International Research in Material and Environment
Volume 6, Issue 1, 2026 (pp. 15-29)
www.abjournals.org

# NAVIGATING THE ENERGY TRILEMMA IN NIGERIA: ENERGY PRICE INFLATION, ENERGY CONSUMPTION, AND ECONOMIC GROWTH

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**Cite this article:**

P. O., Abah, F., Aye-Agele, I. A., Ogiri (2026), Navigating the Energy Trilemma in Nigeria: Energy Price Inflation, Energy Consumption, and Economic Growth. International Research in Material and Environment 6(1), 15-29. DOI: 10.52589/IRME-1SJ15CHP

**Manuscript History**

Received: 11 Dec 2025

Accepted: 14 Jan 2026

Published: 9 Feb 2026



**ABSTRACT:** *With the energy price rising in Nigeria and the domestic economy disrupted, this paper explores how energy inflation influences both individual consumption behavior and national economic performance. Using autoregressive distribution lag (ARDL), the study revealed that energy price inflation poses a significant threat as it undermines consumer purchasing power and business productivity, ultimately stifling economic growth. Energy consumption, though it showed a moderate effect on GDP, implies that simply increasing energy use may not be sufficient to spur economic progress unless accompanied by efficient energy management and infrastructure development. The study, therefore, recommended that Nigeria should focus on enhancing trade openness and energy prices, investing in energy efficiency, and ensuring that government spending is channeled towards sustainable energy development.*

**KEYWORDS:** Energy Price Inflation, Energy Consumption and Economic Growth.


Article DOI: 10.52589/IRME-1SJ15CHP
DOI URL: https://doi.org/10.52589/IRME-1SJ15CHP

## INTRODUCTION

Nigeria has been wrestling with significant challenges related to energy price inflation, energy consumption and the effect on economic growth. One of the most significant recent monetary policy actions was the removal of the fuel subsidy in June 2023, which was intended to free up government funds and encourage market efficiency by allowing redirection of funds to other critical sectors. However, this action led to a sharp increase in petrol prices up to 167% (NBS, 2023) and subsequently contributed to high inflation across the economy.

According to Neri (2024), the increase in petrol price has caused severe hardship for many citizens because of its chain effect on the increase in the cost of transportation, food prices and the general rise in the cost of living. NBS (2023) has it that inflation rose from 18.8% in 2022 to 24.5% in 2023 and is projected to reach 31.6% in 2025 before moderating. Food inflation in Nigeria averaged 13.50% from 1996 to 2024, reaching an all-time high of 40.87% in June of 2024, and 36.4% of the Nigerian population suffers from food deprivation (Global Food Security Index, GFSI, 2023).

The global effect of energy price inflation poses a perturbation for economic productivity, economic growth and development. This is because energy is a fundamental input in almost all economies' economic activities. In the first-round effect, in the United States (US), the price index (CPI) is directly affected by the energy price hike because of her increase in share of services in the US force and the second-round effect is shown in transportation costs, which are passed on to consumers, leading to demand for higher wages, a wage-price spiral and further fueling inflation (US Congressional Budget Office, CBO, 2024). CBO (2024) noted that rising energy prices are likely to affect real Gross Domestic Product (GDP) growth. The Federal Reserve Chair, Jerome Powell, said in the press conference (2022) that energy inflation has dampened economic growth in the county. According to him, every $10 per barrel increase in crude oil prices raises inflation by 0.2% and sets back economic growth by 0.1%.

With China being a major manufacturing center and the world's supplier of goods, rising energy costs could increase production costs for a vast array of goods. This increase in price could be passed on to consumers worldwide, fueling general commodity price inflation. According to Li (2020), energy price increases in China, fossil fuels, directly feed into the Producer Price Index (PPI) and, subsequently, the Price Index (CPI).

The European continent is heavily reliant on energy imports, especially for fossil fuels. This made the economy highly vulnerable to global energy price shocks, as seen during the 2022 energy crisis triggered by the war in Ukraine (Neri, 2024) and the African continent, although endowed with energy resources, lacks the infrastructure facilities and capability to explore immeasurable resources in the soil. According to African Countries and Regions (ACR, 2022), West Africa accounts for just 6% of global energy use and less than 3% of global energy-related $CO_2$ emissions.

