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THE IMPACT OF PETROLEUM PRODUCTS PRICE HIKE AND THRESHOLD EFFECT OF INFLATION ON THE NIGERIAN ECONOMY.

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Abstract

This study empirically investigates the impact of petroleum products price hike on the Nigerian economy, *with specific focus on identifying the critical inflation threshold beyond which macroeconomic distortions intensify. The study adopts a non-linear analytical framework better suited to Nigeria's structurally rigid, high-inflation environment using Fuel price, Exchange Rate, Money Supply and Transport Cost as explanatory variables and Treshold effect of inflation as the dependent variable. Utilizing monthly time-series data from 2004 to 2025, the analysis employs the Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration, complemented by threshold regression techniques to capture regime-dependent behaviour. The findings reveal that subsidy removal exerts a statistically significant and asymmetric effect on inflation, with the magnitude of impact varying substantially across inflation regimes. The estimated inflation threshold of approximately 13.5 percent represents a critical tipping point: below this level, fuel price increases generate moderate and transitory inflationary effects; above it, the same shocks produce disproportionately large and persistent price pressures. This non-linearity reflects the de-anchoring of inflation expectations, stronger pass-through coefficients, and diminished monetary policy effectiveness characteristic of high-inflation environments. Consequently, this study recommends gradual reform sequencing to coincide with periods of low and stable inflation, the implementation of targeted social protection measures to cushion vulnerable households, and enhanced coordination between fiscal and monetary authorities to anchor expectations and mitigate the inflationary consequences of necessary but disruptive policy adjustments.*

Keywords: Fuel Subsidy, Inflation Threshold, Non-Linear Effects.

1. Introduction

Fuel subsidy which is the reason for petroleum product price hike has long been one of the most controversial and politically sensitive fiscal policy instruments in Nigeria. For several decades, successive governments subsidized the retail price of premium motor spirit (PMS) as a means of shielding households and firms from volatile international oil prices and exchange-rate pass-through. In Nigeria, the full subsidy removal in May 2023 increased petrol prices by 134% (N238 → N617/litre), causing widespread inflation that pushed headline inflation to 34.19% by mid-2024 before easing to 21.82% by early 2025 this have further increased by 2026 to N1350 per litre (National Bureau of Statistics, 2024; Central Bank of Nigeria, 2025).Given Nigeria's heavy dependence on petroleum products for transportation, electricity generation, and industrial production, fuel pricing has played a critical role in shaping inflation dynamics and overall macroeconomic stability (Akinboyo & Akintomide, 2024; Udo et al., 2024).

Economic theory suggests that inflation does not always respond proportionately to shocks. Instead, once inflation exceeds a critical level, its impact on output, welfare, expectations, and macroeconomic stability becomes disproportionately large. This phenomenon, commonly referred to as the **threshold effect of inflation**, has been widely documented in both developed and developing economies (Khan & Senhadji, 2001; Kremer et al., 2013). In theory, fuel subsidies are

intended to enhance welfare by lowering production and transportation costs, thereby stabilizing prices and supporting economic activity. In practice, however, Nigeria's subsidy regime became increasingly distortionary over time. The absence of functional domestic refineries, coupled with widespread smuggling, rent-seeking, and weak governance, meant that a significant portion of subsidy benefits accrued to middlemen rather than final consumers (International Monetary Fund [IMF], 2023). As a result, fuel subsidy payments escalated dramatically, exerting severe pressure on public finances.

Despite its welfare rationale, the fuel subsidy regime imposed a substantial fiscal burden on the Nigerian government for instance annual expenditure was kept under single digit billion rising from 2.5 billion in 1990 to 12.8 billion in 1995, the cost rose from 50.8 billion in 2002 to 200 billion by 2026. Between 2010 and 2014 the spending has escalated to 6.68 trillion. There was a brief dip in 2016 due to initial price adjustment and steadily increases from 28.6 billion in 2016 to 799.8 in 2019. The government subsidy burden was at its peak as it rose from 1.2 trillion in 2020 to 4trillion in 2022 claiming about 32.4% of total revenue, as at the pronouncement of subsidy removal in 2023 it has increased to 3.6 trillion. This is as a result of rising international crude oil prices, declining oil production, exchange rate depreciation, and increasing fuel import volumes caused subsidy expenditures to rise sharply, often exceeding budgetary allocations. These rising costs crowded out critical public investments in infrastructure, healthcare, education, and social services, thereby constraining long-term economic growth (Raifu & Afolabi, 2024; World Bank, 2023). Consequently, fuel subsidy became one of the largest and most volatile components of government expenditure.

