Designing Appropriate Compensation Mechanisms for Subsidy Removal in Nigeria: The Role of Fiscal Policy

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Abstract- The removal of subsidies has been a contentious economic policy in many countries, often sparking debates on its implications for various sectors of the economy. This study employs the Structural Equation Model (SEM) to assess the consequences, considering latent variables such as agricultural support program, social safety nets, and infrastructural development. Data from diverse regions of Nigeria are collected through purposive sampling and structured online questionnaires, allowing the study to model and analyze relationships among variables. The research evaluates convergent validity, factor loadings, and normality of measurements, using established benchmarks for goodness-of-fit indices. Results highlight the effectiveness of strategies to mitigate subsidy removal's effects. The agricultural support program stands out with a significant negative coefficient, while social safety nets and infrastructural development exhibit notable yet non-significant relationships. In light of these findings, the study recommends the prioritization of the agricultural support program as a comprehensive strategy for alleviating the consequences of subsidy removal in Nigeria. Additionally, it proposes a series of actionable policy recommendations, including the implementation of an E-wallet system for smallholder farmers, tax rebates on essential commodities, support for agricultural inputs, dam construction for dry season farming, nationwide distribution of grains, and the revival of cost-free extension services for farmers. By shedding light on subsidy removal dynamics, the study benefits policymakers, economists, and stakeholders navigating economic policy decisions in Nigeria.

Indexed Terms- Compensation Mechanisms, Subsidy Removal, and Structural Equation Model (SEM)

I. INTRODUCTION

The issues of Nigeria's subsidies of petroleum products were dated to 1977 when the military regime introduced a short-term cushion measured due to the rising of international oil prices. This was intended as a temporary fiscal response to an oil price spike instigated by the actions of the Organization of the Petroleum Exporting Countries (OPEC) but has been retained by subsequent governments as a mechanism for stabilizing domestic fuel prices and providing a more visible economic benefit to the people. Since fuel prices are fixed at a nominal value, inflation and the subsequent devaluations of the naira have progressively increased the value of the subsidy. As a result, the subsidy budget has grown and become increasingly unmaintainable. The subsidy frequently strains the budget, forcing the government to resort to increasing the price of fuel at the pump (Adeoti et al., 2016). However, this provides only temporary respite, as the subsidy soon starts to accumulate again. When international prices rise as they did between 1999 and 2012 (with the exception of the period immediately following the financial crisis) the subsidy bill escalates rapidly. Since the advent of democratic governance in 1999 and up till date, the upward adjustment of domestic prices of fuel has often been accompanied by civil unrest, and mass action by the population is a continuing phenomenon (Ohaeri & Adeyinka, 2016).
The most recent example of this was on May 29, 2023, when the President announced the total removal fuel subsidy more than doubled the fuel price from ₦194 to ₦537 (USD 432 to USD 660) per litre and further increased to N617 in August (USD 660 to USD 770.30) per litre in a bid to completely remove the subsidy on refined petroleum products. This led to the federal government meeting the organized Nigeria Labour Congress (NLC) and the Trade Union Congress (TUC) regarding the 14-day notice of the national strike. Hence, the federal government is still meeting with the unions on the possible compensation

to cushion the effect of the fuel subsidy removal in Nigeria. In recent years, the fuel subsidy has taken up over a third of the recurrent budget, constituting a huge waste of resources that could have been spent more effectively on pro-poor interventions in the economy (Udo, 2015).

Therefore, this paper resolves to design appropriate compensation mechanisms for subsidy removal in Nigeria, where oil accounts for around 80 percent of Nigeria's government revenues and 95 percent of foreign exchange earnings. Despite its potential, oil wealth in Nigeria has not translated into development gains. Poverty and unemployment are widespread with 64 percent of the population living on less than US $1.25 per day and just 12 percent of the labour force in formal paid employment. Typical of several resource-rich countries, Nigeria is one of the lowest-ranking countries on the UN Human Development Index. A lack of transparency, the absence of reliable oil sector information, weak relations between the state and civil society, and a deeply embedded culture of malpractice have all resulted in a huge gap between a wealthy elite and the rest of the population. Omotosho (2020) studied the effect of oil price shocks, fuel subsidies, and macroeconomic stability in Nigeria between 1980 and 2018 using the New-Keynesian DSGE model approach, the findings revealed that fuel subsidy removal will lead to higher macroeconomic instabilities.