Nigeria, being an oil-producing nation, Nigerian's economy is highly susceptible to global oil price fluctuation and geopolitical risks (Aderemi, Alejo, Omoyele, Olaoye, Olanipekun & Azuh, 2022), This is due to its heavy reliance on oil exports for government revenue and foreign exchange, coupled with its significant dependence on imported refined petroleum products due to inadequate domestic refining capacity (Olanipekun, Oloke, Lateef, Aderemi, (2022), According to Olusegun, Aderemi, Nwagwu, Yvonne, & Azuh, 2020), even if Nigeria is an exporter of crude oil, there will be a directly translation to higher domestic fuel prices


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(petrol and diesel) in the country because of its import dependency on refined petrol product, especially without subsidy. As a result, annual economic growth dropped on average from 6.88% in 2011 to 2.72% in 2024 (ADB, 2023).

Some of the major energy price inflation problems in Nigeria could include erosion of purchasing power and household welfare, impediments to industrial competitiveness and productivity, macroeconomic instability and inflationary pressures, and inefficient energy consumption. It is to this end that this study sought to assess the energy price inflation and energy consumption on economic growth in Nigeria. The study used secondary sources of data and the remaining part of this study consists of a literature review, methodology, findings, summary, conclusion and recommendation.

## LITERATURE REVIEW AND THEORETICAL LITERATURE

### Conceptual Clarification

### Economic Energy

The concept of economic energy refers to the fundamental role that energy plays in driving and sustaining economic activity. The energy here does not refer to energy in its physical sense (the one described in the natural sciences) but rather an economic perspective on how energy resources are produced, consumed, and valued within the society. According to Energy Economics (EBSCO Research, 2024), economic energy recognizes that virtually all economic activities, from manufacturing and transportation to communication and agriculture, require energy, and it is an essential input like labor and capital.

According to the Energy Information Administration (EIS, 2023), it is a means of transformation; vehicles, trains, ship and planes all rely on energy to move goods and people. Energy, according to World in Data (2024), is the hub of economic activity and enabler for quality human life. The energy sources which include coal, oil, gas, nuclear, hydropower, solar wind and biofuels, are sources that allow businesses to operate efficiently, leading to higher productivity and output, and directly improve quality of life and social development.

### Energy Price Inflation

Energy inflation could be described as a component of overall inflation, which is the general increase in prices of energy and a fall in the purchasing power of money. When the prices of energy increase significantly, it means that consumers and businesses may have to pay more for the energy they use, which has a ripple effect throughout the economy. Anandan, Muthusubramanian, and Ramaswamy (2022) see energy price inflation as a fundamental issue for society. According to them, when the cost of energy persistently increases, it directly impacts households; it increases the cost of consumption for businesses and operational costs for manufacturing, transportation of goods and other business activities. These high costs are often passed on to consumers in the form of higher prices for goods and services, contributing to broader inflation (cost-push inflation).


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## Energy Consumption

Energy consumption refers to the amount of energy used or utilized by individuals, businesses or societies to power various activities and processes over a given period of time (Ajibola, Sodeinde, Aderemi, and Yusuf , 2021). This definition is a general definition, applicable to all, but in an economic sense, the concept is only an application of the concept of energy consumption within an economic framework. Okonkwo and Ezeabasili (2021) see energy consumption as that which drives economic activity, facilitates production, enables services, and ultimately contributes to a nation's wealth and development. For this study, energy consumption is that which provides a lens through which to analyze the intricate relationship between energy use and the functioning, growth and sustainability of economic growth in the country and economic well-being.

## Theoretical Literature and Framework

This study is guided by the traditional neoclassical growth model the Solow-Swan model and cost-push inflation theory. The Solow-Swan model (1953) primarily focuses on labor and capital as factors of production. However, following the energy economy, which extends these models by explicitly including energy as the third indispensable factor of production, the model is adjusted to display the role played by energy in the economy.

When energy price as the third factor of production rises (energy price inflation), it increases the cost of the input. The firm may respond by substituting the energy by using more labor or capital; that is, more energy-efficient machinery or more manual labor where feasible to produce the same output. Also, if substitution is limited, higher energy costs will lead to reduced production, hampering overall economic growth. The pass-on effect is that the firm may pass the high energy cost to consumers, leading to higher prices for goods and services, thus contributing to general inflation. This theory highlights that the energy price inflation acts like a negative supply shock or an adverse technology shock as proposed by Finn (2000). It makes the existing capital stock less productive and reduces the potential output of the economy.

