



DEREGULATION OF THE DOWNSTREAM PETROLEUM SECTOR AND ECONOMIC GROWTH IN NIGERIA

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Abstract

The downstream petroleum sector in Nigeria plays a crucial role in the economy, influencing production costs, transportation, and the overall standard of living. Over the years, government control of petroleum product pricing has led to inefficiencies, underinvestment, and heavy subsidy burdens. In response, there have been increasing calls and efforts to deregulate the sector to foster market efficiency, attract investment, and reduce fiscal strain. However, the impact of such deregulation on macroeconomic indicators such as economic growth, inflation, and the standard of living remains a subject of debate and empirical investigation. However, this study examined the impact of deregulating Nigeria's downstream petroleum sector on its economic growth, inflation, and standard of living. Theoretical frameworks employed include the Endogenous Growth Model, Bergson Social Welfare Theory, and the Keynesian Theory of Inflation. Using data from 1981 to 2021, the study employed the Augmented Dickey-Fuller (ADF) unit root test and Autoregressive Distributed Lag (ARDL) technique, alongside stability and diagnostic tests. The findings reveal that deregulation of the petroleum sector negatively impacts Nigeria's economic growth, with significant adverse correlations between the prices of PMS, AGO, and DPK and GDP growth. Although the price of PMS has a negligible positive impact on standard of living, AGO and DPK have a significant negative effect. The deregulation of petroleum prices contributes to rising inflation, with PMS and AGO prices positively correlating with inflation, while DPK has a

marginal positive effect. The study suggests that deregulating PMS could promote sector competition and mitigate the rising fuel prices, which hurt Nigeria's economy and standard of living. It recommends that the government de-regulate PMS, encourage private sector participation, and undertake refinery maintenance to reduce reliance on imported petroleum. Policies aimed at controlling inflation and boosting domestic refining capacity are essential for sustainable energy and economic security.

Keywords: Deregulation, Downstream Petroleum Sector, Economic Growth, Inflation, Standard of Living.

Introduction

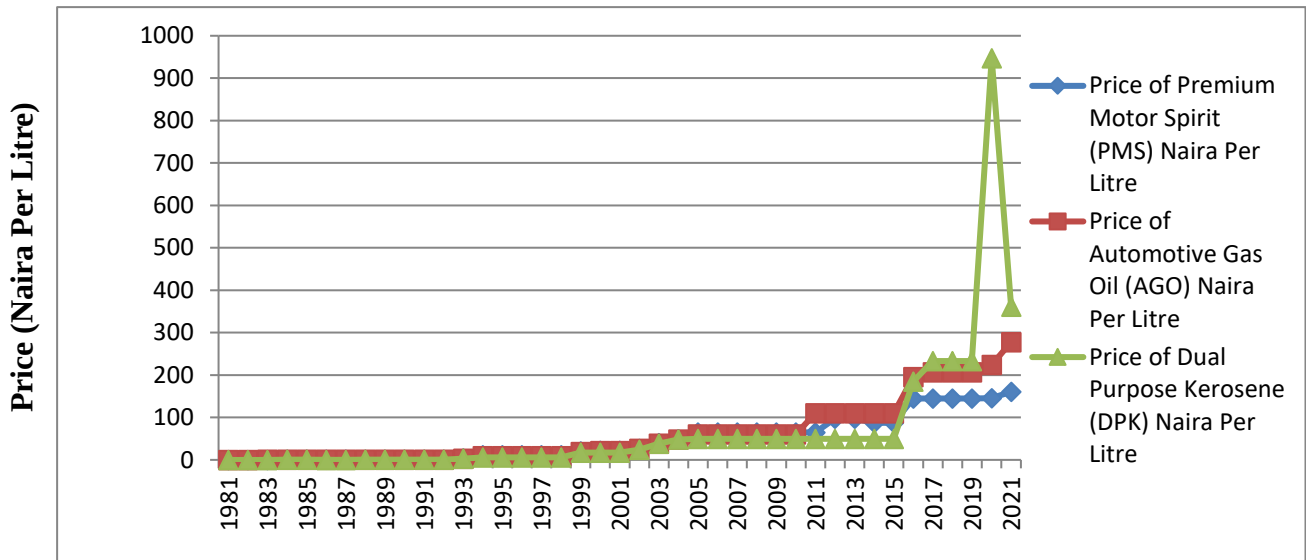
The energy sector is essential for the socio-economic development of nations, as it supports industries and households globally. Governments in several countries, including many OPEC and Non-OECD nations, subsidize energy consumption to foster industrial growth and improve energy access (Siddig, et al., 2014; Dennis, 2016). However, concerns over climate change due to increased greenhouse gas emissions from higher energy consumption (Dennis, 2016; Aune, et al., 2017) have led to global calls for reducing energy subsidies. Furthermore, the fiscal burden of subsidies on government budgets in developing countries has prompted discussions on subsidy removal to free up resources for renewable energy investment and other development projects (Coxhead & Grainger, 2018; Aune, et al., 2017).

One major aspect of global energy reforms is the deregulation of the energy sector. International financial institutions, such as the IMF and OECD, advocate for fuel subsidy removal to achieve fiscal balance (Akinola, 2018). In many countries, including Nigeria, deregulation aims to promote market efficiency and competition (Shawai, et al., 2019). However, the impact of deregulation in Nigeria has been mixed. Despite deregulation efforts, issues like rising petroleum prices, scarcity, and low refinery capacity persist, which adversely affect the economy, people's living standards, and inflation (Akinola, 2018; Ehinomen & Adepoju, 2012).

Petroleum products supply and pricing remain contentious issues in Nigeria, the largest oil exporter in Africa. Despite being a major oil producer, Nigerians often face high fuel prices and supply shortages, impacting household income, quality of life, and the overall economy (Nwachukwu & Chike, 2011; Akinola, 2018). Fuel price increases directly lead to inflation, affecting businesses and households alike. Deregulation, which began in 2003 under the Obasanjo administration, has been linked to rising fuel prices, scarcity, and socio-economic instability (Siddig, et al., 2014; Rentschler, 2016). Though the government argues that subsidy removal is necessary for economic stability, the outcome has been disappointing, as it has not significantly improved fuel availability or reduced poverty (Akinola, 2018). This study seeks to assess the effectiveness of deregulation in the

Nigerian downstream oil sector and its impact on economic performance, living standards, and inflation.

Fig. 1.1 Trend of the Prices of major Petroleum Products in Nigeria (1981 – 2021)



Source: National Bureau of Statistics Petroleum Products Watch, Petroleum Products

Pricing Regulatory Agency (PPPRA) Official Website, NNPC Annual Statistical Bulletin, Central Bank of Nigeria (CBN): Nigeria Major Economic, Financial and Banking Indicators

Since 1986, the pump price of Premium Motor Spirit (PMS) in Nigeria has experienced consistent increases, with a notable 364% spike in 1993 and periods of price stability in years such as 1988, 1992, and 1996. Major hikes included a 49.2% increase in 2012, from ₦65 to ₦97 per litre, following an attempted full subsidy removal under President Jonathan, which raised the price to ₦140 before widespread protests forced a rollback (KPMG, 2023). Price reductions were rare, recorded only in 2009 (₦75 to ₦65) and 2015 (₦97 to ₦86.50). Under President Buhari, the price rose to ₦145 per litre in 2016 amid efforts to reduce subsidy payments. Other petroleum products such as Automotive Gas Oil (AGO) and Dual Purpose Kerosene (DPK) also experienced significant increases, with AGO surging by 446% in 1993 and kerosene prices rising 200% in 2015. Despite regulated pricing, kerosene was often sold far above official rates up to ₦400 per litre in 2017 compared to the subsidized ₦150. These fuel price hikes have been closely linked to inflation and declining living standards, particularly among the poor. In a landmark policy shift, President Bola Tinubu announced the complete removal of fuel subsidies on May 29, 2023, leading to immediate price surges of over 200%, with PMS retailing between ₦488 and ₦577 per litre across states (KPMG, 2023). Though the government claimed the reform saved over \$10 billion in 2023 and aimed to redirect funds to

infrastructure and welfare (The Nation, 2024), it also triggered inflation nearing 30%, currency devaluation, and significant public hardship (Financial Times, 2024; Washington Post, 2025).

