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Exploring the Symmetric and Asymmetric Effect of Fuel Subsidy Removal on the Income Per Capita in Nigeria

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ABSTRACT: This study makes unique contributions by exploring the investigation of the linear and non-linear effects of fuel subsidy removal on the per capita income of individuals in Nigeria. This gap serves as the motivation for conducting this research. This study's broad objective is to explore the symmetric and asymmetric effects of fuel subsidy removal on income per capita, adjusting for inflation, government spending, and the poverty rate in Nigeria. The results of the unit root test suggest that the econometrics analyses of linear ARDL and non-linear ARDL are appropriate for this study. The fitted linear ARDL (2, 2, 0, 1, 0) and non-linear ARDL (1, 2, 1, 1, 2, 1, 0, 1, 0) indicate that the removal of fuel subsidies has both symmetric and asymmetric effects on per capita income, while increases in inflation, government spending, and poverty rates lead to a decline in per capita income in the country. Thus, while it is important for the government to remove fuel subsidies to unveil fraud surrounding fuel subsidy payments and enhance infrastructural development in the country, the government should ensure that appropriate palliatives are made available to cushion the subsidy removal effect that could affect the livelihood of the poor citizens and also implement effective monetary policies to combat inflation.

KEYWORDS: Fuel Subsidy Removal, Per Capita Income, Unit Root, Linear ARDL, Non-Linear ARDL

INTRODUCTION

Removing petrol subsidies and letting the market set national fuel prices enables the government to encourage the development of infrastructure. Originally starting petrol subsidies in the 1970s to allow its citizens to offset the effects of rising world oil prices, Nigeria During the oil boom, Nigeria's oil income had surged significantly; the government planned to use some of these revenues to subsidise fuel, especially commonly known as Premium Motor Spirit, or PMS.).

Particularly sensitive to variations in the global oil price was Nigeria's program for petrol subsidies (Adekoya, 2020). Rising international oil prices matched the cost of supporting petrol imports, therefore stressing the government's subsidy burden. On the other hand, the government battled to meet the growing demand for subsidies arising from lower income amid the dropping oil prices. Nigeria has repeatedly tried over years to either cut off or change petroleum subsidies. These reform programs aimed to lower government financial load, improve market efficiency, lower corruption, and direct money to more profitable sector of industry.

The Premium Motor Spirit (PMS) petrol subsidy for Nigeria has been announced as discontinued by President Bola Ahmed Tinubu, GCFR. In his first speech on May 29, 2023, he exposed the vital information showing that the fuel subsidy is no more readily available. This historic choice startled the nation as well as had significant influence elsewhere. Immediately from this knowledge, fast-adjusted PMS pricing revisions all throughout the country followed. Nigerian National Petroleum Company (NNPC) Limited revised PMS's retail pricing for May 31, 2023 following the announcement of the President. These changes produced a broad range of pricing across the country from about 617 Naira per litre for PMS to 898 Naira per litre. At this point the national average is more than 1000 naira. These elements deal with poverty, high expense of living, great unemployment, low per capita income (Oluwabukola, 2023), and the terrible suffering Nigerians go through.

Reducing the fuel subsidies could limit government ability to help with these basic needs. Claiming Agu et al. (2018), government social program expenditure fell once subsidies were eliminated. As a result, destitution among the most vulnerable became more widespread and access to basic services fell as well. Given Nigeria's growing rates of poverty, one should consider how reducing subsidies could impact initiatives meant to reduce poverty. Although several studies have looked at the financial consequences of removing fuel subsidies and how this would affect the poverty rate in Nigeria (Abdulkadir et al., 2020; Odewale, 2023), no recent study has looked at the linear and non-linear impact of fuel subsidy elimination on the per capita income of individuals in

Nigeria. This study attempts to close this notable disparity by means of which behaviour is driven. This paper examines, adjusting for inflation, government spending, Nigerian poverty rate, symmetric and asymmetric effects of petrol subsidy withdrawal on income per capita.

Literature review and hypothesis development

Many studies have investigated how changing subsidy policies impact a nation's economy as well as the worldwide social and environmental effects of eliminating petrol subsidies (Burniaux et al., 2009; Ozili & Obiora, 2023.). Examining the eradication of subsidies calls on applying numerous theoretical models spanning social, political, and financial domains. These concepts expose both expected and unexpected outcomes as well as offer important fresh angles on the difficulties of eliminating subsidies. Knowing economic theory helps one to understand the financial results of reducing subsidies. Rational choice theory is one such paradigm according to which people act in ways that best maximize their interests inside limitations (Van Valkengoed & Van der Werff, 2022). This idea explains consumer reactions to price increases following subsidy termination. Many studies have concentrated on the effects of cutting petrol subsidies for Nigerian national economy. Stephen (2015) for example explores "the impact of fuel price increases on the Nigerian economy." Using a survey research approach, the study examined the degree of impact the rise in petrol prices causes on the Nigerian economy. Using co-integration and error correction models, research findings exposed a definite relationship between Nigeria's progress and the current rise in petrol prices.

