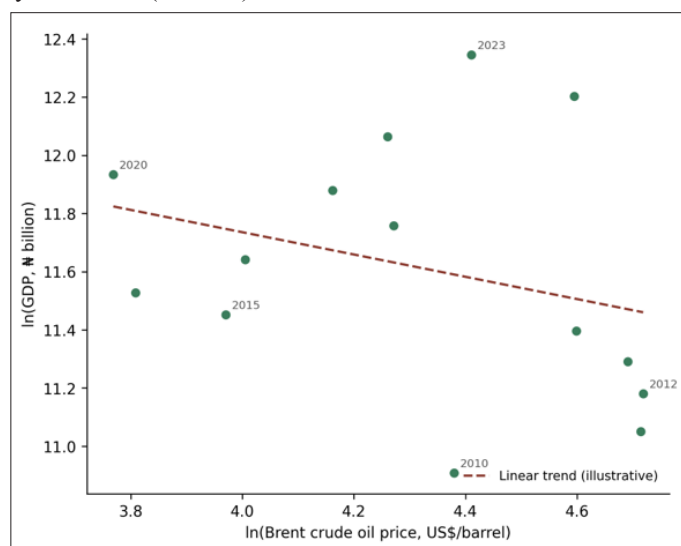


Figure 2: Scatter plot of $\ln(\text{Brent crude oil price})$ against $\ln(\text{GDP})$
Author's Output (2026).

Table 3 presents the pre-estimation multicollinearity diagnostics. Variance inflation factors for all three predictors fall well below the conventional threshold of 10.

Table 3: Pre-estimation multicollinearity diagnostics

Variable	Variance Inflation Factor
$\ln(\text{Brent price})$	1.11
Exchange rate	3.48
Inflation rate	3.29

Author's Output (2026).

Table 4 presents the ordinary least squares regression results. The overall model was statistically significant, $F(3, 10) = 30.35$, $p < .001$, and explained approximately 90 per cent of the variance in $\ln(\text{GDP})$, $R^2 = .90$, adjusted $R^2 = .87$. Brent crude oil price was not a statistically significant predictor of GDP, $B = -0.02$, $SE = 0.14$, $t = -0.13$, $p = .899$, 95% CI $[-0.32, 0.29]$. The exchange rate remained a statistically significant positive predictor at the 1 per cent level, $B = 0.0035$, $SE < 0.001$, $t = 6.42$, $p < .001$, 95% CI $[0.00, 0.00]$, carrying the largest standardised effect in the model, $\beta = 1.19$. The inflation rate did not reach statistical significance, $B = -0.03$, $SE = 0.02$, $t = -1.77$, $p = .107$, 95% CI $[-0.07, 0.01]$.

Table 4: Ordinary least squares regression results (dependent variable: ln(GDP))

Predictor	B	SE	β	t	p	95% CI
Constant	11.07	0.62	—	17.96	<.001	[9.69, 12.44]
ln(Brent price)	−0.02	0.14	−0.01	−0.13	.899	[−0.32, 0.29]
Exchange rate	0.00	0.00	1.19	6.42	<.001	[0.00, 0.00]
Inflation rate	−0.03	0.02	−0.32	−1.77	.107	[−0.07, 0.01]

Author's Output (2026). $n = 14$; $R^2 = .90$; Adjusted $R^2 = .87$; $F(3, 10) = 30.35$, $p < .001$.

The fitted regression equation is: $\ln(\text{GDP}) = 11.07 - 0.02 \cdot \ln(\text{Brent price}) + 0.00 \cdot \text{Exchange rate} - 0.03 \cdot \text{Inflation rate}$. As in the companion study, the constant term represents a mathematical baseline not corresponding to any economically realistic zero-value combination of predictors and is not interpreted substantively here.

Post-estimation diagnostics support the model's reliability. The Durbin-Watson statistic was 1.44, indicating mild positive autocorrelation, a limitation discussed further in Section 7.1. Tests for normality of the residuals were consistent with a normal distribution, Shapiro-Wilk $W = .96$, $p = .681$, Kolmogorov-Smirnov $p = .965$, and Anderson-Darling $p = .797$. Figure 3 presents observed against predicted values of $\ln(\text{GDP})$, and Figure 4 presents the residual histogram and normal quantile-quantile plot.