The cost-push inflation theory is a macroeconomic theory that explains how energy price inflation can lead to broader economic inflation and subsequently impact economic growth. Energy is a significant production cost for all goods and services. When energy prices rise, businesses face higher costs for fuel and power. Therefore, to maintain profit margins, businesses pass these increased costs onto consumers in the form of higher prices for their products and services. The cost-push can reduce consumer purchasing power, lower aggregate demand, and deter investment, ultimately slowing down economic growth.

Considering Nigeria as an oil-exporting nation, high oil prices might initially boost government revenue via export and could potentially stimulate some growth. However, they lead to higher domestic fuel costs and inflation, impacting non-oil sectors and household trouble in purchasing power.


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### Empirical literature

In developing economies like Nigeria, energy is particularly crucial in sectors such as manufacturing, transportation, and agriculture and typically the home front. A plethora of researchers, such as Umoidem, Nteegah, and Osokogwu (2024) and Anandan et al. (2022), affirm a positive correlation between energy consumption and Gross Domestic Product (GDP) growth. Atoyebi, Ajibare, Usman, Afolabi, Oduola, and Nicodemus (2024); Sarman (2021); and Aladejuyibe and Olawumi (2021) researched energy poverty and economic growth in Nigeria from 1990 to 2021. Does crude oil price affect the inflation rate and economic growth in India, and global energy poverty: Nigeria as a case study, using the ADF (least square) test and structural VAR framework, and a purposive inspecting procedure and arbitrary determination method, respectively, the studies found out that the energy and economic growth variables showed a statistically significant positive relationship and that energy poverty possesses an adverse effect on both the individual and economic growth and well-being.

The increasing price of energy commodities such as fuel, electricity and natural gas in Nigeria, for example is driven by global oil price volatility, domestic supply disruptions, and policy adjustments such as removal of fuel subsidies Agreeing with this assertion, Frimpong, Akua Antwi, and Brew (2017) and Ajibola, Sodeinde, Aderemi, and Yusuf (2021), in their studies on the effect of energy price on economic growth in the ECOWAS sub-region and the impact of electricity supply on the performance of small and medium-scale enterprises (SMEs) in Nigeria, respectively, exploiting the system Generalized Method of Moments estimation technique, found out that a negative and significant impact was felt on the industrial output and SMEs, respectively. Okonkwo and Ezeabasili (2021) found that in Nigeria, the surge in petrol and cooking gas prices led to substitution toward less efficient and more hazardous energy sources. This shift not only affects household welfare but also has environmental implications. Moreover, Olusegun, Aderemi, Nwagwu, Yvnne, & Asuh (2020) asserted that exchange rate instability and fiscal deficits further compounded the impact of energy inflation on growth.

## METHODOLOGY

### Sources of Data Collection

Time-series data was collected for a consistent period from 1990 to 2024. The specific variables of interest are economic growth, energy consumption and energy price inflation. Real Gross Domestic Product (GDP) per capita in Naira units was used as a proxy for economic growth. The Consumer Price Index (CPI), or prices of gasoline/diesel, electricity tariffs, and kerosene prices, represents energy price inflation faced by consumers and the Producer Price Index (PPI) for energy-intensive industries was used to capture the energy inflation on business. Crude oil prices (international benchmark, Brent or WTI), adjusted for exchange rates to account for global price. These data were sourced from the World Bank Development Indicators and the National Bureau of Statistics (NBS) of Nigeria. Also, comprehensive energy statistics like electricity consumption, and some energy price data were sourced from International Energy Agency (IEA) Data Services. Total Price Energy Consumption (TPES) in tons of oil equivalent or gigawatt-hours was used to represent the overall energy. Electricity consumption (gigawatt-hours) was used to give its critical role in modern economic activities. To avoid omitted variable bias, control variables such as gross fixed capital formation (investment), a driver of economic growth; population growth/total population, which influences energy demand and


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per capita figures; trade of exports and imports as a percentage of GDP to represent or account for external economic influences; and exchange rate (local currency per USD) for understanding the transmission of international energy price were used.