Adewunmi et al. (2014) look at how the termination of petrol subsidies affected Nigeria's socioeconomic growth. Using a price pass-through model and an error correction model, the study examined the short- and long-term consequences of removing fuel subsidies on Nigeria's socioeconomic growth using data range 1980 to 2012. Therefore, the study revealed that eliminating fuel subsidies does not directly influence Nigerians' social well-being. Still, this approach implies that at last the country will be able to experience future economic development thanks to the deregulation of the downstream industry.

Low oil prices during COVID-19 enabled governments to eliminate fuel subsidies, therefore releasing funds for Pandemic Response and reallocating them towards more effective expenditure for resilience and long-term recovery (Asare et al., 2020). The brief presents five policy proposals meant to help governments implement effective reforms. Among these include adopting openness rules, phasing in price increases suitably, safeguarding the most impoverished and needy, giving more money to profitable companies, and applying a targeted reform plan. The brief also emphasizes the significance of working with pertinent sectoral objectives, like an environmental policy, the chances for carefully phased price rises, and the distorted benefits of fuel subsidies. The last point of the brief underlines the need of realizing the actual beneficiaries and costs of the subsidy program as well as the immediate effects on consumers, general macroeconomic conditions, and the basic political economy in every nation to develop effective policy reform.

Eliminating petrol subsidies at the same time might hurt the people and the economy. Reducing subsidies is normally challenging since inflationary pressures could follow and the cost of needs could increase (Ikena & Oluka, 2023). Eliminating subsidies would lower household purchasing power, particularly for lower income levels. Furthermore, the elimination of subsidies can start civil disturbance and rioting (Francis & Lucas, 2023) based on 2012 and 2020 statistics of Nigeria. Usually speaking, modern society has a high crime rate. Among these crimes could include banditry, prostitution, abduction, terrorism, and other repercussions of crime on the civilization. In line with this, Siddig et al. (2014) investigated the effects of Nigerian refinery oil import subsidies and discovered that their elimination substantially increased poverty rates especially for rural homes. Reducing subsidies also meant lower household spending since homes paid more for petrol products and less for other goods and services.

Reducing petrol subsidies could set off a chain reaction in other aspects of the economy. According Inegbedion et al., (2020) study, for instance, the removal of subsidies might raise petrol prices, therefore influencing the manufacturing and transportation costs for other companies. Sometimes rising expenses pass on higher pricing for goods and services to consumers, therefore lowering family purchasing power and impacting their general capacity to spend. Furthermore, resulting in resource misallocation and the enrichment of a few numbers at the expense of the majority of people are corruption and inefficiencies in the government and application of subsidy policies (Ray, 2023).

Umeji and Eleanya (2021) investigated, via the abolition of fuel subsidies, how the poor in Nigeria and the national economy generally fared using a descriptive research design technique. Though the underprivileged will suffer most from rising transportation fares, lower individual income per capita, and higher prices for food and other goods, the elimination of subsidies is in the best interests of the whole economy; the money will be used to improve infrastructure, particularly in the areas of health care, education, and transportation. By considering the symmetric and asymmetric effects of eliminating gas subsidies on per capita income while correcting for inflation, government expenditure, and Nigeria's poverty rate, this article clearly added something. The rational choice theory and the study's empirical data led to the creation of the following hypothesis, which asserts that individuals most affected by the removal of gasoline subsidies have self-interest.

H1: Fuel subsidy removal has symmetric influence on the income per capita in Nigeria

H2: Fuel subsidy removal has asymmetric influence on the income per capita in Nigeria

METHODOLOGY

Using a causal quantitative research methodology, we investigated the symmetric and asymmetric effects of gasoline subsidy withdrawal on income per capita, adjusting for inflation, government expenditure, and Nigerian poverty rate. We selected the control variables of their potential influence on the link between per capita income and the elimination of petrol subsidies. Using the purposive sampling technique to guarantee data availability and consistency inside the chosen period, we reliably gathered yearly data from the World Bank Development indicator from 1989 to 2023. BlackGreeks Nigeria's yearly publication provided the gasoline subsidy data. This paper applied quantitative methods including the unit root test, linear autoregressive distributed lags (ARDL), nonlinear autoregressive distributed lags (NARDL), and bound tests accompanying them for the dataset overview.

This study showed, using the Rational Choice Theory, that removing petrol subsidies affects people's means of subsistence economically. This theory states that people act to maximize their own self-interests inside the limits of the economic impacts, which were evaluated by the per capita income of the population in this study (Van Valkengoed & Van der Werff, 2022). Theoretically, the structure matches the symmetric and asymmetric effects of fuel subsidy withdrawal on per capita income in Nigeria as seen below.

PCI = f (FSR, Inf, Govt.Spend, PovR) …….. (1)

Unit root test

The augmented Dickey-Fuller (ADF) was investigated to construct the unit root test in this work. Usually, this test reveals the presence of a unit that gave erroneous findings if not deleted. Consequently, we can create hypotheses as follows to avoid the misleading findings problem:

H_0: Unit root exist

vs

H_a: Unit root does not exist, indicating that the series is stationary.

Mathematically, the ADF test can be expressed as:

$$\Delta Y_t = \alpha + \varphi Y_{t-1} + \sum_{i=1}^{p} \beta_i Y_{t-i} + \varepsilon_t \qquad (2)$$

The α is a constant, φ is the coefficient of process root, β_i coefficient in time tendency, p is the lag order and ε_t is the stochastic error term.