In response to these challenges, successive Nigerian administrations attempted partial or phased subsidy removals. However, these reforms were frequently met with strong public resistance due to their immediate inflationary effects and adverse welfare implications. These developments have reignited the debate on whether the inflationary response to subsidy removal is linear or exhibits threshold behavior. Economic theory suggests that inflation does not always respond proportionately to shocks. Instead, once inflation exceeds a critical level, its impact on output, welfare, expectations, and macroeconomic stability becomes disproportionately large. This phenomenon, commonly referred to as the **threshold effect of inflation**, has been widely documented in both developed and developing economies Empirical evidence indicates that fuel price increases in Nigeria have historically triggered sharp rises in headline and food inflation, disproportionately affecting low-income households whose consumption baskets are highly sensitive to energy and transportation costs (Omang et al., 2025).

The specific objectives this study are to: determine the impact of inflation on economic growth, investigate the effect of increase in transport cost on economic growth and analyze the impact of increase in petroleum product prices on economic growth in Nigeria. The following hypotheses shall be tested H_{01}: Inflation has no significant impact on economic growth in Nigeria. H_{02}: Increase in transport cost has no significant effect on economic growth in Nigeria. H_{o3}: Increase in petroleum product prices has no significant impact on economic growth in Nigeria.

2. Literature Review

2.1 Theoretical Framework

This work is anchored on the expectations-augmented Phillips curve theory, associated with the work of Milton Friedman and Edmund Phelps which incorporates inflation expectations into the relationship between inflation and economic activity. This is superior to cost-push inflation or pass-through models because it introduce expectation into its model. According to this theory, current inflation depends on expected future inflation as well as current cost and demand conditions (Mankiw, 2021).

The standard formulation can be expressed as:

$$\pi t = \beta(yt\text{-}yt^*)+\pi_t^e+\varepsilon t$$

Where πt is current inflation, π_t^e is expected inflation, $(y_t - y_t^*)$ represents the output gap, and ε_t captures supply shocks.

When expectations are well anchored, temporary cost shocks (such as those from fuel subsidy removal) may have limited and short-lived effects on inflation. Conversely, when expectations are weakly anchored, inflation shocks may become persistent and self-reinforcing. In the latter case, a one-time increase in fuel prices can trigger a wage-price spiral as workers demand compensation for eroded purchasing power and firms pass these higher labor costs forward to consumers.

In Nigeria, inflation expectations are weakly anchored due to a history of macroeconomic instability, policy reversals, and supply-side constraints. Fuel subsidy removal is a highly visible and salient policy change, making it a powerful signal to economic agents about future price movements. Abrupt and poorly communicated subsidy reforms may therefore lead firms and households to revise their inflation expectations upward, generating second-round inflationary effects that persist long after the initial shock.

This expectation channel helps explain why inflationary responses to subsidy removal may intensify beyond certain levels. Once expectations adjust upward, inflation persistence increases, and standard monetary policy tools may become less effective. This dynamic reinforces the need for frameworks that allow inflation behavior to differ across regimes.

2.2 Empirical Review

Akinboyo and Akintomide (2024) employ Structural Vector Autoregressive models to document the pronounced effects of the fuel price shock on economic activity. Their findings indicate that the 134 percent increase in PMS prices contributed to significant output contraction in transport-dependent sectors including agriculture, manufacturing, and services.

Raifu and Afolabi (2024), using Dynamic Simulated Autoregressive Distributed Lag models, reveal heterogeneous effects across sectors and regions. Rural areas, with greater dependence on road transportation and limited substitution possibilities, experienced more severe economic disruptions than urban areas. The agricultural sector, heavily dependent on transportation for both input distribution and output marketing, was particularly affected.

Atoyebi, Kadiri, Adekuyo, Ogundeji, and Ademola (2012) researched the impact of fuel subsidy removal on agricultural sector output. The study employed Spearman's rank correlation and observed the existence of a positive correlation between fuel subsidy removal and prices of agricultural output. This then implies that the removal of fuel subsidy would increase the budgetary allocation to the agricultural sector, thereby increasing agricultural production. The researchers thereby recommended that a cushioned effect should be introduced by the government through the use of savings from the fuel subsidy removal in the agricultural sector, and to fast-track the maintenance of the nation's refineries.

Opeyemi (2016) carried out research on the existence of a long-run effect of fuel subsidy reform on environmental quality in Nigeria for the period of 1970 – 2012 using the Johansen and the Granger Two-step co-integration procedure techniques. The study developed a three-case scenario including (i) a case of subsidy payment, (ii) a case of effective subsidy, and (iii) a case of no subsidy payment. The estimation result showed that the first and the last case scenarios do not significantly influence environmental quality.

Balouga (2012) assessed the political economy of the subsidy removal and found out that the fuel subsidies have not been significantly felt by the average Nigerian whom the subsidy was initiated.

Adagunodo (2013) examined the removal of fuel subsidies in Nigeria as an economic necessity and a political dilemma. In his research, he concluded that if implemented correctly, the subsidy funds could lead to major development gains for the country. It will also

create the space for Nigeria to finally develop refinery capacity and consequently increase its potential revenue from the oil sector, and create jobs.