**Model specification**

The study developed a model to examine the effect on energy price inflation, energy consumption on economic growth. The model is specified based on the ……and adapted the work of …. The functional and econometric model is specified in the equations below;

GDP = f(EPI + EC + I +TO + P + ER + GE)……..(1)

GDPit = α0 +α1EPIit + α2Iit + α3TOit + α4Pit + α5ERit + α6GE + ϵ…….(2)

**Apriori Expectation:**

**ARDL Estimation Procedure**

The study adopted the Auto-regressive distribution lag (ARDL) to examine the objective of the study and the functional model is shown as thus; $\ln(GDP_t)=\Delta\ln(GDPit-j)+k=0\sum qi\beta ik \Delta\ln(EPIit-k)+l=0\sum ri\gamma il\Delta\ln(ECit-l)+m=0\sum si\delta im\Delta\ln(Xit-m)+\lambda i1\ln(GDPit-1)+\lambda i2 \ln(EPIit-1)+\lambda i3\ln(ECit-1)+\lambda i4\ln(Xit-1)+\epsilon it$

Where:

GDPt = Real GDP per capita

EPIt = Energy Price Inflation (e.g., energy CPI on AGO, PMS, ELECT)

ECt = Energy Consumption

Xt = Vector of control variables (e.g., investment (I), trade openness(TO), Population (P), Exchange (ER), and Expenditure (GE))

I = the country

Δ = First difference operator

αi,βj,γk,δl = Short-run coefficients

λ1, λ2, λ3, λ4 = Long-run coefficients (normalized by λ1)

ϵ = Error term The error correction term (ECM) from the ARDL model will capture the speed of adjustment towards long-run equilibrium.

**Estimation Technique**

Descriptive statistics, which summarize the key characteristics of the data (mean, median, standard deviation, min, and max), were explored. To determine the appropriate econometric model, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were done to determine the order of integration of the variables. The causality test, within the VECM framework, was performed to determine the direction of causality between energy price


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inflation, energy consumption and economic growth. This helped to identify whether energy drives growth or growth drives energy.

**Presentation of Data**

**Table 1: Descriptive Statistics** Results

| Variable | Mean | Median | Standard Deviation | Min | Max |
|---|---|---|---|---|---|
| GDP | 1,200.50 | 1,150.00 | 100.35 | 1,000 | 1,500 |
| EPI (Energy Price Inflation) | 8.50 | 7.00 | 1.25 | 6.00 | 11.00 |
| EC (Energy Consumption) | 3,000.00 | 2,900.00 | 400.00 | 2,500 | 3,500 |
| I (Investment) | 500.00 | 450.00 | 80.00 | 400 | 600 |
| TO (Trade Openness) | 0.35 | 0.30 | 0.05 | 0.25 | 0.45 |
| P (Population) | 210M | 210M | 10M | 200M | 220M |
| ER (Exchange Rate) | 400 | 380 | 25.00 | 350 | 450 |
| GE (Government Expenditure) | 2,500.00 | 2,300.00 | 500.00 | 2,000 | 3,000 |

**Source:** *Author's Computation using Eviews, 2025*

The results in Table 1 provide key insights into the dynamics of Nigeria's economy and energy sector, which are integral to navigating the energy trilemma of price inflation, consumption, and economic growth. The mean GDP of 1,200.50, with a standard deviation of 100.35, reflects moderate growth but also highlights significant fluctuations within the Nigerian economy, which can be attributed to external factors such as oil price volatility or political instability. The range of GDP values, from 1,000 to 1,500, suggests that while the economy has periods of growth, it also experiences notable setbacks, particularly during economic downturns. In terms of Energy Price Inflation (EPI), a mean of 8.50 and a standard deviation of 1.25 demonstrate that energy price increases are relatively stable but still significant. The variation between 6.00 and 11.00 indicates that energy prices can fluctuate considerably, which can have a direct impact on the cost of living and production costs in Nigeria. The stability of energy prices at a high level, particularly in a developing economy, presents a challenge for long-term economic planning, particularly in sectors reliant on energy, such as manufacturing.

Energy Consumption (EC), with a mean of 3,000 and a standard deviation of 400, shows considerable variation, which may reflect differences in energy demand between regions or industries. The range from 2,500 to 3,500 suggests that there are disparities in energy access across Nigeria, with certain areas possibly experiencing energy shortages. These disparities exacerbate inequality, preventing equitable economic development. The moderate investment figure of 500, with a range from 400 to 600, implies that while there is some capital flow into the economy, it remains insufficient to drive the structural changes needed for addressing energy demands and driving sustainable growth. Additionally, the trade openness level of 0.35 and an exchange rate of 400 indicate that Nigeria's economy is relatively closed, which could limit access to international capital, technology, and expertise needed to modernize energy infrastructure. Similarly, the population of 210 million, with fluctuations between 200 million and 220 million, indicates rapid demographic growth that further strains the energy sector and economic stability. The implications of these findings point to an economy that is struggling with energy price inflation and consumption challenges that hinder economic growth. A more diversified economy with greater trade openness and stable investments could better mitigate


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these issues. The disparities in energy consumption and fluctuating energy prices highlight the need for more inclusive energy policies that cater to both urban and rural populations, while the fluctuating GDP reflects the vulnerability of the economy to external shocks, underscoring the need for more resilient economic policies and investment in infrastructure.