The fiscal strain imposed by Nigeria's fuel subsidy regime became particularly evident in 2007 when global crude oil prices surged above \$145 per barrel, sharply increasing the government's subsidy obligations. At its peak, the Nigerian government subsidized approximately 80% of domestic fuel consumption, resulting in an unsustainable fiscal burden ([KPMG, 2023](#); [Financial Times, 2024](#)). Although efforts were made toward partial deregulation, the subsidy remained a dominant component of government expenditure. This structural inefficiency became even more pronounced during the global oil price collapse of 2014–2015, which significantly reduced government revenue and intensified fiscal pressure. The resulting shortfall contributed to Nigeria's 2016 economic recession, its first in over two decades, as lower oil earnings clashed with persistently high subsidy costs (Reuters, 2023; [The Nation, 2024](#)).

While past research has studied the effects of deregulation on Nigeria's economy, most have focused on individual aspects, such as economic growth or inflation. Few studies have examined the combined effects of deregulation on economic growth, inflation, and the standard of living. This research, covering 1981 to 2021, aims to assess the broader impact of deregulating the downstream petroleum sector on Nigeria's economy, including its effects on inflation, economic growth, and the welfare of the population. The study distinguishes itself by analyzing a longer time period, offering a comprehensive view of the consequences of deregulation in the petroleum sector. However, the broad objective of this study is to examine the macroeconomic impacts of deregulation of the downstream sector of petroleum products on economic growth in Nigeria. Hence, the specific objectives of this study are stated below:

- (i) To measure the extent of the impact of the deregulation of downstream oil sector on the economic growth of Nigeria;
- (ii) To investigate the effect of the change in the pricing of petroleum products on the standard of living of people under the deregulation of the downstream oil sector in Nigeria;
- (iii) To estimate the pass through of petroleum products prices to inflation after the deregulation of the downstream oil sector in Nigeria.

Deregulation

Deregulation refers to the process of reducing or eliminating government control in markets or industries, aiming to promote competition and efficiency. There are two phases: partial deregulation, which reduces government control to improve distribution efficiency while protecting consumers, and full deregulation, which removes all government controls, allowing market forces to dictate prices and operations. In Nigeria, deregulation is closely tied to the Structural Adjustment

Programme (SAP) introduced in 1986, aimed at encouraging private sector participation in the economy, particularly in the downstream oil sector (Orji, 2015).

The downstream sector of Nigeria's oil industry includes refining, distribution, and marketing of petroleum products. Deregulating this sector involves removing government price controls, encouraging private sector involvement in refining, and eliminating entry barriers in petroleum product supply chains (Shawai, 2019). The goal is to enhance efficiency, competition, and regular supply of petroleum products at reduced prices, though this often involves fuel subsidy removal (Igbikiowubo, 2011).

Economic Growth

Economic Growth is the increase in the monetary value of products and services produced by an economy over time (Olamide, 2022). It is crucial for reducing poverty, creating jobs, and improving quality of life, especially in developing nations. Economic growth is often linked to an increase in GDP, which can lead to enhanced welfare and development (Shaik & Gona, 2020). A *subsidy* is financial assistance provided by the government to reduce costs for consumers or industries. In the context of Nigeria, subsidies on petroleum products have been a significant part of government policy. *Deregulation* typically requires the removal of these subsidies, shifting the economy toward market-driven pricing (Ezeah & Abodunrin, 2016). Economic growth is crucial for every nation. The primary objective of various macroeconomic policies adopted by countries worldwide is to ensure sustained and robust economic growth (Ugwunna & Obi, 2023).

Petroleum Product Pricing

Petroleum Product Pricing in Nigeria is based on a 'Cost-Plus' method, where the price of petroleum products is determined by the cost of crude oil, refining, distribution, and other associated expenses. Deregulation aims to allow prices to be set by market forces, but often includes government subsidies to prevent excessive price increases (Ukpong, 2004).

Inflation

Inflation refers to the sustained rise in the general price level of goods and services over time. It is influenced by various factors, including changes in the prices of petroleum products. Inflation erodes the purchasing power of money, making goods and services more expensive (Ighoroje & Orife, 2022). However, deregulation of Nigeria's downstream oil sector aims to enhance competition and efficiency, though it involves challenges such as the removal of subsidies, rising petroleum prices, and inflation. These factors significantly impact economic growth and the welfare of citizens.

Theoretical Review

Computable General Equilibrium (CGE)

The Computable General Equilibrium (CGE) model is widely used in studies examining the effects of petroleum product pricing on economic growth, inflation, and household welfare. This model has been favoured over others, such as partial equilibrium models, due to its ability to capture the macroeconomic consequences of policy changes like fuel subsidy removal. It provides insights into budget improvements, resource reallocation, and the impact on household welfare through changes in earnings and expenditures (Breisinger, et al., 2019).

The CGE model is based on the general equilibrium theory developed by French economist Léon Walras, 1874 (Walras, 1874). It analyzes how the interactions between markets specifically product and factor markets lead to equilibrium in prices and quantities. Producers (firms) buy labour (factor services) in the factor market, which becomes part of their production cost. Once production is completed, goods are sold in the product market, where consumers use their income to purchase these products. This interdependence between markets is central to the model, with firms seeking profit maximization and consumers aiming to maximize utility (Breisinger, et al., 2019; Coxhead & Grainger, 2018).

In the context of fuel subsidy reform, the CGE model examines the impact of energy price changes by including energy costs as an input in production and as a normal good consumed by households (Gelan, 2018; Coxhead & Grainger, 2018). When subsidies are removed, energy costs rise, leading firms to respond in three ways: reducing production (causing GDP to fall), passing on higher costs to consumers (resulting in inflation), or substituting labour costs to absorb energy cost increases, which could negatively impact household welfare (Coxhead & Grainger, 2018). Thus, the CGE model provides a comprehensive framework for analyzing the broader economic effects of fuel subsidy reforms, including their impact on growth, inflation, and household well-being.

Endogenous Growth Model

Another popular model that is widely used to examine the economic growth of a country is endogenous growth model. It was developed in the 1980s and 1990s by American economists; Paul Romer and Robert Lucas in the bid to identify and consider the unexplained determinants of growth by Solow growth model. They argue that long-term growth rate cannot be explained by exogenous factors only rather endogenous factors that are determined within the model such as: investment in human capital, R&D, technology and a host of others. Hence, this model emphasises the fact that productivity is not only dependent on the primary factors of production. Besides, it explains why countries grow at different rates. For instance, a country with more advanced technology would record higher growth rate than others with less technical knowledge. So, if the government create a

conducive environment that encourages qualitative investment in human capital, support R&D, facilitate technical knowledge transfer etc. it is expected that such country would experience increased economic growth.

Theory of Inflation

Inflation is commonly understood as "too much money chasing too few goods," with two main theories explaining its causes: the Monetarist and Structural (Keynesian) perspectives.