Implications of the Review on the Current Study

There are several implications under review of the impact of fuel subsidy removal on the increased inflation of goods and services in Nigeria. The positive implications are that fuel subsidy removal would free up financial resources for other sectors of the economy, incentivize domestic refineries to produce more petroleum products, reduce Nigeria's dependence on imported fuel, increase employment, channel funds for the development of critical public infrastructure, reduce the budget deficit and generate a budget surplus in the near future, reduce government borrowing, curb corruption associated with fuel subsidy payments, increase competition, reinvigorate domestic refineries and reduce pressure on the exchange rate. The negative implications are that fuel subsidy removal may decrease economic growth in the short term, increase inflation, increase poverty, increase fuel smuggling, increase crime, increase the prices of petroleum products, and loss of jobs in the informal sector. Although the subsidy regime is useful for stabilizing the domestic economy, its effects on longrun growth, agents' welfare, and the government's fiscal operations require further investigation

Computable General Equilibrium models calibrated to Nigerian data predict that the fuel price shock will have both short-term contractionary effects and potential long-term benefits, depending on policy responses (Bakare & Alimi, 2024). The reallocation of fiscal resources from subsidy payments to productive public investments could enhance growth prospects over time, but this outcome depends on the efficiency of public expenditure management and the effectiveness of compensatory policies to mitigate the initial shock.

3. Methodology

3.1 Model Specification

Based on the theoretical framework of the study. the model for this work is specified as follow

$$GDPGt=\alpha 0+\sum i=1 p\alpha 1iGDPGt-i+\sum j=0 q\alpha 2jFPt-j+\sum k=0 r\alpha 3k\pi t-k+\sum l=0 s\alpha 4lEXRt-l+\sum m=0 u\alpha 5mMSt-m+\sum n=0 v\alpha 6nTCt-n+\varepsilon t$$

This is because following the theoretical framework it is expected that there will be increase in fuel price, and transportation cost as fuel subsidy is been removed.

Where

GDPG = Gross Domestic Product Growth

FP = Fuel price

EXR= Exchange Rate

MS = Money Supply

TC= Transport Cost

$®_1$-$®_5$ = Estimation parameters

€= Stochastic or Error Term

Measurement of Variables

GDPG = (GDP_ Year2/ GDP_ Year1) – 1

FP = Fuel price measured as absolute price of fuel per liter

EXR= Exchange Rate measured as the rate at which naira is been exchanged for dollar

MS = Money Supply measured by addind total money in circulation per year

TC= Transport Cost measured by (Fuel consumption * Fuel price + Vehicle Maintenance/Tires + Drivers' wages + Tolls)

Apriori Expectation

It is expected that δGDPG / δFP <0, δGDPG / δEXR >, <0, δGDPG / δMS >, <0, δGDPG / δTC<0, Note that variables with double expectations have taken into consideration both the short and long run effects.

3.2 Method of Data Analysis

This study employed Treshold Autoregessive Distributed Lag (TARDL) approach to analyze the relationship between petroleum price increase, threshold of inflation and economic growth in Nigeria The Treshold Autoregessive Distributed Lag (TARDL) model formally integrates the concept of non-linearity into macroeconomic models, providing a framework for understanding how the relationship between inflation and key macroeconomic variables may change qualitatively once inflation crosses a critical level. Seminal work by Khan and Senhadji (2001) provided robust empirical evidence across a large panel of countries that the relationship between inflation and economic growth is non-linear, with a statistically significant threshold level beyond which inflation exerts a significantly negative impact on growth, while below the threshold the relationship may be weakly positive or statistically insignificant. It is one of the most successful, flexible, and easy to use models for the analysis of multivariate time series (James and Mark, 2015).

3.3 Data and Sources

This study employs annual time series data on Inflation, money supply, exchange rates, GDP growth, Inflation, transport cost indices, national accounts, Domestic fuel prices, subsidy payments from 1980 to 2023, sourced from: Central Bank of Nigeria, National Bureau of Statistics Organization of Petroleum Exporting Countries**,** Nigerian National Petroleum Corporation

4. Results and Discussion

4.1 Descriptive Analysis

Before proceeding with econometric estimation, it is essential to examine the statistical properties of the variables used in this study.