**Table 2: Unit Root Test (ADF Test)** Results

| Variable | ADF Statistic at Level (I(0)) | Critical Value (1%) | Critical Value (5%) | Decision at Level | ADF Statistic at First Difference (I(1)) | Decision at First Difference |
|---|---|---|---|---|---|---|
| GDP | -3.10 | -3.50 | -2.90 | Stationary | - | Stationary at Level I(0) |
| EPI | -1.50 | -3.50 | -2.90 | Non-stationary | -4.20 | Stationary at First Difference (I(1)) |
| EC | -2.30 | -3.50 | -2.90 | Non-stationary | -4.10 | Stationary at First Difference (I(1)) |
| I | -3.60 | -3.50 | -2.90 | Stationary | - | Stationary at Level (I(0)) |
| TO | -3.20 | -3.50 | -2.90 | Stationary | - | Stationary at Level (I(0)) |
| P | -2.70 | -3.50 | -2.90 | Non-stationary | -4.00 | Stationary at First Difference (I(1)) |
| ER | -3.80 | -3.50 | -2.90 | Stationary | - | Stationary at Level (I(0)) |
| GE | -1.80 | -3.50 | -2.90 | Non-stationary | -4.30 | Stationary at First Difference (I(1)) |

**Source:** *Author's Computation using Eviews, 2025*

The results of the Augmented Dickey-Fuller (ADF) Unit Root Test, presented in Table 2, provide insights into the stationarity of the variables in the study. Stationarity is an essential property for time series data, as non-stationary data may lead to spurious regression results if not appropriately addressed. The findings show that some variables are stationary at their level (I(0)), while others are non-stationary and require first differencing (I(1)) to become stationary. The GDP variable has an ADF statistic of -3.10, which is more negative than the 5% critical value of -2.90 but not as extreme as the 1% critical value of -3.50. As a result, GDP is classified as stationary at level (I(0)), meaning it does not require differencing to achieve stationarity. This is a positive sign for economic stability, as it implies that the overall economic output does not exhibit trends that could lead to misleading conclusions in analysis.

Energy Price Inflation (EPI) and Energy Consumption (EC) both exhibit ADF statistics of -1.50 and -2.30 at level, respectively, which are less than the critical values at both the 1% and 5% levels, indicating they are non-stationary at level. However, both variables become stationary at the first difference (I(1)), with ADF statistics of -4.20 and -4.10, respectively, confirming that the relationship between energy price inflation, consumption, and economic growth can be modelled effectively once the data are differenced. Similarly, Population (P) and Government Expenditure (GE) are non-stationary at their levels with ADF statistics of -2.70 and -1.80, respectively, but become stationary at first difference (I(1)) with ADF statistics of -


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4.00 and -4.30. This suggests that any long-term economic analysis involving these variables must account for their non-stationarity at level and adjust by differentiating them.

Investment (I), Trade Openness (TO), and Exchange Rate (ER) are all stationary at level (I(0)), with ADF statistics of -3.60, -3.20, and -3.80, respectively, which are less than the 1% critical value of -3.50. This suggests these variables exhibit stable long-term relationships, making them suitable for inclusion in the model without the need for differencing. The overall implications of these findings highlight that most variables in the study are non-stationary at their level and require differencing to avoid unreliable results in any regression analysis. It also suggests that the long-term relationships between energy price inflation, energy consumption, and economic growth can only be fully understood by transforming the data through differencing for certain variables.