Monetarist Theory of Inflation

The Monetarist Theory of Inflation was popularized in the 1960s by Milton Friedman, one of the most influential economists of the 20th century. Alongside Anna Schwartz, Friedman presented the theory in their landmark publication *A Monetary History of the United States* (1963). Their work emphasized that inflation is not a random occurrence but a predictable outcome of excessive growth in the money supply relative to the real output of an economy.

According to monetarists, inflation is fundamentally a monetary phenomenon. The theory is grounded in Irving Fisher's equation of exchange ($MV = PQ$), where M stands for money supply, V for the velocity of money, P for the price level, and Q for real output. If the money supply (M) increases at a faster rate than real output (Q), and the velocity of money (V) remains constant, then the price level (P) will rise leading to inflation. This perspective highlights the role of monetary policy in maintaining price stability, advocating for controlled and predictable growth in money supply.

The strength of the Monetarist theory lies in its clarity and quantifiability. It has been historically validated in cases of hyperinflation, where excessive money printing led to rapid price increases. It also provides policymakers with a straightforward framework for inflation control through monetary discipline. However, the theory has been criticized for relying on the assumption that the velocity of money is stable, which often does not hold in volatile or underdeveloped economies. Additionally, it overlooks structural and supply-side causes of inflation, such as infrastructure deficits or production bottlenecks, and fails to adequately explain complex scenarios like stagflation or cost-push inflation.

In the context of this study, the Monetarist theory is relevant for understanding how government spending on fuel subsidies may contribute to inflation in Nigeria. Financing subsidies often requires borrowing or printing money, which expands the money supply and can fuel inflationary pressure. While subsidy removal may reduce fiscal pressure and stabilize the money supply in the long term, it also causes immediate increases in fuel prices, which may trigger short-term inflation. Thus, the Monetarist perspective offers a lens to examine how monetary expansion driven by subsidy expenditures can indirectly affect inflation in Nigeria's deregulated downstream petroleum sector.

Structuralist Theory of Inflation

The Structuralist Theory of Inflation, also known as the Structural Keynesian perspective, emerged in the post-World War II period, particularly during the 1950s and 1960s. It was developed by Latin American economists such as Raúl Prebisch, building upon the foundational work of John Maynard Keynes in the 1930s. While Keynes emphasized demand-side management in developed economies, structuralists adapted his ideas to the context of developing countries, where economic instability is often rooted in deeper institutional and infrastructural challenges.

This theory posits that inflation in developing economies is largely caused by structural bottlenecks rather than merely excessive money supply or demand. These bottlenecks include inadequate infrastructure, low industrial capacity, supply chain inefficiencies, poor governance, and heavy reliance on imports. When aggregate demand exceeds aggregate supply and the economy cannot quickly increase output due to these constraints demand-pull inflation occurs. Moreover, cost-push inflation arises from rising input costs, especially energy and transport, which are exacerbated in deregulated environments where fuel prices are no longer fixed.

The strength of the Structuralist theory lies in its realistic approach to inflation in underdeveloped economies. It accounts for the persistent nature of inflation in countries where monetary stability alone does not resolve price instability. By acknowledging the importance of supply-side constraints, it explains why inflation may remain high even when monetary indicators appear stable. However, a major criticism is that the theory often lacks quantifiable metrics, making it difficult to integrate into economic models. Additionally, it may downplay the role of monetary policy and proposes solutions such as large-scale structural reforms that are slow to implement and often politically challenging.

In the context of this study, the Structuralist theory offers a compelling explanation for the inflationary outcomes observed following fuel subsidy removal in Nigeria. Deregulation leads to immediate increases in fuel prices, which then drive up transportation and production costs across the economy. Given Nigeria's limited refining capacity, dependence on imported petroleum products, and underdeveloped infrastructure, these cost increases translate directly into general price inflation. The theory thus helps illuminate how non-monetary, structural factors such as poor energy infrastructure and supply chain inefficiencies play a significant role in shaping the inflationary impact of deregulating the downstream petroleum sector.

Theory of Social Welfare

The standard of living in any country reflects the overall well-being of its citizens, often measured by the level and quality of goods and services consumed. When individuals are able to access and consume adequate quantities of both private and public goods such as food, healthcare,

education, transportation, and housing their individual welfare improves. The level of satisfaction derived from such consumption is referred to as utility, which forms the foundation of welfare analysis in economics.

The Theory of Social Welfare is rooted in utilitarian philosophy, particularly the works of Jeremy Bentham (late 18th century) and later formalized by Arthur Cecil Pigou in the early 20th century. Bentham introduced the concept that the best policy is one that promotes “the greatest happiness of the greatest number.” Building on this idea, Pigou (1920) developed the modern economic theory of social welfare, emphasizing the role of income distribution and resource allocation in determining overall societal well-being. According to this theory, social welfare is a function of the individual utilities (satisfaction levels) of all members of society.

The theory asserts that each individual seeks to maximize their own utility through the consumption of goods and services. The social welfare function is then derived by aggregating the utilities of all individuals in a society. In this sense, social welfare improves when individuals are more satisfied, and satisfaction (or utility) depends largely on their access to goods and services, which in turn is influenced by their income level. Thus, while utility maximization is central, income acts as a constraint on the extent to which individuals can consume and enjoy a higher standard of living.

In the context of this study, the Theory of Social Welfare is essential for understanding the impact of deregulation in the petroleum sector on the standard of living in Nigeria. The removal of fuel subsidies and the resulting increase in fuel prices can reduce individuals' real income and purchasing power, limiting their ability to consume necessary goods and services. This decline in consumption may lead to lower utility and, by extension, a decline in overall social welfare. Therefore, this theory provides a useful framework for analyzing how economic policies such as deregulation affect the general welfare and living standards of the population.

Empirical Review

Empirical research on the deregulation of Nigeria's downstream petroleum sector and its macroeconomic consequences has yielded mixed and often inconclusive findings. Several studies have explored the relationship between deregulation, particularly fuel subsidy removal, and economic growth. For instance, Adebisi, Alenoghen, and Ayobola (2023) found a long-run relationship between energy supply and economic growth using an ARDL model, but no short-run dynamics. Similarly, Oyalabu and Oyalabu (2023) reported a statistically insignificant relationship between crude oil prices and economic growth. These studies, while useful in identifying long-term trends, largely ignore the transitional effects of deregulation, such as price shocks and their disruptive impact on economic activity. Moreover, they often rely on single-variable frameworks that overlook complex

interactions among fiscal policy, public sentiment, and global oil market volatility. Complementing these findings, Percy and Gloria (2024) conducted a descriptive survey of 400 Nigerians across different socio-economic strata to assess public perception surrounding fuel subsidy removal. Their findings highlight deep public concern over rising costs of living and the perceived risk of increased poverty. Importantly, the study emphasized public preference for investments in renewable energy infrastructure as a viable, long-term solution to reduce unsustainable subsidy spending and enhance welfare outcomes. Together, these studies underscore the social costs and political sensitivity surrounding deregulation, while pointing to structural investment gaps as a barrier to successful reform.

When examining welfare implications, empirical evidence suggests that subsidy reforms tend to worsen living standards, particularly among low-income groups. Perry's (2020) cross-country study on Haiti argues that such reforms disproportionately harm the poor and cautions against one-size-fits-all approaches. In the Nigerian context, Maku, Adetowubo-King, and Aduralere (2018) demonstrated that rising petroleum product prices—particularly PMS and kerosene had a significant negative impact on welfare indicators. However, these studies tend to treat welfare in narrow economic terms, focusing on income and expenditure metrics while underexploring multidimensional aspects such as access to essential services, energy poverty, and regional disparities. Moreover, public perception and political resistance to reforms are either ignored or weakly integrated into the analysis, limiting the policy relevance of their findings.