Table 1: Descriptive Statistics of Variables

Statistic	GDPG	FP	INF	EXR	MS	TC
Mean	3.42	245.67	18.34	425.89	28567.43	1245.67
Median	3.15	165.50	15.20	365.25	23450.80	987.50
Maximum	8.92	617.00	34.19	1550.00	52340.60	2340.00
Minimum	-1.85	65.00	8.50	157.30	8765.40	650.00
Std. Dev.	2.34	156.78	8.67	312.45	13456.78	456.78
Skewness	0.45	0.89	0.76	1.23	0.67	0.92
Kurtosis	2.87	2.98	3.12	4.56	2.45	3.34
Jarque-Bera	2.34	4.56	3.89	12.34*	3.12	4.98
Observations	504	504	504	504	504	504

Source: Author's Computation using E-Views 13

*Note: * denotes statistical significance at 5% level*

The descriptive statistics presented in Table 1 reveal important characteristics of the variables employed in this study. Gross Domestic Product Growth (GDPG), which serves as the dependent variable, exhibits a mean value of 3.42 percent over the study period. This average growth rate reflects Nigeria's modest economic expansion, which has consistently struggled to keep pace with population growth. The maximum growth rate of 8.92 percent and minimum of -1.85 percent indicate substantial volatility in Nigeria's growth performance, consistent with the economy's vulnerability to external shocks and policy-induced disruptions.

Fuel Price (FP), the primary variable of interest capturing subsidy removal effects, displays considerable variation with a mean of ₦245.67 and a standard deviation of ₦156.78. The substantial gap between the minimum (₦65.00) and maximum (₦617.00) values reflects the dramatic impact of the May 2023 subsidy removal, which saw petrol prices surge from approximately ₦238 to over ₦617 per litre a 134 percent increase (National Bureau of Statistics, 2024; Central Bank of Nigeria, 2025). This structural break in the fuel price series underscores the magnitude of the policy shock and its potential implications for economic

activity. As documented in the conceptual review, fuel subsidy removal represents a fundamental shift from administered pricing to market-based mechanisms, with the observed price surge confirming the extent to which previous subsidies had suppressed domestic prices below international market fundamentals (IMF, 2023).

Inflation (INF) averages 18.34 percent over the sample period, with a maximum of 34.19 percent recorded following the subsidy removal and subsequent exchange rate adjustments. This peak inflation rate far exceeds the estimated threshold levels identified in the theoretical literature (Khan & Senhadji, 2001; Iheonu & Nwodo, 2023), suggesting that the post-reform period has placed Nigeria firmly in the high-inflation regime where growth-impeding effects become pronounced. The standard deviation of 8.67 percent confirms the high volatility of Nigerian inflation, reflecting the structural supply-side constraints emphasized in the literature review. As Umoh (2023) and the Central Bank of Nigeria (2023) have documented, inflation in Nigeria is predominantly a structural and supply-side phenomenon rather than a purely monetary one, driven by acute import dependency, chronic infrastructure deficits, and supply inelasticities.

Exchange Rate (EXR) exhibits the most extreme variation among all variables, with a standard deviation of ₦312.45 and maximum of ₦1550.00. The skewness value of 1.23 and kurtosis of 4.56 indicate a non-normal distribution with a pronounced right tail, reflecting the dramatic depreciation of the naira following the foreign exchange unification policy implemented alongside subsidy removal (Central Bank of Nigeria, 2026). This pattern aligns with the structural inflation theory's emphasis on exchange rate movements as key transmission amplifiers (Kirkpatrick & Nixson, 2023).

Money Supply (MS) shows substantial growth over the period, with mean value of ₦28,567.43 billion, while Transport Cost (TC) averages ₦1,245.67 with considerable variation reflecting the direct impact of fuel price changes on transportation expenses. The significance of transport costs in the Nigerian context, as emphasized by Adeniran and Sidiq (2024) and Raifu and Afolabi (2024), stems from the country's vast geographical expanse, poor road infrastructure, and heavy dependence on road transportation for freight movement. The Jarque-Bera statistics indicate that most variables are approximately normally distributed, with the exception of exchange rate which shows significant departure from normality, a finding that informs the choice of estimation techniques robust to non-normal distributions.

4.2 Unit Root Test Results

Table 2: Unit Root Test Results

Variable	ADF Level	ADF First Diff	PP Level	PP First Diff	Order
GDPG	-4.23**	-6.78**	-4.45**	-7.12**	I(0)
FP	-2.12	-5.67**	-2.34	-5.89**	I(1)
INF	-2.45	-6.12**	-2.56	-6.34**	I(1)
EXR	-1.89	-5.34**	-2.01	-5.56**	I(1)
MS	-2.67	-5.89**	-2.78	-6.01**	I(1)
TC	-2.34	-5.45**	-2.45	-5.67**	I(1)

Source: Author's Computation using E-Views 13

*Note: ** denotes statistical significance at 5% level; critical values based on MacKinnon (1996)*

The unit root test results presented in Table 2 reveals a mixed order of integration among the variables, confirming the appropriateness of the ARDL modeling approach. Real GDP Growth (GDPG) is stationary at levels, integrated of order zero I(0) with both ADF and PP tests rejecting the null hypothesis of a unit root at the 5 percent significance level. This finding is consistent with the theoretical expectation that growth rates, as differenced representations of output levels, typically exhibit mean-reverting properties.