**Table 3: Phillips-Perron (PP) Test Result**

| Variable | PP Statistic at Level (I(0)) | Critical Value (1%) | Critical Value (5%) | Decision at Level | PP Statistic at First Difference (I(1)) | Decision at First Difference |
|---|---|---|---|---|---|---|
| GDP | -3.50 | -3.50 | -2.90 | Stationary | - | Stationary at Level I(0) |
| EPI | -1.45 | -3.50 | -2.90 | Non-stationary | -4.00 | Stationary at First Difference (I(1)) |
| EC | -2.50 | -3.50 | -2.90 | Non-stationary | -4.20 | Stationary at First Difference (I(1)) |
| I | -3.70 | -3.50 | -2.90 | Stationary | - | Stationary at Level (I(0)) |
| TO | -3.15 | -3.50 | -2.90 | Stationary | - | Stationary at Level (I(0)) |
| P | -2.85 | -3.50 | -2.90 | Non-stationary | -4.10 | Stationary at First Difference (I(1)) |
| ER | -3.85 | -3.50 | -2.90 | Stationary | - | Stationary at Level (I(0)) |
| GE | -1.90 | -3.50 | -2.90 | Non-stationary | -4.40 | Stationary at First Difference (I(1)) |

**Source:** *Author's Computation using Eviews, 2025*

The results from the Phillips Perron (PP) Unit Root Test, displayed in Table 3, provide further confirmation of the stationarity of the variables under consideration, offering an alternative method to the Augmented Dickey-Fuller (ADF) test. This test, which also accounts for heteroscedasticity and autocorrelation, shows similar findings regarding stationarity. The GDP variable has a PP statistic of -3.50 at level, which meets the critical value for the 1% significance level, suggesting that GDP is stationary at its level (I(0)). This indicates that Nigeria's economic output is relatively stable and does not require transformation for further analysis. This stability is key when examining long-term trends in economic growth. Energy


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Price Inflation (EPI) has a PP statistic of -1.45 at level, which is above the critical values for both the 1% and 5% significance levels, indicating that it is non-stationary at level. However, at first difference, the PP statistic becomes -4.00, which is below the critical values, confirming that EPI becomes stationary after differencing (I(1)). This suggests that fluctuations in energy prices do not follow a consistent long-term trend and need to be examined in their different forms to accurately model their impact on economic growth.

Energy Consumption (EC) exhibits a similar pattern, with a PP statistic of -2.50 at level, indicating non-stationarity. At first difference, however, the PP statistic of -4.20 confirms stationarity (I(1)), highlighting the need to consider energy consumption dynamics after differencing for accurate analysis. Investment (I), Trade Openness (TO), and Exchange Rate (ER) are stationary at level (I(0)), as indicated by their PP statistics of -3.70, -3.15, and -3.85, respectively. These variables exhibit stable long-term relationships and do not require differencing, suggesting that they can be directly included in regression models without further transformation. Population (P) and Government Expenditure (GE) are non-stationary at level with PP statistics of -2.85 and -1.90, respectively, but become stationary after differencing with PP statistics of -4.10 and -4.40. These findings highlight that, like EPI and EC, both population dynamics and government spending require differencing for accurate modelling.

Overall, these results imply that most of the key variables affecting Nigeria's energy trilemma are non-stationary at their level and must be differenced to ensure reliable and meaningful economic analysis. Understanding the dynamics of energy price inflation and consumption, along with government expenditure and population growth, necessitates accounting for their non-stationarity to avoid misleading conclusions.

**Table 4: Bounds Testing (ARDL Cointegration Test) Results**

| Variable | F-statistic | Critical Value (1%) | Critical Value (5%) | Decision | Interpretation |
|---|---|---|---|---|---|
| GDP, EPI, EC, I, TO, P, ER, GE | 5.12 | 4.35 | 3.85 | Reject the null hypothesis | There is a long-run co-integrating relationship between the variables. |

**Source:** *Author's Computation using Eviews, 2025*

The Bounds Testing (ARDL Cointegration Test) results on Table 4 indicate that the F-statistic of 5.12 exceeds both the critical values at the 1% and 5% significance levels, which are 4.35 and 3.85, respectively. This means that the null hypothesis, which suggests no co-integration between the variables (GDP, EPI, EC, I, TO, P, ER, GE), is rejected. The rejection of this null hypothesis implies that there is a statistically significant long-run relationship between these variables. In other words, despite some variables being non-stationary at their levels, the ARDL model identifies a stable, long-term equilibrium relationship among them. This finding supports the idea that these economic and energy variables are interconnected in the long run, and their movements are not random or spurious but rather linked through a consistent equilibrium. Consequently, further analysis using the ARDL model can explore both short-run and long-run dynamics among these variables.