In terms of inflation, studies offer conflicting results. While Kpagih, Chinda, and Akidi (2022) found no causal link between oil prices and inflation using Granger causality tests, Korgbeelo (2022) and Abatcha (2021) established a strong long-term relationship between petroleum prices and inflation. Yet, these studies differ widely in their methodologies, inflation measures, and time periods considered. Some, such as Olawale and Luqman (2020), find no significant causal relationship between PMS pricing and inflation, contradicting others that report high inflation pass-through from deregulated petroleum pricing. This inconsistency suggests that inflation dynamics in Nigeria may be mediated by additional variables such as exchange rate volatility, monetary policy stance, and fiscal spending factors that are often omitted or under-theorized in existing literature. Additionally, most of these studies lack comparative context, making it difficult to benchmark Nigeria's experience against other developing economies undergoing similar reforms.

However, the empirical literature is predominantly Nigerian-focused and methodologically fragmented. Many studies are descriptive or narrowly scoped, failing to provide an integrated view of how deregulation affects economic growth, inflation, and welfare simultaneously. Furthermore, there is limited attention to cross-country lessons, especially from other resource-rich, developing

economies. This study addresses these gaps by employing a broader macroeconomic framework to analyze the joint impact of downstream sector deregulation on economic growth, inflation, and living standards in Nigeria, over a longer time horizon (1981–2021). By synthesizing these macroeconomic indicators within a unified model, this research offers a more comprehensive understanding of the trade-offs and policy implications of fuel subsidy reforms, an area where existing literature remains insufficiently developed.

Although several studies have investigated the effects of oil sector deregulation in Nigeria and other countries, most have focused on specific aspects such as economic growth, welfare, or inflation. There remains a gap in the literature regarding the comprehensive impact of the deregulation policy, which may lead to economic growth but also create inflationary pressures that could lower people's standard of living. This study addresses this gap by applying econometric tools to assess the multidimensional impact of deregulation on economic growth, standard of living, and inflation in Nigeria. By examining both micro and macro effects, the study aims to provide a holistic understanding of the policy's impact and serve as a basis for evaluating its effectiveness. Additionally, this study distinguishes itself by covering a longer time frame, from 1981 to 2021, compared to previous studies, which have generally focused on shorter periods.

Theoretical Framework

This study employs three key theoretical frameworks to analyze the impact of deregulation in Nigeria's downstream oil sector on economic growth, standard of living, and inflation. The Endogenous Growth Model (EGM) considers factors like education, health, technology, and R&D as drivers of economic growth. In the context of deregulation, the model suggests that encouraging competition in the oil sector can lead to more investment in human capital, R&D, and technological advancements. Using an augmented Cobb-Douglas production function, the relationship between petroleum product prices and economic growth is examined. The model postulates that efficient pricing of petroleum products can influence the overall production process, affecting economic growth.

To assess the effect of petroleum prices on the standard of living, Bergson's Social Welfare Theory is applied. The theory posits that social welfare depends on the welfare of individuals in society, which is linked to the goods and services consumed. The welfare function is negatively related to prices, meaning that higher petroleum prices would lead to lower welfare, as they reduce the utility derived from consumption.

The Keynesian theory of inflation is used to evaluate the impact of fuel price changes on inflation. According to this theory, inflation is driven by structural rigidities that push up factor costs, including fuel costs. A modified Cobb-Douglas cost function is employed to examine how fuel prices

contribute to inflation. The model suggests that increases in petroleum product prices directly affect inflation by raising production costs.

Together, these theories provide a comprehensive framework for analyzing the effects of deregulation in Nigeria's downstream oil sector on economic growth, welfare, and inflation.

Methodology

Model Specification

Three models shall be used to investigate the impacts of deregulation of the downstream oil sector in Nigeria. The models were formulated based on inferences drawn from various empirical studies reviewed in this study. The three models are stated below:

Model I:

The first model seeks to achieve objective one of this study, which is to examine the impact of the deregulation of downstream oil sector on economic growth in Nigeria. The model was derived from the studies conducted by Adebisi, et al., (2023) with some adjustments in terms of the number of explanatory variables and the time frame. The model functional form is of specified thus:

$$RGDPG = f(PMS, AGO, DPK, EXR, INF, LFPR) \text{-----} (11)$$

The econometric form of the model can be expressed as:

$$RGDPG = \alpha_0 + \alpha_1 PMS + \alpha_2 AGO + \alpha_3 DPK + \alpha_4 EXR_{t-1} + \alpha_5 INF + \alpha_6 LFPR + \mu_t \text{-----} (12)$$

The linearized form of equation (3) was derived by taking the natural logarithms of the necessary variables. So the model can be re-written as:

$$RGDPG_t = \alpha_0 + \alpha_1 \ln PMS_{t-1} + \alpha_2 \ln AGO_{t-1} + \alpha_3 \ln DPK_{t-1} + \alpha_4 EXR_{t-1} + \alpha_5 INF_{t-1} + \alpha_6 LFPR_{t-1} + \mu_t \text{----} (13)$$

Where;

RGDPG = Real Gross Domestic Product Growth Rate

LnPMS = Average price of Premium Motor Spirit Naira per Litre

LnAGO = Average price of Automotive Gas Oil Naira per Litre

LnDPK = Average price of Dual Purpose Kerosene Naira per Litre

EXR = Exchange rate

INF = Inflation rate

LFPR = Labour force participation rate, total (% of total population ages 15+)

Ln = Natural Logarithm

α_0 = Constant

$\alpha_1 - \alpha_5$ = Estimation parameters

μ = Stochastic error term or unexplained variation

A priori specification: the expected signs of the coefficients of the explanatory variables are:

$\alpha_1 > 0, \alpha_2 > 0, \alpha_3 > 0, \alpha_4 < 0, \alpha_5 < 0$.

Model II:

The second model seeks to achieve the objective two of this study, which is to determine the impact of the petroleum pump prices on standard of living in Nigeria. The model was adopted from the studies conducted by Maku, et al., (2018) with some adjustments to the number of explanatory variables as well as the time range. The functional form of the model is stated below:

$$PCI = f(PMS\ AGO, DPK, INF, EXR, LFPR) \text{-----} (14)$$

The linear function of equation 5 can be stated thus:

$$PCI = \beta_0 + \alpha_1 PMS + \beta_2 AGO + \beta_3 DPK + \beta_4 INF + \beta_5 EXR + \beta_6 LFPR + \mu_t \text{-----} (15)$$

Taking the natural logarithms of some of the variables with the assumption of linearity among them, the model becomes:

$$PCI_t = \beta_0 + \beta_1 \ln PMS_{t-1} + \beta_2 \ln AGO_{t-1} + \beta_3 \ln DPK_{t-1} + \beta_4 \ln INF_{t-1} + \beta_5 EXR_{t-1} + \beta_6 LFPR_{t-1} + \mu_t \text{--} (16)$$

Where;

PCI = Per capita income (annual %) is taken as proxy for standard of living

LnPMS = Average price of Premium Motor Spirit Naira per Litre

LnAGO = Average price of Automotive Gas Oil Naira per Litre

LnDPK = Average price of Dual Purpose Kerosene Naira per Litre

INF = Inflation rate

EXR = Exchange rate

LFPR = Labour force participation rate, total (% of total population ages 15+)

Ln = Natural Logarithm

β_0 = Constant

$\beta_1 - \beta_4$ = Estimation parameters

μ = Stochastic error term or unexplained variation

A priori specification: the expected signs of the coefficients of the explanatory variables are: $\beta_1 < 0, \beta_2 > 0, \beta_3 < 0, \beta_4 < 0, \beta_5 < 0$ and $\beta_6 > 0$