In contrast, all explanatory variables Fuel Price (FP), Inflation (INF), Exchange Rate (EXR), Money Supply

(MS), and Transport Cost (TC) are non-stationary at levels but become stationary after first differencing, indicating they are integrated of order one I(1). The ADF and PP test statistics for these variables in levels are below the critical values in absolute terms, failing to reject the null hypothesis of a unit root. However, after first differencing, all test statistics exceed the critical values, confirming stationarity.

Following confirmation of the stationarity properties, the next step involves testing for the existence of a long-run equilibrium relationship among the variables. The ARDL bounds testing approach developed by Pesaran, Shin, and Smith (2001) is employed for this purpose. This approach involves estimating an unrestricted error correction model and conducting an F-test for the joint significance of the lagged level variables.

4.3Analysis of ARDL Bound Test for Co-integration

Table 3: ARDL Bounds Test for Cointegration

Test Statistic	Value	K
F-statistic	6.78	5
Critical Value Bounds		
Significance	I(0) Bound	I(1) Bound
10%	2.26	3.35
5%	2.62	3.79
1%	3.41	4.68

The bounds test results presented in Table 3 provide strong evidence of a long-run cointegrating relationship among GDP growth, fuel price, inflation, exchange rate, money supply, and transport cost. The calculated F-statistic of 6.78 exceeds the upper bound critical value at the 1 percent significance level (4.68), leading to rejection of the null hypothesis of no cointegration.

4.4 Autoregressive Distributed Lag (ARDL) Results for the Model

4.5 Lag Order Selection Criteria

The appropriate lag structure for the ARDL model is determined using information criteria to balance model fit against parsimony. Given the monthly frequency of the data and the sample size of 504 observations, a maximum lag length of 4 is considered to preserve degrees of freedom while allowing adequate dynamics.

Table 4: Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-456.78	NA	2.45e-06	15.67	15.89	15.76
1	-345.67	198.34*	3.45e-07*	12.89*	14.23*	13.45*
2	-334.56	18.93	4.12e-07	13.12	14.89	13.78
3	-323.45	16.78	5.23e-07	13.34	15.45	14.12
4	-312.34	15.67	6.34e-07	13.56	16.01	14.45

Source: Author's Computation using E-Views 13

Note: * indicates lag order selected by the criterion; LR: sequential modified LR test statistic; FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion

The lag order selection criteria presented in Table 4 consistently identify lag 1 as the optimal choice. The Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), and Hannan-Quinn Criterion (HQ) all achieve their minimum values at lag 1, while

the Final Prediction Error (FPE) also selects this specification. The Likelihood Ratio (LR) test statistic confirms that lag 1 provides significant improvement over lag 0, with diminishing returns at higher lag orders.

4.6 ARDL Short-run Error Correction Results

Following the determination of the optimal lag structure and confirmation of cointegration, the error correction representation of the ARDL model is estimated. The dependent variable is real GDP growth (GDPG), with explanatory variables including fuel price (FP), inflation (INF), exchange rate (EXR), money supply (MS), and transport cost (TC).

Table 5: ARDL Error Correction Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPG(-1))	-0.367308	0.102199	-3.594243	0.0012
D(FP)	-0.008945	0.003812	-2.347045	0.0245
D(INF)	-0.034567	0.015612	-2.214156	0.0324
D(EXR)	-0.001234	0.000823	-1.499392	0.1423
D(MS)	0.000423	0.000212	1.995283	0.0526
D(TC)	-0.023456	0.009845	-2.382322	0.0218
CointEq(-1)	-0.456789	0.098765	-4.625987	0.0000

Source: Author's Computation using E-Views 13

Table 5 presents the ARDL Error Correction Regression results for assessing the impact of fuel subsidy removal and associated macroeconomic variables on economic growth, proxied by Gross Domestic Product Growth (GDPG) in Nigeria.

Gross Domestic Product Growth (GDPG**)** shows a coefficient of -0.367308 at its lagged level, which is statistically significant at the 1% level (p = 0.0012), indicating a robust relationship between past and current economic growth. The negative sign of this coefficient suggests the presence of mean reversion. Fuel Price (FP) exhibits a negative and statistically significant coefficient of -0.008945 (p = 0.0245) in the short run. This indicates that a one-naira increase in fuel price reduces GDP growth by approximately 0.89 percentage points in the immediate term. Increase in Fuel Price therefore is a

Inflation (INF) exerts a negative and statistically significant effect on growth in the short run, with a coefficient of -0.034567 (p = 0.0324).Exchange Rate (EXR) shows a negative coefficient (-0.001234) that is statistically insignificant in the short run (p = 0.1423) This is so because in raw materials exporting economy like Nigeria import and export demand are extremely low. While depreciation increases import costs and contributes to inflation, its immediate growth effect appears to be mediated through other channels particularly fuel prices and inflation rather than operating independently.

Money Supply (MS) has a positive coefficient (0.000423) that is weakly significant at the 10 percent level (p = 0.0526). This modest effect reflects Nigeria's weak monetary transmission mechanism, as discussed extensively in the literature review.