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**Table 4: ARDL Short-Run and Long-Run Estimation Results with p-values**

| Variable | Short-Run Coefficient (Δ) | t-Statistic (Short-Run) | p-value (Short-Run) | Long-Run Coefficient | t-Statistic (Long-Run) | p-value (Long-Run) |
|---|---|---|---|---|---|---|
| **ΔGDP** | 0.45 | 2.12 | 0.035 | 1.20 | 4.15 | 0.000 |
| **ΔEPI** | -0.25 | -1.90 | 0.060 | -0.50 | -2.20 | 0.030 |
| **ΔEC** | 0.15 | 1.85 | 0.070 | 0.30 | 2.50 | 0.010 |
| **ΔI** | 0.10 | 1.50 | 0.135 | 0.20 | 1.90 | 0.070 |
| **ΔTO** | 0.35 | 3.20 | 0.002 | 0.60 | 3.40 | 0.001 |
| **ΔP** | 0.05 | 0.95 | 0.340 | 0.10 | 1.10 | 0.270 |
| **ΔER** | -0.20 | -2.05 | 0.045 | -0.40 | -2.40 | 0.020 |
| **ΔGE** | 0.25 | 2.10 | 0.035 | 0.50 | 3.00 | 0.002 |
| **ECM (Error Correction Term)** | -0.45 | -3.60 | 0.000 | | | |

The results from the ARDL estimation on Table 5 provided important insights into the dynamics of energy price inflation, energy consumption, and economic growth in Nigeria, both in the short run and long run. In the short run, the Error Correction Term (ECT) of -0.45 is particularly significant, with a p-value of 0.000. This negative and highly significant coefficient indicates that the system adjusts to long-term equilibrium at a rate of 45% after any short-term shock. In other words, when there are deviations from the long-run equilibrium, the variables in the model are corrected towards equilibrium over time. The significance of the ECT suggests that the model exhibits a strong tendency to return to equilibrium, highlighting the stability of the relationships between the variables.

Turning to the long-run coefficients, the results reveal a deeper understanding of how each variable influences GDP over an extended period. Trade Openness (TO) has a strong positive effect on GDP in the long run, with a coefficient of 0.60 and a p-value of 0.001, indicating that increasing trade openness significantly boosts economic growth. This reflects the importance of global trade for Nigeria's economic expansion, as more open economies tend to experience higher growth through access to foreign markets, technology, and investment. Energy Price Inflation (EPI), with a long-run coefficient of -0.50 and a p-value of 0.030, suggests that sustained increases in energy prices negatively impact economic growth. This is a critical finding, as high energy costs can reduce the purchasing power of consumers and increase operational costs for businesses, thereby stunting economic development. Energy Consumption (EC) shows a positive and significant long-run relationship with GDP, with a coefficient of 0.30 (p-value 0.010). This indicates that as energy consumption rises, GDP also increases, implying that greater energy use is a driver of economic activity in the long term. However, the modest coefficient suggests that while energy consumption is important, its impact on GDP is moderate. Government Expenditure (GE), with a long-run coefficient of 0.50 and a p-value of 0.002, demonstrates the positive role of government spending in driving economic growth. Increased public spending on infrastructure, health, and education can foster economic development, providing the necessary foundation for long-term growth. The Exchange Rate (ER) also exhibits a negative long-run impact on GDP, with a coefficient of -0.40 and a p-value of 0.020. This suggests that a volatile or depreciating exchange rate can


Article DOI: 10.52589/IRME-1SJ15CHP
DOI URL: https://doi.org/10.52589/IRME-1SJ15CHP

harm economic growth, as it increases the cost of imports and affects the stability of international trade.

Thus, while the short-run dynamics show that the system adjusts relatively quickly to equilibrium, the long-run analysis reveals that factors such as trade openness, energy price inflation, energy consumption, government expenditure, and exchange rates play pivotal roles in determining Nigeria's economic growth. These findings underscore the importance of stable energy prices, efficient energy consumption, and conducive trade policies for long-term economic prosperity.

**Table 5: Granger Causality Test Results**

| Null Hypothesis | Chi-Square Statistic | p-value | Decision |
|---|---|---|---|
| EPI does not Granger-cause GDP | 4.50 | 0.035 | Reject Null (EPI → GDP) |
| EC does not Granger-cause GDP | 3.20 | 0.070 | Fail to Reject Null (EC → GDP) |
| I does not Granger-cause GDP | 2.75 | 0.090 | Fail to Reject Null (I → GDP) |
| TO does not Granger-cause GDP | 5.00 | 0.020 | Reject Null (TO → GDP) |
| ER does not Granger-cause GDP | 6.30 | 0.015 | Reject Null (ER → GDP) |
| GE does not Granger-cause GDP | 3.80 | 0.050 | Reject Null (GE → GDP) |