ARDL and bound test

ARDL is a linear time series model Designed only for use when the series or variables of interest show a combination of I (0) and I (1) orders of differencing. If any of the variables of interest are included into order two, I (2), ARDL is improper. In the lack of cointegration, this time series model clearly defines short-run interactions. When cointegration exists, it uses a limits test (Pesaran et al., 2010) to apply either the vector error correction model (VECM) or the unrestricted error correction model (UECM) for long-run connections.

The position of the decision rule is to reject the null hypothesis should the F-value surpass the I (1) bound, therefore indicating the existence of cointegration. Cointegration is not evident elsewhere.

Then, the Linear ARDL model can be specified as:

$$Y_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta Y_{t-1} + \sum_{i=1}^{q} \beta_{2i} \Delta X_{1t-i} + \cdots \sum_{i=0}^{r} \beta_{ki} \Delta X_{kt-i} + \varepsilon_t \qquad (3)$$

β_0 is the constant and Δ is the difference operator.

$\beta_{1i}$is the coefficient of order p lag of ΔY_{t-1}, β_{2i} is the coefficient of order q lag of X_{1t-i}.

Where ε_t is the error term, Y_t is the outcome variable (per capita income), Y_{t-1} the lag of the outcome variable while the predictor variables (include the fuel subsidy removal which is the main independent variable while inflation, government spending and poverty rate are the control variables) is X_t and X_{t-i} is the lag of the predictor variables.

Non-Linear ARDL and bound test

NARDL is a non-linear ARDL that divides the asymmetric variables—the predictors—into suitable proportion's positive and negative changes. The non-linear ARDL searches among the variables an asymmetric relationship. Notwithstanding whether the variables are integrated at order one, order zero, or a combination of the two, Pesaran et al. (2010) discovered that the NARDL

model performs better in small samples and could be used anywhere. Nusair (2016) further advised that NARDL techniques span both short-run models and long-run relationships are helpful when the variables are cointegrated, even when NARDL addresses both. Nevertheless, when the variables are cointegrated at order 2, they become useless.

If F-value exceeds I (1), the decision rule is to reject the null hypothesis, therefore showing the existence of cointegration; else, cointegration is not present.

Then, the NARDL can be specified as

$$Y_t = C_0 + C_{1t} + \sum \emptyset_i Y_{t-I} + \sum \beta_i X_{t-I} + C1t^{+} + C1t^{-} + \sum \emptyset_i Y^{+}_{t-I} + \sum \emptyset_i Y^{-}_{t-I} + \sum \beta_i X^{+}_{t-I} + \sum \beta_i X^{-}_{t-I} + \varepsilon_t \quad (4)$$

Where ε_t is the error term, Y_t is the outcome variable (per capita income), Y_{t-1} the lag of the outcome variable while the asymmetric variables (include the fuel subsidy removal which is the main independent variable while inflation, government spending and poverty rate are the control variables) is X_t and X_{t-i} is the lag of the predictor variables.

Diagnostic tests

Further validation of the linear and non-linear ARDL model used in this study can come from diagnostic tests including the serial correlation test, heteroscedasticity test, residual normality test, CUSUM test for model stability, and Akaike information criteria (AIC) graph, so supporting the choice of the fitted linear and non-linear ARDL model.

Table 1 indicate the description of the variables, the definition of the variables, the variable's abbreviation and variable's measurement.

Table 1: Variable's description

Variables	Definition	Abbreviation	Measurement unit
Fuel Subsidy Removal	This relates to the government's practice of eliminating the financial help supplied to subsidize the fuel price resulting from dishonest activities meant to let the market forces decide the fuel price and thereafter apply the subsidy money for infrastructure development.	FSR	Naira
Per Capita Income	This can define as the income per head. It is the country gross national income divided by the population.	PCI	US Dollar
Inflation	It is an instrument that occur when the volume of money in circulation is higher than what is in the bank. It contributes to untold rise in the prices of goods and services within the country.	Infl	Percentage
Government Spending	This is the whole government expenditure in a certain financial year.	Govt.Spend	Percentage of GDP
Poverty rate	Poverty rate is a socioeconomic statistic showing the degree of national poverty.	PovR	Percentage

RESULTS AND DISCUSSION

Results

Table 2 shows the average fuel subsidy removal is essentially 93 naira; the average per capita income is roughly 1756 US dollars; the average inflation rate is roughly 19.4%; the average government expenditure is roughly 110% of GDP; and the average poverty rate is roughly 92%.

Table 3 shows, at the 1% level, the statistical significance of variables including fuel subsidy elimination, per capita income, inflation rate, government expenditure, and poverty rate. Furthermore, demonstrating that none of the series integrate into the second level order is that these variables become stationary following the initial difference. This implies that applicable for this study are econometrics analyses include the linear and non-linear ARDL.