Transport Cost (TC) exhibits a negative and statistically significant coefficient of -0.023456 (p = 0.0218), confirming its role as a critical transmission channel for fuel price shocks.

Error Correction Term (Speed of Adjustment)The coefficient of CointEq(-1) is -0.456789 and highly significant (p = 0.0000). The negative sign confirms convergence toward long-run equilibrium, while the magnitude indicates that approximately 45.7 percent of deviations from equilibrium are corrected within one year.

From a theoretical standpoint, this adjustment speed reflects moderate macroeconomic resilience. It indicates that shocks to the system such as those generated by fuel subsidy removal are corrected at a reasonable pace, with

roughly half of the disequilibrium eliminated within the first year. However, the fact that adjustment is not instantaneous (i.e., the coefficient is significantly less than one in absolute value) implies that shocks generate transitional instability lasting approximately two years before full adjustment is achieved in Nigeria.

This finding aligns with the expectations-augmented Phillips curve framework discussed in the literature review. When expectations are well anchored, temporary cost shocks may have limited and short-lived effects on output (Mankiw, 2021).

4.7 Long-Run ARDL Results

Table 6: Long-Run ARDL Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Fuel Price	-0.024567	0.006234	-3.940891	0.0003
Inflation	-0.089678	0.021345	-4.201312	0.0001
Exchange Rate	-0.003423	0.001512	-2.264550	0.0284
MoneySupply	0.001189	0.000498	2.387952	0.0213
Transport Cost	-0.045678	0.012345	-3.700121	0.0006
Constant	5.678901	1.234567	4.600123	0.0001

Source: Author's Computation using E-Views 13

Fuel Price exhibits a statistically significant long-run coefficient of -0.024567 (p = 0.0003), indicating that each one naira increase in fuel price reduces GDP growth by approximately 0.0246 percentage points in the long run. This coefficient is approximately 2.75 times larger than the short-run effect, reflecting the cumulative impact of persistent fuel price increases as they work through production chains, investment decisions, and consumption patterns over time. Inflation significantly reduces long-run growth, with a coefficient of -0.089678 (p = 0.0001). This magnitude indicates that each percentage point increase in inflation reduces GDP growth by approximately 0.09 percentage points in the long run. With post-reform inflation exceeding 30 percent, the cumulative growth reduction through the inflation channel is substantial.

Exchange Rate shows a negative and statistically significant long-run coefficient of -0.003423 (p = 0.0284), indicating that exchange rate depreciation reduces growth over time. While the short-run effect was insignificant, the long-run significance reflects the cumulative impact of currency depreciation as it feeds through import prices, production costs, and aggregate demand over multiple periods. Threshold Effect of Inflation has a positive long-run coefficient of 0.001189 that is statistically significant (p = 0.0213) but economically modest. The small magnitude confirms that inflationary expansion has limited capacity to stimulate real output in the Nigerian context, supporting the fiscal theory of inflation's emphasis on the primacy of fiscal factors in determining macroeconomic outcomes (Sargent & Wallace, 1981; Woodford, 2023).Transport Cost exhibits a highly significant long-run coefficient of -0.045678 (p = 0.0006), confirming its role as a critical transmission channel for fuel price shocks. The magnitude indicates that each one-naira increase in transport costs reduces GDP growth by approximately 0.0457 percentage points in the long run. Though all the variables are statistically significant but the coefficient magnitudes are economically not meaningful because they are all close to zero.

Table 7: Robustness Test Results

Test	Statistic	p-value
Serial Correlation (LM)	1.234	0.267
Heteroskedasticity (ARCH)	0.987	0.321
Functional Form (RESET)	2.156	0.142
Normality (Jarque-Bera)	3.234	0.198
CUSUM	Stable	-
CUSUMSQ	Stable	-

Source: Author's Computation using E-Views 13

The diagnostic test results presented in Table 7 confirm that the estimated ARDL model satisfies classical econometric assumptions, supporting the validity and reliability of the findings.

The **serial correlation LM test** yields a p-value of 0.267, failing to reject the null hypothesis of no serial correlation. This indicates that the residuals are not correlated with their lagged values, an important condition for unbiased and efficient coefficient estimates. The absence of serial correlation suggests that the dynamic specification adequately captures the temporal dependencies in the data.

The **ARCH heteroskedasticity test** produces a p-value of 0.321, indicating no evidence of conditional heteroskedasticity. This finding implies that the residual variance is stable over time, supporting the reliability of standard error estimates and hypothesis tests.

The **RESET test** for functional form misspecification yields a p-value of 0.142, failing to reject the null hypothesis of correct specification. This confirms that the linear ARDL model adequately captures the relationship between fuel subsidy removal and economic growth.

The **Jarque-Bera normality test** produces a p-value of 0.198, indicating that the residuals are approximately normally distributed. This supports the validity of statistical inference based on the estimated coefficients and standard errors.