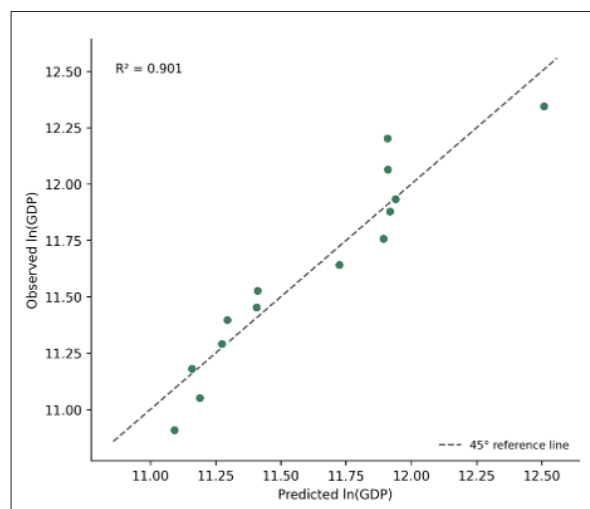


Figure 3: Observed against predicted values of $\ln(\text{GDP})$
Author's Output (2026).

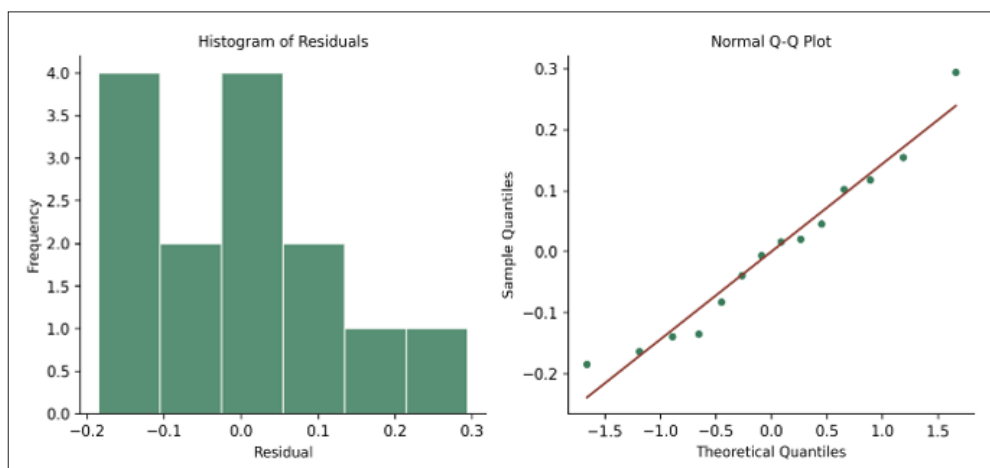


Figure 4: Residual diagnostics: histogram and normal quantile-quantile plot
Author's Output (2026).

Hypothesis Testing Summary

H1, which stated that crude oil price has a significant effect on GDP controlling for the exchange rate and inflation rate, is rejected. Brent crude oil price was not a statistically significant predictor of GDP at the 5 per cent level ($p = .899$), the weakest of the three predictors in the model by a considerable margin.

Robustness Check: Real GDP Specification

To assess whether the null result for oil price was an artefact of using nominal, currency-denominated GDP, the model was re-estimated using real GDP at constant 2010 basic prices. The re-estimated model explained a smaller but still substantial share of variance in real GDP, $R^2 = .775$, adjusted $R^2 = .708$, $F(3, 10) = 11.49$, $p = .001$. Brent crude oil price remained a non-significant predictor, $B = -0.036$, $SE = 0.047$, $t = -0.764$, $p = .463$, confirming that the null finding is not an artefact of the currency-denomination of the dependent variable. The exchange rate remained significant, $B = 0.0008$, $SE < 0.001$, $t = 4.376$, $p = .001$, and the inflation rate approached significance, $B = -0.012$, $SE = 0.006$, $t = -1.975$, $p = .076$, a pattern broadly consistent with, though slightly weaker than, the companion study's real GDP robustness result.