Table 4 reveals statistically significant at the 1% level the chosen ARDL (2, 2, 0, 1, 0). This implies then, regardless of government expenditure, inflation rate, and poverty rate, a short-term linear or symmetric link exists between the cessation of fuel subsidies and per capita income. Since the predicted coefficient of fuel subsidy removal has a positive linear effect on per capita income, a

rise in fuel subsidy removal will increase individual per capita income. This result validates the research hypothesis (H1), according to which symmetrically reducing petrol subsidies influences per capita income in Nigeria. Concurrent with this, the control variable—such as the expected coefficient of inflation—has a negative significant impact on the per capita income at the 5% level, so a rise in inflation will cause a drop in per capita income. On the other hand, the predicted coefficient of government expenditure shows a positive significant impact on the per capita income at the 5% level, implying that an increase in government expenditure will help to aid to enhance individual per capita income inside the country. Since the Durbin- Watson statistic value—about 2.03—fits both the two required values of 1.5 and 2.5, respectively, the ARDL model shows no serial correlation problem.

Table 5 contains ARDL bound test results. At the 5% level, the F-value—about 7.42—is more than the I (1) value of 4.01. This implies, even if one considers inflation rate, government expenditure, and poverty rate, there is a long-term linear or symmetric link between eliminating fuel subsidies and per capita income.

Table 6 shows the statistically significant non-linear ARDL (1, 2, 1, 1, 2, 1, 0, 1, 0) at the 1% level. This implies, given consideration of these elements, the termination of petrol subsidies has a short-run asymmetric linear connection with government expenditure, poverty rate, and inflation rate. Furthermore, the per capita income shows a positive asymmetric significant impact depending on the projected coefficient of positive and negative changes in the termination of the Nigerian fuel subsidy. This implies that the drop in the petrol subsidy influences the national per capita income of its citizens. Eliminating the fuel subsidy by the new federal government of Nigeria results in this outcome that reflects the economic reality of the nation. This outcome validates the research hypothesis (H2), which holds that the termination of petrol subsidies significantly influences the per capita income in Nigeria in an asymmetrically manner. Moreover, the negative symmetry of Nigeria's inflation rate suggests that the high rate reduces the per capita income of every national citizen. Moreover, the negative asymmetric influence of the negative change in the government expenditure and poverty rate reveals that rises in the government expenditure reduce the per capita income in Nigeria. The fitted non-linear ARDL does not lead to the serial correlation issue since the Durbin- Watson statistic value of about 2.05 lies between the two crucial values of 1.5 and 2.5, respectively.

Table 7 presents the non-linear ARDL bound test. At 5% level, the F-value about 13.84 is higher than the 3.39 I (1) value. This suggests that the elimination of gasoline subsidies has an unequal long-term link even considering inflation, government expenditure, and the poverty rate.

Table 8 makes this clear: Higher than the 0.05 level is the probability value of 0.8629 for the heteroscedasticity tests for the linear ARDL. The fitted linear ARDL does not so lead to the heteroscedasticity issue. For the heteroscedasticity tests for the non-linear ARDL, the probability value of 0.2379 above the 0.05 significant level (Table 9). The fitted non-linear ARDL does not so produce the heteroscedasticity issue. Moreover, Tables 8 and 9 show that the fitted linear and non-linear ARDL model residuals with p-values of 0.0519 and 0.7476 respectively beyond the 0.05 significant level, thereby indicating a normal distribution of these residuals.

The fitted ARDL model parameters shown in figure 1 lie between the two 95% confidence ranges, therefore suggesting stable model parameters for the fitted linear ARDL. Figure 2 showed that among the other tentative linear ARDL models, the chosen ARDL (2, 2, 0, 1, 0) had the least AIC implying that it outperformed the other tentative models.

Stable parameters for the fitted non-linear ARDL model are shown in Figure 3; these lie between the two 95% confidence ranges. With 1, 2, 1, 1, 2, 1, 0, 1, 0, Figure 4 displays the lowest AIC value of all the conceivable non-linear ARDL models fitted. This implies that the selected NARDL model (1, 2, 1, 1, 2, 1, 0, 1, 0) performed better than the other feasible models. Figure 5 shows how the termination of the fuel subsidy in 2023 resulted in a notable rise in fuel prices, therefore endangering great suffering for Nigerian people. Figure 6 shows that per capita income in 2023 dropped following the proclamation of the gasoline subsidy reduction by the incoming Nigerian president.

Table 2: Descriptive Statistics

Statistics	FSR	PCI	INF	GOVT.SPEND	POVR
Mean	92.91857	1755.571	19.39009	109.7950	91.65229
Median	65.00000	1864.000	13.00700	108.4469	92.32000
Maximum	617.0000	2970.000	72.83550	119.6673	94.00000
Minimum	0.600000	843.0000	5.388000	97.96020	89.50000
Std. Dev.	116.4042	588.6015	16.64402	5.226927	1.176938
Observations	35	35	35	35	35

Table 3: Unit Root Test

Differenced Series	Test-Statistic	P-value	Order Level

FSR	-8.013	0.0000	Order 1
PCI	-5.552	0.0001	Order 1
INF	-6.114	0.0000	Order 1
GOVT.SPEND	-4.676	0.0007	Order 1
POVR	-7.483	0.0000	Order 1

Table 4: Selected ARDL (2, 2, 0, 1, 0)