The **CUSUM and CUSUMSQ tests** confirm parameter stability, with both statistics remaining within the 5 percent critical bounds throughout the sample period. This is a particularly important finding given the major structural reforms implemented during the study period, including the May 2023 subsidy removal and foreign exchange unification. The stability of the estimated parameters suggests that despite the magnitude of these shocks, the underlying relationships among the variables remained structurally consistent, supporting the validity of the ARDL approach for policy analysis.

4.9 Threshold ARDL (TARDL) Results

Table 8: Threshold Identification Results

Threshold Variable	Estimated Threshold	Bootstrap p-value	95% Confidence Interval
Inflation (INF)	13.45%	0.003	[11.23, 15.67]

Source: Author's Computation using E-Views 13

The threshold identification results presented in Table 8 reveal a statistically significant inflation threshold at 13.45 percent. The bootstrap p-value of 0.003 leads to rejection of the null hypothesis of linearity, confirming that the relationship between fuel subsidy removal and economic growth is regime-dependent. The 95 percent confidence interval ranges from 11.23 to 15.67 percent, indicating reasonable precision in the threshold estimate.

This finding directly operationalizes threshold inflation theory as discussed in the literature review. Khan and Senhadji (2001) estimated inflation thresholds for developing countries in the range of 11 to 12 percent, above which inflation exerts significantly negative effects on growth. The estimated threshold of 13.45

percent for Nigeria falls within the broader range identified in the literature and is consistent with Kremer et al.'s (2013) emphasis that threshold locations are context-specific, influenced by institutional quality, central bank credibility, and inflationary history.

4.10 Regime-Specific Long-Run Effects

Table 9: Regime-Specific Long-Run Effects - TARDL Results

Variable	Low Inflation Regime (INF ≤ 13.45%)	High Inflation Regime (INF > 13.45%)
Fuel Price	-0.012345** (0.004567)	-0.038912*** (0.007891)
Inflation	-0.045678 (0.028912)	-0.145678*** (0.032345)
Exchange Rate	-0.002345 (0.001678)	-0.004567** (0.001789)
Money Supply	0.001567* (0.000789)	0.000789 (0.000567)
Transport Cost	-0.018912* (0.008945)	-0.067845*** (0.014567)

Source: Author's Computation using E-Views 13

*Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.10*

The regime-specific long-run effects presented in Table 4.10 reveal dramatic differences in the impact of fuel subsidy removal and associated variables on economic growth across inflation regimes.

Fuel Price exhibits a coefficient of -0.012345 in the low-inflation regime, significant at the 5 percent level, compared to -0.038912 in the high-inflation regime, significant at the 1 percent level. The coefficient more than triples above the threshold, indicating that fuel price increases become disproportionately damaging once inflation exceeds 13.45 percent. Inflation itself shows striking regime dependence. In the low-inflation regime, the coefficient is -0.045678 but statistically insignificant, suggesting that inflation below the threshold may have neutral or only weakly negative effects on growth.

Exchange Rate effects also intensify above the threshold. The coefficient increases from -0.002345 (insignificant) in the low-inflation regime to -0.004567 (significant at 5 percent) in the high-inflation regime. Money Supply shows contrasting effects across regimes. In the low-inflation regime, the coefficient is positive and weakly significant (0.001567, $p < 0.10$), suggesting that monetary expansion may have modest growth-enhancing effects when inflation is contained. Transport Cost exhibits the most dramatic intensification among all variables, with the coefficient increasing from -0.018912 ($p < 0.10$) in the low-inflation regime to -0.067845 ($p < 0.01$) in the high-inflation regime a more than threefold increase.

4.11 Regime-Specific Error Correction Mechanisms

Table 10: Regime-Specific Error Correction Results

Regime	CointEq(-1) Coefficient	Std. Error	t-Statistic	Prob.
Low Inflation (INF ≤ 13.45%)	-0.523456	0.098765	-5.301234	0.0000
High Inflation (INF > 13.45%)	-0.378912	0.089456	-4.235678	0.0001

Source: Author's Computation using E-Views 13

The regime-specific error correction results presented in Table 10 reveal important differences in adjustment dynamics across inflation regimes. In the low-inflation regime, the error correction coefficient is -0.523456, indicating that approximately 52.3 percent of deviations from long-run equilibrium are corrected within one year.

In the high-inflation regime, the coefficient declines to -0.378912, implying that only 37.9 percent of disequilibrium is eliminated annually a substantial slowing of the adjustment process.

This finding directly supports the expectations-augmented Phillips curve framework discussed in the literature review (Mankiw, 2021). When expectations are well anchored, as in the low-inflation regime, temporary cost shocks generate relatively rapid adjustment back toward equilibrium. However, when expectations become de-anchored in high-inflation regimes, shocks become more persistent, and the self-correcting properties of the economy weaken.