Model III:

The third model seeks to achieve objective three of the study, which is to ascertain the effect of deregulated petroleum prices on inflation in Nigeria. To do this, the structure of the model was adopted from a study by Olawale and Luqman (2020) with some adjustments to the number of explanatory variables used and the time range. The functional form of the model is stated thus:

$$INF = f(PMS, AGO, DPK, EXR, LFPR) \text{-----} (17)$$

The linear function of equation 8 can be stated thus:

$$INF = \beta_0 + \alpha_1 PMS + \alpha_2 AGO + \beta_3 DPK + \beta_4 EXR + \beta_5 LFPR + \mu_t \text{-----} (18)$$

Adopting a log-linear specification and assuming linearity among variables, thus, the economic model is stated below:

$$INF_t = \lambda_0 + \lambda_1 \ln PMS + \lambda_2 \ln AGO_{t-1} + \lambda_3 \ln DPK_{t-1} + \lambda_4 EXR_{t-1} + \lambda_5 LFPR_{t-1} + \mu_t \text{-----} (19)$$

Where;

INF = Inflation rate

LnPMS = Average price of Premium Motor Spirit Naira per Litre

LnAGO = Average price of Automotive Gas Oil Naira per Litre

LnDPK = Average price of Dual Purpose Kerosene Naira per Litre

EXR = Exchange rate

LFPR = Labour force participation rate, total (% of total population ages 15+)

Ln = Natural Logarithm

λ_0 = Constant

$\lambda_1 - \lambda_5$ = Estimation parameters

μ = Stochastic error term or unexplained variation

A priori specification: the expected signs of the coefficients of the explanatory variables are:

$\beta_1 < 0$, $\beta_2 > 0$, $\beta_3 < 0$, $\beta_4 < 0$ and $\beta_5 > 0$.

Estimation Technique and Procedure

Augmented Dickey Fuller (ADF) test used to ascertain the stationarity of the variables in order to eliminate the problems associated with autocorrelation. The estimation technique employed in this study is Autoregressive Distributive Lag (ARDL) bounds test. However, some preliminary tests such as the unit root test are conducted to determine the properties of the time series data used in the model before running the cointegration test, and the Error Correction Model (ECM). In addition to these,

the reliability and stability of the models are determined by conducting diagnostic and stability tests. The subsections below explain the procedure involved in the data analyses in detail.

Presentation and Analysis of Result

Unit Root Test Results

The result of ADF testing can be seen in Table 4.1.

Table 4.1: ADF Unit Root Test for the Models Respectively

	Variables	ADF-Statistic	Critical Value @ 5%	Order of Int.
Model 1	Real Gross Domestic ProductGrowth Rate (RGDPG)	-4.275709	-2.936942	1(0)
	Average price of Premium Motor Spirit Naira per Litre (LnPMS)	-6.310895	-2.938987	1(1)
	Average price of Automotive Gas Oil Naira per Litre (LnAGO)	-5.100225	-2.938987	1(1)
	Average price of Dual Purpose Kerosene Naira per Litre (LnDPK)	-10.95591	-2.938987	1(1)
	Exchange rate (EXR)	-3.838880	-2.938987	1(1)
	Inflation rate (INF)	-6.170039	-2.941145	1(1)
	Labour force participation rate (LFPR)	-6.420601	-2.948404	1(0)
Model 2	Per capita income (PCI)	-4.330749	-2.936942	1(0)
	Average price of Premium Motor Spirit Naira per Litre (LnPMS)	-6.310895	-2.938987	1(1)
	Average price of Automotive Gas Oil Naira per Litre (LnAGO)	-5.100225	-2.938987	1(1)
	Average price of Dual Purpose Kerosene Naira per Litre (LnDPK)	-10.95591	-2.938987	1(1)
	Exchange rate (EXR)	-3.838880	-2.938987	1(1)
	Inflation rate (INF)	-6.170039	-2.941145	1(1)
	Labour force participation rate (LFPR)	-6.420601	-2.948404	1(0)
Model 3	Inflation rate (INF)	-6.170039	-2.941145	1(1)
	Average price of Premium Motor Spirit Naira per Litre (LnPMS)	-6.310895	-2.938987	1(1)
	Average price of Automotive Gas Oil Naira per Litre (LnAGO)	-5.100225	-2.938987	1(1)
	Average price of Dual Purpose Kerosene Naira per Litre (LnDPK)	-10.95591	-2.938987	1(1)
	Exchange rate (EXR)	-3.838880	-2.938987	1(1)
	Labour force participation rate (LFPR)	-6.420601	-2.948404	1(0)

Source: Author's Compilation using E-views 9 Output

The non-stationarity issue is always present with time series data. This might make forecasts made using these data less accurate. To get around this issue, this study used the common Augmented Dickey-Fuller (ADF) tests to determine whether or not the data in this study were stationary.

Therefore, based on a 5 percent level of significance in the models, the results of the estimated Augmented Dickey-Fuller (ADF) tests clearly show that data on the variables Real Gross Domestic Product Growth Rate (RGDPG), Labour Force Participation Rate (LFPR), and Per Capita Income (PCI) are stationary at level 1(0). While the exchange rate (EXR), inflation rate (INF), and the average prices for premium motor spirit (LnPMS), automotive petrol oil (LnAGO), dual-purpose kerosene (LnDPK), and oil were stationary at the first differences 1(1) in the models, respectively. This indicated that variables of orders 1(0) and 1(1) were integrated, respectively. Ouattara (2004) asserted that the limits test approach is only appropriate when the variables are a mixture of I(0) and I(1). So, we can confidently proceed with the bounds test. As a result, the study uses the Autoregressive Distributed Lag (ARDL) method to examine the long-term relationship between the relevant variables. This method is used with time series data that have a mixture of I(0) and I(1) orders of integration.

ARDL Bounds Testing Procedure

The outcome of the ARDL strategy to co-integration is presented in Table 4.2.

Table 4.2 Result for the Bound Test for the Models

Models	Functional Form	F-statistic Value	K	Critical Values Bounds		
				Significance	10 Bound	I1 Bound
Model I	RGDP =f(PMS, AGO, DPK, EXR, INF, LFPR)	7.150861	6	10%	2.12	3.23
				5%	2.45	3.61
				2.5%	2.75	3.99
				1%	3.15	4.43
Model II	PCI =f(PMS AGO, DPK, INF, EXR, LFPR)	6.606550	6	10%	2.12	3.23
				5%	2.45	3.61
				2.5%	2.75	3.99
				1%	3.15	4.43
Model III	INF =f(PMS, AGO, DPK, EXR, LFPR)	4.992362	5	10%	2.26	3.35
				5%	2.62	3.79
				2.5%	2.96	4.18
				1%	3.41	4.68

Source: Author's Compilation from E-views 9 Output

According to the results in table 4.2 above, the F-statistic for this Bound test in the models is greater than the critical values of both the lower and upper limits at all levels of significance, respectively, at 7.150861, 6.606550, and 4.992362. On the basis of this empirical discovery, the null hypothesis that there is no long-run cointegration is rejected. This suggests that in the models, the deregulation of the downstream oil sector and economic growth, standard of living, and inflation have a cointegrated relationship. After confirming the presence of a long-term link, the study chose models using the Akaike Information Criteria (AIC). 2048 ARDL model specifications in all were taken into

account. Finally, based on the AIC, an ARDL ((3, 0, 0, 2, 3, 3, 3 for model I; 3; 0, 0, 2, 3, 3 for model II; 2, 0, 0, 0, 0, 2 for model III) was chosen.