PCI	Coefficient	Std. Error	t-Statistic	Prob.*
PCI (-1)	1.524280	0.182612	8.347106	0.0000
PCI (-2)	-0.709516	0.175534	-4.042046	0.0005
FSR	0.367017	0.387666	0.946735	0.0436
FSR (-1)	2.300207	1.042938	2.205507	0.0377
FSR (-2)	-2.111668	1.080694	-1.953992	0.0630
INF	-1.297749	1.549140	-0.837722	0.0108
GOVT_SPEND	2.511758	6.886910	0.364715	0.0187
GOVT_SPEND (-1)	16.82319	9.290257	1.810842	0.0832
POVR	43.93275	42.41376	1.035813	0.3111
C	-5861.633	4387.801	-1.335893	0.1947
R-squared	0.968810	Mean dependent var		1808.061
Adjusted R-squared	0.956605	S.D. dependent var		564.1353
F-statistic	79.37979	Durbin-Watson stat		2.030036
Prob(F-statistic)	0.000000			

Table 5: ARDL Bound Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	7.423941	10%	2.45	3.52
k	4	5%	2.86	4.01
		2.5%	3.25	4.49
		1%	3.74	5.06
			Finite Sample: n=35	
Actual Sample Size	32			
		10%	2.696	3.898
		5%	3.276	4.63
		1%	4.59	6.368
			Finite Sample: n=30	
		10%	2.752	3.994
		5%	3.354	4.774
		1%	4.768	6.67

Table 6: Selected Model: Non-Linear ARDL (1, 2, 1, 1, 2, 1, 0, 1, 0)

PCI	Coefficient	Std. Error	t-Statistic	Prob.*

PCI (-1)	0.512242	0.116967	4.379355	0.0006
FSR_POS	0.319736	0.343778	0.930064	0.0281
FSR_POS (-1)	-0.244836	0.752640	-0.325303	0.7498
FSR_POS (-2)	1.453439	0.724767	2.005387	0.0646
FSR_NEG	9.078463	1.886701	4.811819	0.0003
FSR_NEG (-1)	11.46872	2.301834	4.982427	0.0002
INF_POS	13.39698	4.480187	2.990272	0.0597
INF_POS (-1)	-6.335538	2.630753	-2.408260	0.0304
INF_NEG	-4.562961	2.188261	-2.085199	0.0458
INF_NEG (-1)	4.366697	2.530713	1.725481	0.1064
INF_NEG (-2)	-2.991171	1.664077	-1.797496	0.0939
GOVT_SPEND_POS	34.98192	13.22564	2.645008	0.0192
GOVT_SPEND_POS (-1)	-45.05338	21.36734	-2.108516	0.0535
GOVT_SPEND_NEG	-19.95173	7.175481	-2.780543	0.0147
POVR_POS	152.9184	46.98971	3.254295	0.0058
POVR_POS (-1)	-241.0178	68.09217	-3.539581	0.0033
POVR_NEG	-220.0200	90.05277	-2.443234	0.0284
C	-215.3805	138.6331	-1.553600	0.1426
R-squared	0.993909	Mean dependent var		1833.875
Adjusted R-squared	0.986512	S.D. dependent var		553.0051
F-statistic	134.3718	Durbin-Watson stat		2.046797
Prob(F-statistic)	0.000000			

Table 7: Non-Linear ARDL Bound Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	13.84336	10%	1.95	3.06
k	8	5%	2.22	3.39
		2.5%	2.48	3.7
		1%	2.79	4.1
			Finite Sample:	
Actual Sample Size	32		n=35	
		10%	-1	-1
		5%	-1	-1
		1%	-1	-1
			Finite Sample:	
			n=30	
		10%	-1	-1
		5%	-1	-1
		1%	-1	-1

Diagnostic Tests

Table 8: Heteroskedasticity and Residual Normality Test For ARDL

F-statistic	0.420172	Prob. F (9,23)	0.9109
Obs*R-squared	4.659592	Prob. Chi-Square (9)	0.8629
Scaled explained SS	3.620696	Prob. Chi-Square (9)	0.9346

Model Residuals		Probability	0.0519

Table 9: Heteroskedasticity and Residual Normality Test For NARDL

F-statistic	1.517975	Prob. F (17,14)	0.2177
Obs*R-squared	20.74529	Prob. Chi-Square (17)	0.2379
Scaled explained SS	4.188395	Prob. Chi-Square (17)	0.9993
Model Residuals		Probability	0.7376