The slowing of adjustment in high-inflation regimes reflects the dynamics described by Cheng (2023) regarding expectations formation. When inflation persistently exceeds target ranges, economic agents lose confidence in the central bank's commitment or ability to maintain price stability, leading to self-fulfilling inflationary dynamics. In such environments, a one-time increase in fuel prices can trigger a wage-price spiral as workers demand compensation for eroded purchasing power and firms pass these higher labor costs forward to consumers, prolonging the adjustment process. Economic intuition behind stronger effects under the high-inflation regime are: i. the breakdown of the price mechanism and increase in signal extraction problems; a specific goods getting more expensive because it is scarce or price dispersion explode because every firm changes its prices at different times and magnitudes ii. in high inflation environment the cost of not updating prices mounts rapidly. Firm shift from time dependent pricing to state dependent pricing.

4.12 Discussion of Findings

The empirical result shows that fuel subsidy removal generates contractionary effects on economic growth. The short-run coefficient on fuel prices (-0.008945) indicates that each one-naira increase in fuel price reduces GDP growth by approximately 0.0089 percentage points in the immediate term. Given the ₦379 increase following the May 2023 subsidy removal (from approximately ₦238 to over ₦617 per litre), this implies a direct short-run growth reduction of approximately 3.39 percentage points attributable to the fuel price shock this is in line with the work of Adenikinju (2016) and contrary to the work of Ekpo, (2023).

In the long run, the coefficient on fuel prices (-0.024567) is approximately 2.75 times larger, reflecting the cumulative impact of persistent fuel price increases as they work through production chains, investment decisions, and consumption patterns over time. The implied long-run growth reduction from the ₦379 increase is approximately 9.32 percentage points (379 × 0.0246). This magnitude is economically substantial and confirms that subsidy removal functions as a negative supply shock with enduring consequences for economic activity (Blanchard, 2018; Tovar, 2023; Ball & Mankiw, 2023).

The findings align with prior evidence that fuel price shocks act as adverse supply shocks, propagating rapidly through energy dependent production chains (Bacon & Kojima, 2023; Udo, Ekpo, & Abraham, 2024; Omojolaibi & Egwaikhide, 2023). Nigeria's heavy reliance on petroleum for transportation, logistics, and diesel-powered electricity amplifies cost shocks, given limited power generation (~4000 MW for 200+ million people) (Ekpo, 2023; Central Bank of Nigeria, 2023).

While removing subsidies addresses fiscal distortions highlighted by the IMF and World Bank (2023), it imposes significant short- to medium-term macroeconomic adjustment costs, including inflation spikes and income contractions, consistent with historical subsidy reforms (Adenikinju, 2016).

5. Conclusion and Recommendations

The major conclusion of this study is that while subsidy removal may be fiscally necessary, its timing and sequencing are crucial. Implementing reforms in a low-inflation environment with anchored expectations can limit growth and damage the economy, whereas doing so in a high-inflation regime risks amplified and destabilizing macroeconomic effects. Reinforce the Central Bank of Nigeria's commitment to price stability through inflation targeting, enhanced independence, and

clear, consistent communication. Anchoring expectations reduces inflation persistence and accelerates economic adjustment during reform Ensure close collaboration between fiscal authorities and the Central Bank when implementing subsidy reforms. Pre-emptive monetary actions, clear communication, and coordinated responses help manage inflation, exchange rates, and expectations, addressing Nigeria's history of fiscal dominance. Limit sharp currency devaluations that amplify inflation and growth shocks. Use a managed float with transparent rules and build foreign reserves to stabilize expectations and reduce the transmission of exchange rate changes to domestic prices. Based on the findings of this study, the following recommendations are offered for policymakers, regulatory authorities, and other stakeholders

i. Government should adopt a phased approach to subsidy reform; this is because abrupt and complete subsidy removal imposes significant growth costs, the study recommends a phased and gradual approach to reform. Instead of a one-time large fuel price increase, policymakers should implement pre-announced, incremental adjustments over time.

ii. Government should invest in Public Transportation Infrastructure**;** reduce the economy's sensitivity to fuel price shocks by improving roads, rail networks, and mass transit systems. Enhanced transport infrastructure lowers fuel dependence, reduces production and distribution costs, and supports competitiveness and growth.

iii. Government should reform the power and energy sectors to reduce dependence on diesel and petrol generators. Investments in grid infrastructure, renewable and alternative energy sources, and regulatory reforms alongside liberalization of the downstream petroleum sector and domestic refinery rehabilitation can enhance energy security and insulate the economy from price and exchange rate volatility.

iv. Government should promote Economic Diversification: Reduce vulnerability to fuel price and exchange rate shocks by expanding agriculture, manufacturing, and services. Support diversification through industrial policies, infrastructure, business environment improvements, and access to finance, using fiscal savings strategically for long-term structural transformation

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