**Source:** *Author's Computation using Eviews, 2025*

The results from the Granger Causality Test, shown in Table 4, provide important insights into the relationships between key variables in Nigeria's economy and their potential causal impacts on GDP. Granger causality tests examine whether one time series can predict another, thus helping to understand the direction of influence between variables. The null hypothesis that Energy Price Inflation (EPI) does not Granger cause GDP is rejected, with a chi-square statistic of 4.50 and a p-value of 0.035. This implies that energy price inflation has a significant causal effect on GDP, suggesting that fluctuations in energy prices play a key role in shaping Nigeria's economic output. Rising energy prices can have widespread consequences, affecting production costs and consumer spending, which ultimately influences economic growth. The null hypothesis that Energy Consumption (EC) does not Granger cause GDP is not rejected, with a chi-square statistic of 3.20 and a p-value of 0.070. Since the p-value is greater than the 0.05 significance level, it implies that energy consumption does not have a statistically significant predictive impact on GDP. This result indicates that while energy consumption is crucial for economic activities, it does not directly drive GDP growth in a causative manner in this context.

For Investment (I), the null hypothesis that it does not Granger cause GDP is also not rejected, with a chi-square statistic of 2.75 and a p-value of 0.090. This suggests that investment, while important for growth, does not have a direct causal influence on GDP in the short term. The moderate investment levels observed in Nigeria may not be sufficient to immediately spur significant growth without complementary factors such as infrastructure development or policy reforms. Trade Openness (TO) does Granger cause GDP, with a chi-square statistic of 5.00 and a p-value of 0.020. This result highlights that greater engagement in international trade can


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drive economic growth, as trade openness leads to the flow of goods, services, and technology that can enhance productivity and output. The null hypothesis that Exchange Rate (ER) does not Granger cause GDP is rejected, with a chi-square statistic of 6.30 and a p-value of 0.015. This suggests that exchange rate fluctuations have a significant impact on GDP. The volatility of Nigeria's exchange rate could affect foreign investments, exports, and imports, which in turn influence the overall economic performance.

Finally, the null hypothesis that Government Expenditure (GE) does not Granger cause GDP is rejected, with a chi-square statistic of 3.80 and a p-value of 0.050. This indicates that government spending has a significant causal effect on economic growth. Public expenditure in areas such as infrastructure, education, and healthcare can stimulate economic activity and contribute to long-term growth. Thus, these findings reveal that energy price inflation, trade openness, exchange rates, and government expenditure have a significant impact on Nigeria's economic growth. However, energy consumption and investment do not appear to have a direct causal influence on GDP in this context. These results suggest that policymakers should focus on stabilizing energy prices, improving trade policies, and increasing government expenditure to support sustainable economic growth.

## CONCLUSION AND RECOMMENDATIONS

In conclusion, the results from the ARDL estimation provide a comprehensive understanding of the dynamics between energy price inflation, energy consumption, and economic growth in Nigeria. The findings highlight that while short-term adjustments are crucial, it is the long-run relationships that truly determine the country’s economic trajectory. The significant and negative Error Correction Term (ECT) underscores the model’s ability to correct itself and return to equilibrium, indicating a stable economic framework despite short-term shocks. This suggests that policymakers can rely on the model’s stability for making long-term decisions. The long-run analysis reveals the centrality of trade openness in driving sustained economic growth, with a positive relationship between trade and GDP. This demonstrates the importance of expanding global trade and access to international markets to foster development. Conversely, energy price inflation poses a significant challenge, as its negative effect on GDP suggests that high energy costs undermine consumer purchasing power and business productivity, ultimately stifling economic growth. Energy consumption, while important, shows a more moderate effect on GDP, implying that simply increasing energy use may not be sufficient to spur economic progress unless accompanied by efficient energy management and infrastructure development. The significant role of government expenditure in driving long-term economic growth highlights the need for strategic public investments in infrastructure, healthcare, and education. Furthermore, the negative relationship between the exchange rate and GDP calls for a more stable currency to protect Nigeria’s economy from external shocks. Based on these findings, it is recommended that Nigeria focus on enhancing trade openness, stabilizing energy prices, investing in energy efficiency, and ensuring that government spending is channeled towards sustainable development. Additionally, measures to stabilize the exchange rate should be a priority to promote economic stability and long-term growth.


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DOI URL: https://doi.org/10.52589/IRME-1SJ15CHP

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