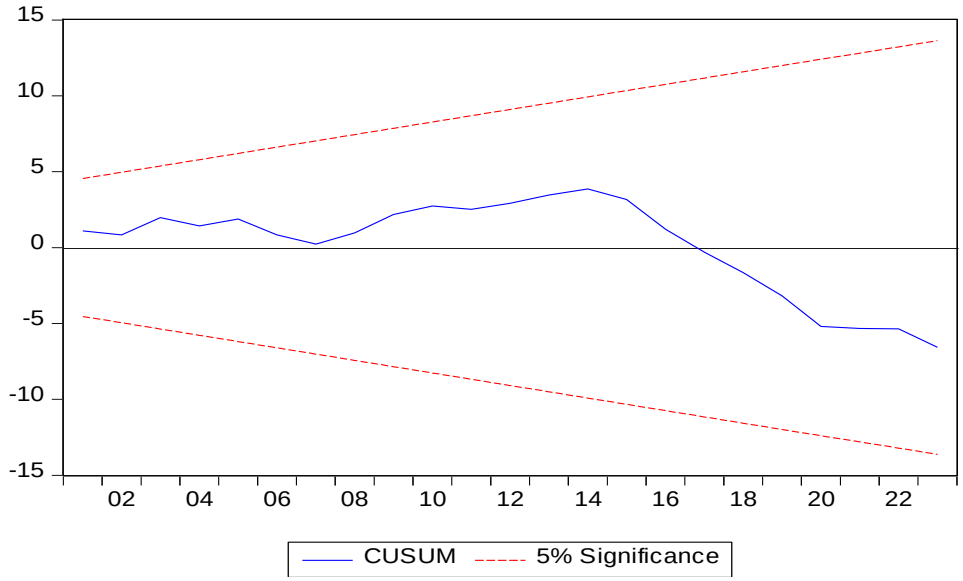

Figure 1: CUSUM Test For ARDL

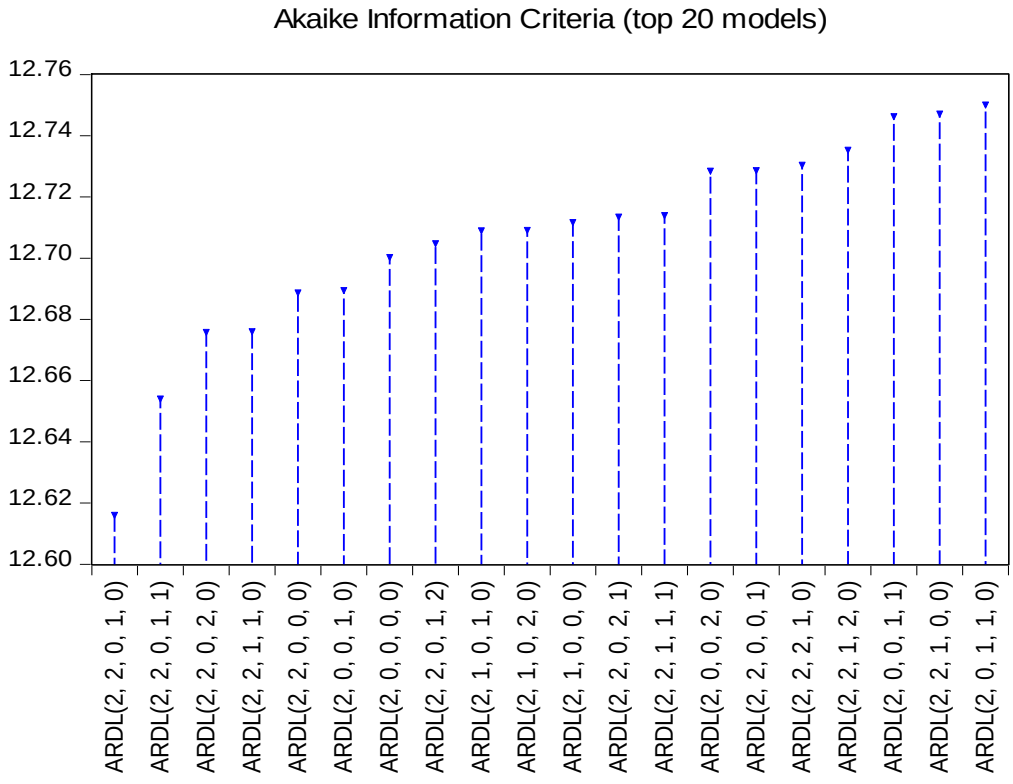

Figure 2: Criteria Graph For ARDL

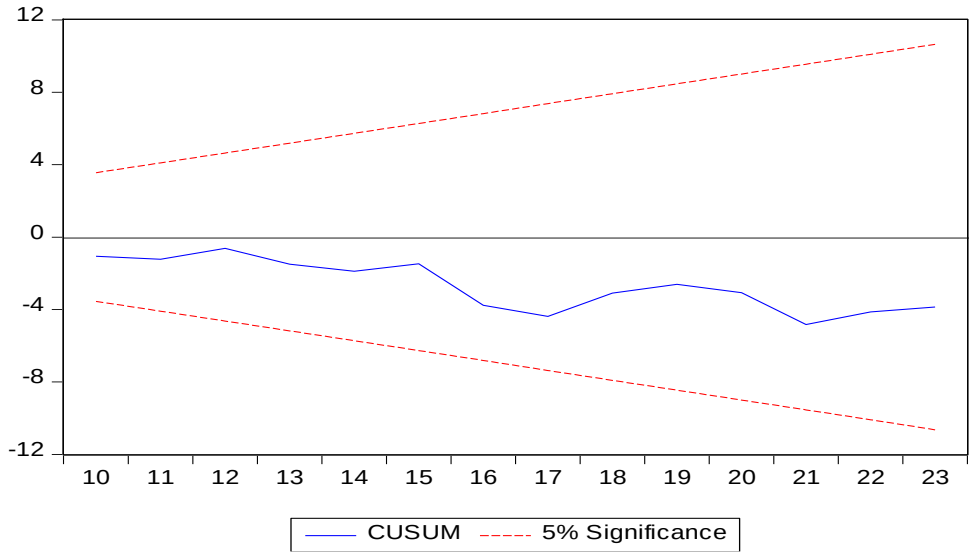

Figure3: CUSUM Test for Non-Linear ARDL

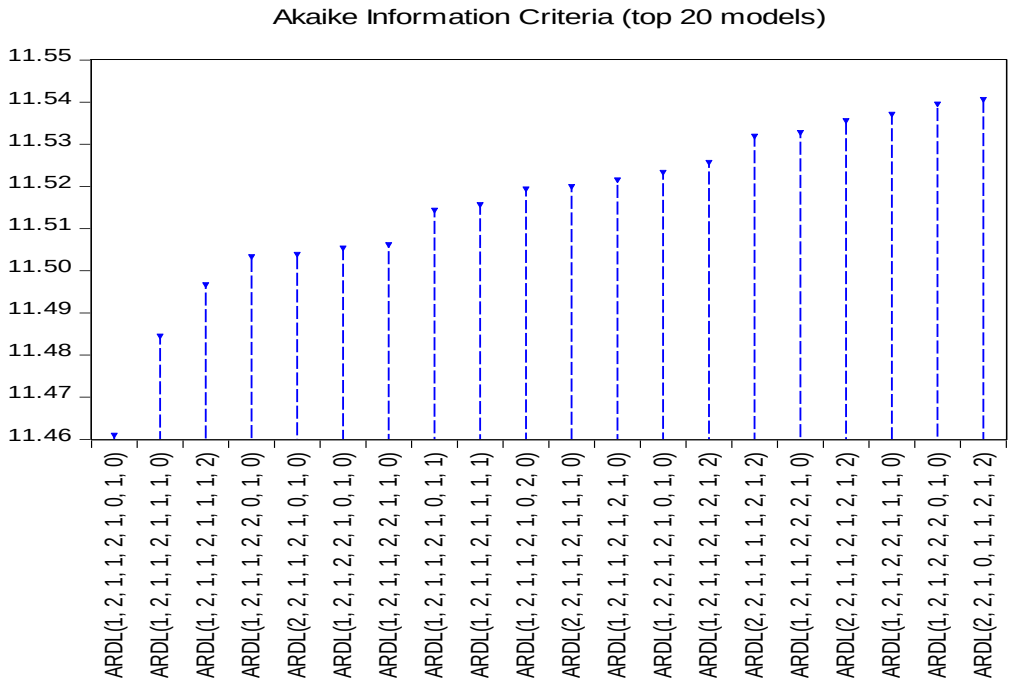

Figure 4: Criteria Graph for Non-Linear ARDL

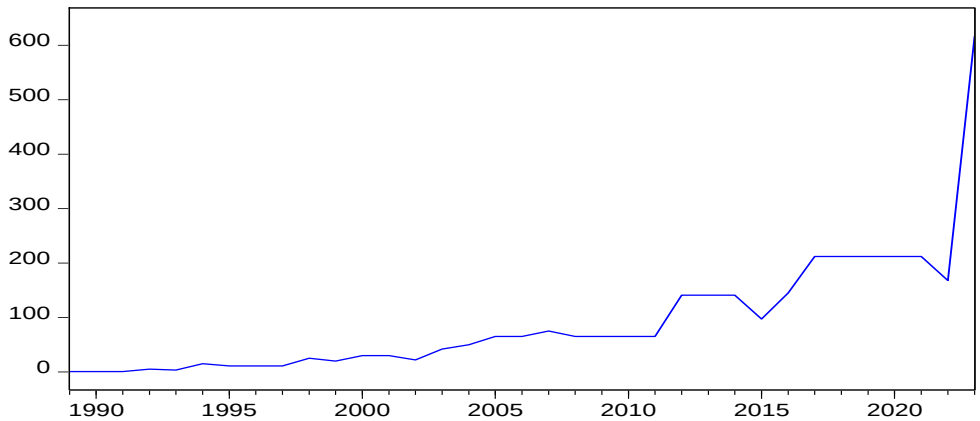

Figure 5: Graph demonstrating the fuel prices hike due to fuel subsidy removal

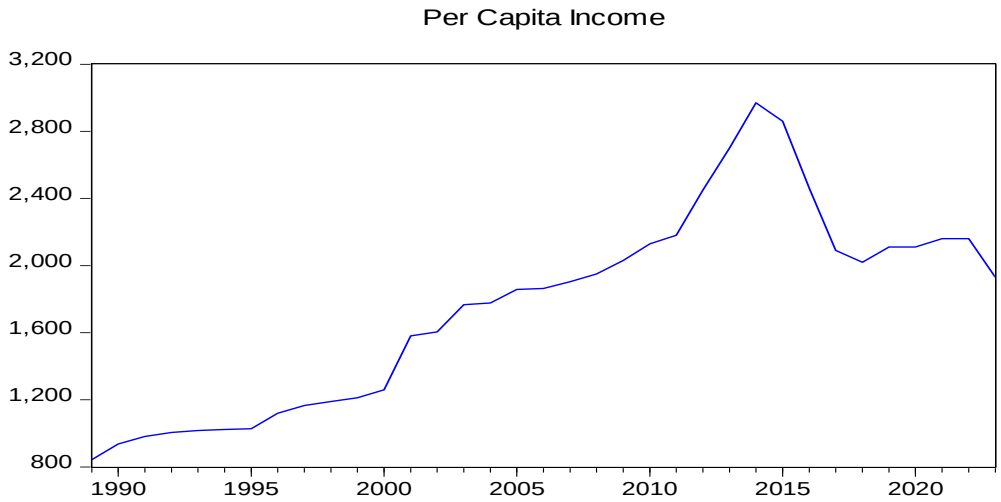

Figure 6: The Graph of the Per capita income from 1989 to 2023

DISCUSSION

Eliminating fuel subsidies is an astute strategy for the government to enhance infrastructure development while allowing the market to dictate fuel prices across the nation. Both linear and non-linear ARDL are suitable econometric methods for this research project, as indicated by the unit root test findings from the analysis conducted for this study. Controlling for inflation, government expenditure, and poverty, the fitted ARDL (2, 2, 0, 1, 0) indicates a short-term linear or symmetric correlation between the elimination of fuel subsidies and per capita income. The elimination of gasoline subsidies has a positive linear impact on per capita income, indicating that a greater reduction in fuel subsidies will enhance individual per capita income. This corroborates the research of Van Valkengoed and Van der Werff (2022) and aligns with the rational choice theory, which is founded on this study and presents a framework demonstrating that the elimination of gasoline subsidies has economic repercussions on individual livelihoods. This theory posits that individuals behave to optimize their self-interests within the limitations of economic factors assessed by the per capita income of the participants in this study. Although the estimated coefficient of inflation positively and significantly influences per capita income at the 5% level, indicating that heightened government expenditure will enhance individual per capita income within the nation, the control variable, represented by the