Discussion of Results based on Research Objective One

Table 4.3 ARDL abbreviated calculated long-run and short-run coefficients based on ARDL (3, 0, 0, 2, 3, 3, 3) for model one were used to gauge the impact of the deregulation of the downstream oil sector on Nigeria's economic growth.

Table 4.3 Estimated Long-run and Short-run Coefficients for Model One

	Regressor	Coefficient	Std. Error	t-Statistic	Prob.
Short-run	D(RGDPG(-1))	0.121	0.190	0.641	0.529
	D(RGDPG(-2))	0.271	0.150	1.806	0.088
	D(LnPMS)	-0.050	0.072	-0.697	0.495
	D(LnAGO)	-0.040	0.038	-1.042	0.312
	D(LnDPK)	0.001	0.005	0.089	0.930
	D(LnDPK(-1))	0.053	0.020	2.580	0.019*
	D(EXR)	-0.062	0.031	-1.971	0.065
	D(EXR(-1))	-0.010	0.038	-0.264	0.794
	D(EXR(-2))	-0.036	0.033	-1.106	0.284
	D(INF)	-0.162	0.029	-5.608	0.000*
	D(INF)	-0.016	0.034	-0.468	0.645
	D(INF)	0.088	0.036	2.408	0.027*
	D(LFPR)	-0.040	0.134	-0.300	0.767
	D(LFPR(-1))	-0.494	0.127	-3.880	0.001*
	D(LFPR(-2))	0.464	0.100	4.623	0.000*
	CointEq(-1)	-1.160	0.198	-5.844	0.000*
Long-run	LnPMS	-0.043	0.062	-0.694	0.496
	LnAGO	-0.034	0.033	-1.028	0.318
	LnDPK	-0.040	0.014	-2.785	0.012*
	EXR	0.069	0.031	2.213	0.040*
	INF	-0.141	0.044	-3.223	0.005*
	LFPR	0.097	0.069	1.404	0.178
	C	1.431	3.254	0.439	0.665
	R-squared = 0.861715	Adjusted R-squared = 0.730708	F-statistics = 6.577625	Prob (F-statistics) = 0.000078	Durbin Watson = 1.635831

Source: Author's Compilation using E-views 9 Output

Note: * denote statistical significance at the 5% level.

The analysis reveals that fuel price volatility particularly of deregulated petroleum products has a significant and adverse impact on Nigeria's economic growth. A 1% increase in the average price of Premium Motor Spirit (LnPMS) leads to a 4.3% decline in real GDP, suggesting that rising petrol prices elevate production and transportation costs across the economy. This is particularly problematic in a country where petrol remains a dominant input in household energy consumption and logistics. Similarly, a 1% increase in the price of Automotive Gas Oil (LnAGO), commonly used in industrial and transportation sectors, reduces GDP by 3.4%. This confirms the energy-dependence of Nigeria's productive sectors, especially manufacturing, which suffers when diesel prices rise. Likewise, dual-purpose kerosene (LnDPK), heavily used for cooking and lighting in low-income households, contributes to a 4.03% fall in GDP for every 1% increase in price highlighting the regressive impact of deregulation on welfare and economic productivity.

Inflation (INF) shows the most pronounced negative effect, with a 1% rise leading to a 14.18% decline in GDP. This result underscores the damaging role of price instability in the Nigerian economy, especially in an environment where fuel price hikes pass through to general price levels due to high transport and input costs. High inflation reduces real purchasing power, distorts investment decisions, and undermines long-term planning for both households and businesses. Therefore, the combination of inflation and fuel price increases acts as a double shock to economic growth raising costs while eroding demand.

In contrast, the exchange rate (EXR) exhibits a counterintuitive positive relationship with GDP, where a 1% increase in the exchange rate (i.e., depreciation) is associated with a 6.95% rise in economic growth. This suggests that in the short run, currency depreciation may boost domestic production by making imports more expensive and promoting local alternatives. It could also enhance the competitiveness of non-oil exports, potentially aiding diversification. However, in the long term, the benefits of depreciation may be offset by inflationary pressures especially since Nigeria relies heavily on imported fuel and machinery. This finding highlights the need for a balanced exchange rate policy that supports growth without triggering cost-push inflation.

Labour force participation rate (LFPR) also contributes positively to economic growth, with a 9.76% increase in GDP corresponding to a 1% rise in labour force participation. While this effect is statistically significant, its economic interpretation must be contextualized. In Nigeria, a large informal sector and underemployment are common, so a rise in LFPR does not necessarily equate to productivity gains unless accompanied by job creation in productive sectors. Nonetheless, it signals the potential of harnessing human capital through improved education, vocational training, and labour-intensive infrastructure programs.

Short-run dynamics further reveal interesting patterns. The lagged price of kerosene ($D(\text{LnDPK}(-1))$) and inflation ($D(\text{INF})$) have positive effects on GDP in the short term, possibly reflecting adjustment lags where temporary price increases lead to higher nominal output before real effects materialize. Conversely, lagged exchange rate variables ($D(\text{EXR}(-1))$, $D(\text{EXR}(-2))$) and inflation show negative short-run effects, indicating that past depreciation or inflationary pressures eventually dampen output growth highlighting the time-sensitive trade-offs involved in macroeconomic management.

The Error Correction Model (ECM) coefficient of -0.9161 confirms a rapid speed of adjustment toward long-run equilibrium, implying that approximately 91.6% of any short-run disequilibrium in the system is corrected within a year. This strong convergence suggests that despite short-term volatility, Nigeria's economy has an inherent capacity to return to its growth path provided macroeconomic fundamentals are managed effectively.

Finally, the robustness of the model is confirmed by an R-squared value of 0.8617, indicating that 86.17% of the variation in real GDP is explained by the included variables. Even after adjusting for degrees of freedom, the adjusted R-squared remains high (0.7307), suggesting strong explanatory power. The Durbin-Watson statistic (1.6358) indicates some positive autocorrelation, but this was appropriately handled using autoregressive correction, reinforcing the model's reliability.

These results have critical implications for policy. First, the high sensitivity of GDP to fuel prices and inflation suggests that deregulation without cushioning mechanisms (e.g., targeted cash transfers or transport subsidies) can significantly undermine economic performance and living standards. Second, while exchange rate depreciation may offer temporary growth benefits, it must be managed carefully to avoid fueling inflation. Third, investment in alternative energy sources, public transport infrastructure, and domestic refining capacity would help mitigate the negative effects of global oil price shocks on the domestic economy. Lastly, harnessing the demographic dividend through higher labour productivity rather than just labour force expansion is essential for translating human capital into economic gains.

Discussion of Results based on Research Objective Two

The table 4.4 ARDL abridged estimated long-run and short-run coefficients based on ARDL (3, 0, 0, 2, 2, 3, 3) for model two examined the impact of the change in petroleum product pricing on the standard of living of people under the deregulation of the downstream oil sector in Nigeria.