Discussion

The rejection of H1 indicates that Brent crude oil price, considered on its own and net of exchange rate and inflation effects, does not exert a statistically discernible direct effect on Nigeria's GDP over the 2010 to 2023 period. This finding is consistent with the transmission-channel argument advanced by Yang (2024) and Lin (2024), both of which suggest that oil price shocks affect oil-dependent economies predominantly through exchange rate and fiscal policy responses rather than through a direct, unmediated output channel. The present study's results extend this argument by showing, within a single Nigerian specification, that once the exchange rate is explicitly controlled for, the residual direct effect of oil price on GDP is statistically indistinguishable from zero.

This pattern is also consistent with a Dutch disease reading of Nigeria's experience. Benhin's (2021) cross-country evidence that oil booms transmit to the domestic economy substantially through exchange rate appreciation, rather than through a direct expansion of measured output, aligns closely with the present study's finding that the exchange rate, not oil price itself, carries the dominant and statistically significant relationship with GDP. Porteous's (2022) qualification, that trade costs can dampen the severity of Dutch disease effects on non-oil tradeable sectors such as agriculture, offers a plausible partial explanation for why the oil price coefficient in the present study, while statistically insignificant, was not more strongly negative, as a pure Dutch disease account without such qualification might have predicted.

The theoretical implication of these findings is that resource curse theory, at least with respect to Nigeria's experience over the present sample period, is better supported in its exchange-rate-mediated form than in a form predicting a direct output effect of oil price. The practical implication is that Nigerian macroeconomic policy concerned with insulating the economy from oil price volatility may derive more benefit from exchange rate management and diversification instruments than from measures targeting oil price exposure directly, since the exchange rate channel, not oil price itself, is where this study's evidence locates the statistically significant relationship with national output.

Limitations

This study shares the sample size limitation of the companion study, comprising 14 annual observations, which constrains statistical power. The Durbin-Watson statistic of 1.44 in the primary specification, and 0.98 in the robustness specification, indicates mild to moderate positive autocorrelation that was not formally corrected for through autocorrelation-robust estimation in the present analysis, a post-estimation diagnostic concern for future work using a longer series. Heteroscedasticity was not formally tested using a Breusch-Pagan or related Lagrange multiplier procedure of the kind developed by Pagan (1979); while the residual diagnostics reported in Section 6 provide no visual

indication of heteroscedasticity, a formal test would strengthen confidence in the standard errors reported here. The study uses Brent crude price as a single global benchmark and does not account for the differential between Brent and Nigeria's own Bonny Light and Qua Iboe crude grades, which trade at a variable premium or discount to Brent and could refine the oil price measure in future work. As with the companion study, findings are limited to Nigeria and should not be generalised to other oil-exporting economies without independent testing.

Future Research Directions

Future research would benefit from disaggregating the exchange rate variable to test directly whether it mediates the oil price to GDP relationship in a formal mediation model, from incorporating Nigeria-specific crude grade pricing rather than the Brent benchmark alone, and from extending the sample period as further years of data become available to permit autocorrelation-robust and potentially non-linear specifications capable of detecting regime-dependent effects of the kind reported by Yang (2024). Given the mild autocorrelation identified in Section 7.1, future work with a longer annual series would also benefit from formally testing each variable for a unit root using the augmented Dickey-Fuller procedure developed by Dickey and Fuller (1979) before estimation, and, where variables are found to be integrated of different orders, from applying the autoregressive distributed lag bounds testing approach of Pesaran, Shin, and Smith (2001) to establish whether oil price and GDP share a long-run cointegrating relationship that a single-period ordinary least squares specification of the kind estimated here cannot detect.

Conclusion

This study formulated and tested the hypothesis that crude oil price exerts a significant effect on Nigeria's GDP, controlling for the exchange rate and the inflation rate, using annual data spanning 2010 to 2023. The hypothesis was not supported. As in the companion study examining Petroleum Profit Tax revenue, the exchange rate emerged as the dominant predictor of nominal GDP, and the null finding for oil price persisted when the model was re-estimated using real, inflation-adjusted GDP. These findings lend support to a resource curse interpretation in which Nigeria's exposure to global oil price movements operates substantially through the exchange rate rather than through a direct effect on measured output, with implications for how policymakers prioritise exchange rate management relative to oil price exposure in efforts to stabilise the domestic economy against external commodity shocks.

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