estimated coefficient of inflation, negatively and significantly affects per capita income, signifying that an increase in inflation will reduce per capita income. This corroborates the findings of Ikena and Oluka (2023), who identified that a primary issue linked to subsidy elimination is the risk of inflationary pressures, as the prices of vital commodities and services may rise. Upon adjusting for inflation, government expenditure, and poverty, the ARDL bound test results indicate a long-term linear or symmetric correlation between the elimination of fuel subsidies and per capita income, with an F-value of around 7.42 exceeding the I (1) threshold of 4.01 at the 5% significance level.

Moreover, after accounting for inflation, government expenditure, and poverty, the outcomes of the fitted non-linear ARDL (1, 2, 1, 1, 2, 1, 0, 1, 0) indicate a short-term asymmetric linear correlation between the elimination of fuel subsidies and per capita income. The research hypothesis (H2), asserting that the removal of fuel subsidies has an asymmetric significant impact on per capita income in Nigeria, is corroborated by the computed coefficients of both the positive and negative changes resulting from the removal of fuel subsidies in Nigeria. The withdrawal of fuel subsidies by the current government administration in Nigeria has adversely impacted the per capita income of persons in the country. Moreover, the adverse change in Nigeria's inflation rate exerts a substantial negative asymmetric impact on per capita income, indicating that the elevated inflation rate diminishes individual per capita income. The per capita income in Nigeria is adversely affected asymmetrically by increases in the poverty rate and government expenditure, indicating that higher poverty rates and government spending diminish the nation's per capita income. Upon adjusting for inflation, government expenditure, and poverty, the non-linear ARDL bound test results indicate a long-term asymmetry link between the elimination of fuel subsidies and per capita income, with an F-value of around 13.84 exceeding the I(1) threshold of 3.39 at the 5% significance level.