Table 4.4 Estimated Long-run and Short-run Coefficients for Model Two

	Regressor	Coefficient	Std. Error	t-Statistic	Prob.
Short-run	D(PCI(-1))	0.123	0.178	0.693	0.4969
	D(PCI(-2))	0.362	0.136	2.649	0.016*
	D(LNPMS)	0.001	0.051	0.031	0.974
	D(LNAGO)	-0.051	0.032	-1.562	0.135
	D(LNDPK)	0.004	0.004	0.974	0.342
	D(LNDPK(-1))	0.049	0.019	2.567	0.019*
	D(EXR)	-0.068	0.028	-2.392	0.027*
	D(EXR(-1))	-0.034	0.026	-1.306	0.207
	D(INF)	-0.155	0.027	-5.657	0.000*
	D(INF)	-0.040	0.031	-1.300	0.209
	D(INF)	0.116	0.032	3.5570	0.002*
	D(LFPR)	-0.215	0.115	-1.860	0.079
	D(LFPR(-1))	-0.473	0.121	-3.907	0.001*
	D(LFPR(-2))	0.431	0.092	4.643	0.000*
	CointEq(-1)	-1.080	0.179	-6.031	0.000*
Long-run	LnPMS	0.001	0.047	0.031	0.974
	LnAGO	-0.047	0.030	-1.586	0.130
	LnDPK	-0.030	0.013	-2.212	0.040*
	EXR	0.041	0.024	1.702	0.105
	INF	-0.175	0.041	-4.275	0.000*
	LFPR	0.097	0.068	1.414	0.174
	C	0.172	3.368	0.051	0.959
	R-squared = 0.850616	Adjusted R-squared = 0.723640	F-statistics = 6.699014	Prob (F-statistics) = 0.000055	Durbin Watson = 1.816110

Source: Author's Compilation using E-views 9 Output

Note: * denote statistical significance at the 5% level.

The analysis shows that the average price of Premium Motor Spirit (LnPMS) has a statistically insignificant but positive effect on the standard of living, with a high probability value of 0.9748. While this may appear counterintuitive, it reflects the complex and mixed consequences of deregulation. On one hand, deregulation may attract private investment into the oil sector, reduce fiscal pressure, and improve efficiency. On the other hand, it often leads to immediate price increases, eroding purchasing power and increasing the cost of essential goods and services. This duality means that while deregulation might bring long-term structural benefits, its immediate impact on living standards, particularly for low-income groups, remains weak or even harmful without complementary welfare policies.

The results further revealed that exchange rates (EXR) and labour force participation rates (LFPR) have a positive and significant impact on living standards by 4.1% and 9.7% respectively per

1% increase. This suggests that currency depreciation, when managed well, may promote domestic production and employment, thereby improving household incomes. Additionally, rising labour force participation tends to improve livelihoods as more individuals become economically active. However, the quality and productivity of labour remain crucial. In Nigeria, much of the employment is informal or underpaid; hence, the observed positive impact is likely amplified when labour participation is linked with productive engagement and formal sector inclusion.

In contrast, increases in the prices of Automotive Gas Oil (LnAGO), Dual Purpose Kerosene (LnDPK), and inflation (INF) are shown to reduce living standards significantly by 4.76%, 3.07%, and a striking 17.57% respectively for each 1% increase. This underscores the regressive impact of fuel price hikes and inflation, especially in a consumption-driven economy. AGO and DPK are critical inputs for transportation and household energy, respectively. As their prices rise due to deregulation, the cost of living spikes, disproportionately affecting poorer households who spend a larger share of income on energy. Inflation exacerbates this effect by further eroding real incomes and reducing access to basic goods, thus directly harming welfare and widening inequality.

Short-run dynamics reveal a nuanced picture. Unexpectedly, short-term increases in fuel prices ($D(\text{LnPMS})$, $D(\text{LnDPK})$) and inflation ($D(\text{INF})$) show slight improvements in standard of living, possibly due to temporary nominal gains in government revenue, wage adjustments, or social transfer programs that may follow subsidy reforms. However, this benefit appears unsustainable, as longer-term effects of inflation and price volatility eventually reduce real income and increase poverty. Moreover, the negative short-term impacts of variables like $D(\text{LnAGO})$, $D(\text{EXR})$, and especially lagged LFPR ($D(\text{LFPR}(-2))$) suggest that gains from labour force expansion may take time to materialize, and in the short run, an influx of workers without job creation could actually suppress wages and worsen welfare.

The Error Correction Model (ECM) coefficient of -1.0809 indicates a rapid and strong adjustment to long-run equilibrium. This suggests that the system is self-correcting, and any temporary disequilibrium particularly due to price shocks or labour market fluctuations—will be resolved within a year. However, a correction speed exceeding 100% may reflect model over-adjustment or volatile responses to shocks, which could point to underlying instability in the economy's response mechanisms.

The R-squared value of 0.8506 indicates that over 85% of the variation in living standards is explained by the variables, reflecting a well-specified model. The significant F-statistic (6.699) confirms that the combined explanatory variables are jointly significant, and the Durbin-Watson statistic (1.816) suggests mild positive autocorrelation, which is manageable within the model's structure.

The findings carry important policy implications. First, while deregulation is fiscally desirable, its immediate impact on living standards is negative, especially through rising fuel prices and inflation. Policymakers should therefore consider targeted social safety nets, such as conditional cash transfers or transport vouchers, to cushion the poor. Second, leveraging the positive impact of labour force participation requires active labour market policies including vocational training, job creation schemes, and industrial development to ensure productive absorption of labour. Third, exchange rate management must strike a balance between export competitiveness and import cost inflation. Finally, containing inflation through prudent fiscal and monetary policies is essential for protecting real incomes and stabilizing living standards.

Discussion of Results based on Research Objective Three

The table 4.5 presents an abbreviated presentation of the estimated long-run parameters of the ARDL (2, 0, 0, 0, 0, 2) for the model three in order to predict the pass-through of petroleum product prices to inflation following the deregulation of the downstream stream oil sector in Nigeria.

Table 4.5 Estimated Long-run and Short-run Coefficients for Model Three

	Regressor	Coefficient	Std. Error	t-Statistic	Prob.
Short-run	D(INF)	0.418	0.175	2.386	0.023*
	D(LnPMS)	-0.403	0.247	-1.629	0.114
	D(LnAGO)	0.443	0.196	2.264	0.031*
	D(LnDPK)	0.026	0.023	1.134	0.265
	D(EXR)	-0.224	0.104	-2.139	0.040*
	D(LFPR)	0.047	0.635	0.074	0.941
	D(LFPR(-1))	-1.125	0.572	-1.964	0.059*
	CointEq(-1)	-0.929	0.187	-4.958	0.000*
Long-run	LnPMS	-0.434	0.257	-1.686	0.102
	LnAGO	0.477	0.192	2.482	0.019*
	LnDPK	0.028	0.024	1.156	0.257
	EXR	-0.241	0.101	-2.371	0.024*
	LFPR	0.539	0.289	1.863	0.072
	C	11.002	13.752970	0.800	0.430
	R-squared = 0.761716	Adjusted R-squared = 0.620708	F-statistics = 2.872401	Prob (F-statistics) = 0.000000	Durbin Watson = 1.956409

Source: Author's Compilation using E-views 9 Output

Note: * denote statistical significance at the 5% level.

The analysis reveals a complex relationship between fuel price components, macroeconomic variables, and inflation in Nigeria. Interestingly, the average price of Premium Motor Spirit (LnPMS) is associated with a 43.45% reduction in inflation, suggesting a counterintuitive outcome. This may

reflect the possibility that increased PMS prices, especially under deregulation, can reduce fiscal pressures and limit the need for deficit financing—thereby decreasing inflationary money supply growth. Additionally, higher fuel prices may initially suppress consumption and demand, applying downward pressure on inflation in the short run. However, this finding should be interpreted with caution, as the broader inflationary effects of fuel price hikes particularly through transportation and logistics are often delayed and may not be fully captured in the immediate period.

Similarly, the exchange rate (EXR) exhibits a 24.13% negative effect on inflation, implying that a depreciated naira, paradoxically, contributes to disinflation. This result may reflect short-run dynamics where managed exchange rate regimes and foreign exchange interventions dampen inflationary expectations. However, this contradicts the typical experience of import-dependent economies like Nigeria, where depreciation tends to increase the cost of imported goods, contributing to inflation. It may suggest that during the study period, other policy measures such as forex restrictions or subsidies buffered the pass-through effect. Over time, however, persistent depreciation would likely exert upward pressure on inflation, indicating a need for further research into structural and policy responses during currency fluctuations.

In contrast, the price of Automotive Gas Oil (LnAGO) has a strong inflationary effect, with a 47.76% increase in inflation following a 1% rise in AGO price. Diesel is a major input in manufacturing, agriculture, and transportation in Nigeria. Its rising cost is quickly transmitted through the supply chain, making goods and services more expensive. Similarly, prices of Dual Purpose Kerosene (LnDPK) and Labour Force Participation Rate (LFPR) contribute modestly to inflation, by 2.88% and 53.99%, respectively. The positive link between LFPR and inflation may reflect demand-pull inflation: as more people become economically active and earn incomes, aggregate demand rises, which if not matched by supply-side expansion pushes prices up.

Short-run dynamics offer further insights. While LnPMS, lagged LFPR (-1), and EXR reduce inflation by 40.38%, 22.43%, and 112.5%, respectively, these short-term deflationary effects could stem from government stabilization measures or delayed price pass-through. For example, in the immediate aftermath of subsidy removal, reduced government spending and subdued demand might lower inflation temporarily. Conversely, AGO, DPK, and LFPR in their first differences exert upward pressure on inflation 44.39%, 2.67%, and 4.7%, respectively reaffirming the importance of energy prices in driving inflation in a highly energy-cost-sensitive economy like Nigeria.

The Error Correction Model (ECM) confirms a rapid convergence to long-run equilibrium, with a correction rate of 92.94%, meaning that nearly all inflationary disequilibrium is corrected within the following period. This robust error correction term suggests that inflationary shocks although impactful in the short-run tend to self-correct quickly, provided macroeconomic

fundamentals are stable. This highlights the importance of maintaining policy credibility, monetary stability, and effective inflation targeting.

From a statistical standpoint, the model performs well. The R-squared value of 0.7617 means that 76.17% of the variation in inflation is explained by the selected variables, indicating strong explanatory power. The adjusted R-squared (0.6207) confirms the model's reliability even after accounting for degrees of freedom. The F-statistic (2.872) is statistically significant, validating the joint relevance of the explanatory variables. The Durbin-Watson statistic (1.956) indicates no serial correlation in the residuals, suggesting that the model is well-specified.

The findings suggest that fuel price deregulation must be handled with caution, especially regarding AGO and kerosene, due to their high inflationary pass-through effects. Policymakers should consider strategic price smoothing mechanisms or targeted subsidies for diesel-dependent sectors such as agriculture and transport to minimize inflationary shocks. The apparent short-run disinflationary effect of PMS and exchange rate changes must be interpreted alongside long-term structural factors, as these relationships could reverse if depreciation becomes chronic or subsidy savings are not reinvested effectively. Additionally, rising labour force participation needs to be complemented by productivity-enhancing investments and supply-side policies, otherwise it could worsen inflation through increased demand. Ultimately, to control inflation in a deregulated fuel market, Nigeria must invest in domestic refining capacity, diversify energy sources, and adopt a more coordinated fiscal-monetary policy framework. Stabilizing exchange rates, ensuring competitive pricing in the petroleum sector, and promoting energy efficiency will be essential to break the link between energy prices and inflation.

Discussion of Findings

The study reveals that deregulation of Nigeria's downstream oil sector, particularly through fuel price increases, has a significant negative effect on economic growth. Increases in the prices of Premium Motor Spirit (PMS), Automotive Gas Oil (AGO), and Dual Purpose Kerosene (DPK) reduce GDP due to their role as essential production and consumption inputs. This supports the findings of Maku et al. (2018), who identified petroleum price hikes as detrimental to human welfare and economic performance. Additionally, the large negative effect of inflation on GDP underscores the fragility of Nigeria's growth trajectory when faced with price instability, echoing the conclusions of Abatcha (2021) and Sakanko et al. (2021) on the inflationary consequences of rising fuel prices. Conversely, the positive effect of the exchange rate on growth aligns with short-run competitiveness benefits of currency depreciation, although this effect may be temporary if structural deficits persist.

Regarding the standard of living, the findings suggest that while deregulation may carry long-term potential benefits, in the short run it disproportionately harms welfare. The negative impact of

rising fuel prices and inflation on living standards reinforces Perry's (2020) argument that subsidy reforms hurt the poor and intensify inequality. The study by Nduka and Akamobi (2024) also aligns with this finding, as public perceptions captured in their survey reflected deep concerns over rising poverty and reduced affordability of basic goods following subsidy removal. Although labour force participation and exchange rates had some positive impact on living standards, these benefits are outweighed by the burden of increased fuel costs, especially in a context where social protection mechanisms are weak and household incomes are stagnant.

Finally, the analysis of inflation dynamics shows that fuel prices, especially AGO and DPK, significantly contribute to inflationary pressures in both the short and long run. These results are consistent with Korgbeelo (2022), who found bidirectional causality between fuel prices and inflation, and Olawale and Luqman (2020), who confirmed the inflationary effect of PMS pricing. Interestingly, the negative relationship between PMS price and inflation in this study may reflect delayed pass-through effects or fiscal consolidation benefits from reduced subsidy spending. Nonetheless, the strong error correction term across all models indicates that while short-term shocks are significant, Nigeria's macroeconomic system tends to return to equilibrium. This suggests that with improved infrastructure, better energy alternatives, and effective policy coordination, the long-term benefits of deregulation could be realized but without these structural supports, short-term hardship is likely to persist.

Conclusion and Recommendations

The price deregulation of petroleum products is a beneficial move that affects an economy both positively and negatively. Nigeria has fully deregulated the industry and has had multiple partial deregulations at various points in time. Large sums of money that were initially utilised to subsidise the product are now made available for development projects thanks to this policy. The study came to the conclusion that Nigeria's economic growth is negatively impacted by the deregulation of the downstream oil sector. The study found that the price of Premium Motor Spirit has a small but positive effect on Nigeria's standard of living. The standard of living in Nigeria is negatively and negligibly impacted by automotive petrol oil. Similar to that, Dual Purpose Kerosene has a negative but sizable impact on Nigeria's standard of living. According to the study, Premium Motor Spirit has no effect on the inflation rate in Nigeria. According to the study, Nigeria's auto fuel has a positive and noticeable effect on inflation. Moreover, the cost of dual-purpose paraffin at the pump has a negligible favourable impact on Nigeria's inflation. The following recommendations for policy are made;

- i. Policy makers should embark or implement policies that will lower the cost of Premium Motor Spirit, Dual Purpose Kerosene, and Automotive Gas Oil by deregulating the downstream sector and simultaneously encouraging private company participation in crude oil refining to

foster competition and lower the cost of these fuels. Additionally, the government should encourage both domestic and foreign investment in Nigeria by putting in place the necessary infrastructure.

- ii. Policy makers should ensure that petrol pump prices be regulated because they have a long history on the market. Because the majority of products rely on one of these, a rise in the price of petroleum products will result in a collapse of the market. Since inflation rates worsen people's well-being, policymakers must find a way to keep inflation under control in order to make people's lives better.
- iii. Maintenance should be performed on our refineries so they can run at maximum capacity in order to lessen the negative effects of pump prices for petroleum products on inflation. Private individuals should also be given permission to run modular refineries across the nation. In order to lessen the impact of imported petroleum products on the overall price level, this will ensure that the goods are processed domestically. Increased competitiveness and efficiency in product refinement and distribution will also make the refined products easily accessible. The government should boost its price subsidies for petroleum products, particularly petrol and kerosene, to lessen the burden of rising petroleum product prices on the populace.

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