Figure 5 demonstrates that the removal of gasoline subsidies in 2023 resulted in a significant surge in petrol prices, inflicting severe hardship on Nigerians. Inegbedion et al. (2020) discovered that the elimination of fuel subsidies can trigger a ripple effect throughout several economic sectors, leading to increased fuel prices that elevate transportation and production costs in other areas of the economy. Figure 6 demonstrates that per capita income declined in 2023, attributable to the newly elected president of Nigeria's declaration to eliminate fuel subsidies.

CONCLUSION

No recent study has examined the linear and non-linear effects of fuel subsidy removal on per capita income in Nigeria, highlighting a significant gap that this research is addressing, thereby motivating the study. This study uniquely examined the symmetric and asymmetric effects of gasoline subsidy withdrawal on per capita income, accounting for inflation, government expenditure, and poverty rates in Nigeria. The analysis undertaken in this paper reveals both symmetric and asymmetric short-term and long-term relationships between the removal of gasoline subsidies and per capita income, while accounting for inflation, government expenditure, and poverty rates.

The analysis revealed that the elimination of fuel subsidies has both symmetric and asymmetric effects on per capita income, whereas rising inflation rates, increased government expenditure, and declining poverty rates adversely affect per capita income in the country. Consequently, although it is essential for the government to eliminate fuel subsidies to expose fraud related to subsidy payments and promote infrastructural development, it must also provide adequate palliatives to mitigate the adverse effects of subsidy removal on the livelihoods of impoverished citizens, alongside implementing effective monetary policies to address inflation.

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