However, to the best of our knowledge, no studies conducted using the Structural Equation Model (SEM) to assess the consequences, considering latent variables such as agricultural support programme, social safety nets, and infrastructural development. Data from diverse regions from the geopolitical zone of Nigeria were collected through purposive sampling and structured online questionnaires, this will provide workable transmission mechanisms for subsidy removal in Nigeria.

The paper is organized as follows. Section 2 discusses the key literature related to and overview of fuel subsidy removal in Nigeria. Section 3 sets to presents the methodology. Then Section 4 contains the estimated results, findings, and policy discussions; while Section 5 summarizes, concludes, and provides policy implications.

II. LITERATURE REVIEW

2.1 Overview of the Fuel Subsidy Regimes in Nigeria

Nigeria is one of the world's largest producers of crude oil, alongside the United States, Russia, Saudi Arabia, Canada, China, Iraq, Brazil, United Arab Emirates, Iran, and among other Countries (OPEC, 2023). These countries have a long history of crude oil production globally and with a production quota, that continues to be moderated by the Organisation of the Petroleum Exporting Countries. However, Nigeria since its inception has had four government-owned refineries under the monitoring and supervision of the Nigeria National Petroleum Corporation (NNPC), now called Nigeria National Petroleum Corporation (NNPC) Limited, due to the signing into law of the Petroleum Industry Act (PIA,2021). The country's capacity for refining crude oil products is obsolete. The four have a total refining capacity of 470,000 barrels per day. Two of the refineries are located at Port Harcourt, with the capacity to refine 210,000 barrels per day, and are operated by the Port Harcourt Refining Company (PHRC) Limited. The older of the two has a nominal refining capacity of 60,000 barrels per day and was commissioned in 1965, while the new plant with a nominal capacity of 150,000 barrels per day was commissioned in 1989. More so, the other two refineries are located in Warri and Kaduna. The Warri refinery was established in 1978, currently has a refining nominal capacity of 125,000 barrels per day and is operated by the Warri Refining and Petrochemicals Company (WRPC) Limited. The Kaduna refinery has a nominal refining capacity of 110,000 barrels per day and is operated by the Kaduna Refining and Petrochemicals Company (KRPC) Limited respectively.

Domestic consumption of petroleum products averaged 11 million metric tonnes between 2003 and 2013. Temporarily, production of refined petroleum products averaged 5 million metric tonnes, leaving a significant shortfall of 6 million metric tonnes on average for the period. This gap was filled by importation. Premium Motor Spirit (PMS) (excepting the sharp drop in 2011), averaged 5.4 million metric tonnes from 2004 to 2013 while household kerosene (HHK) imports averaged 1.2 million metric tonnes (NISER, 2016). However, for the past 10 years now, the domestic consumption of petroleum products has continued to fluctuate substantially. The daily consumption is on the average of 566 tonnes per day as of August 2023. Nigeria's refineries have been endemically inefficient, having suffered prolonged neglect and total breakdowns. Sadly, occasional turnaround maintenance efforts have failed to engineer sustained improvement in refining capacity over the years.

Theoretical Review

Many empirical studies both in the advanced and developing economies have adopted different theories to buttress their analysis of the impact of removal of fuel subsidy on general prices in Nigeria. For examples, studies by Oduyemi et al., (2021) cited in Okwanya et al., (2015) implemented the poverty gap theory to explain the effect of petroleum subsidies and inflation in Nigeria. For this aforementioned, this paper will adopt the neoclassical concept that serves as the theoretical framework. Among many features of this theory, one outstanding characteristic of neoclassical ideology is the combination of Classical microeconomic theories and Keynesian macroeconomic theories respectively. The mixture between both schools led to the neoclassical, which has dominated the land of economic reasoning since then. Neoclassical economics primarily concerns the efficient allocation of limited productive resources. It also considers the growth of the resources in the long term. It emphasizes that market equilibrium is the key to an efficient allocation of resources. Thus, market equilibrium should be one of the primary economic priorities of a government (Weintraub, 2007), likewise, state intervention is only considered to be economically reasonable in case of a market failure. Abruptly, neoclassical economics originated on the belief that there are both short and long-run consequences of any policy of the economy. They argued that an increase in aggregate demand leads to an increase in output growth in the first range, a simultaneous increase in the national income and the general price level in the second range, and an increase in the price level in the last range. While government intervention in the market leads to a quick remedy to economic issues as argued by the Keynesian school, the market through the invisible hand brings the market into equilibrium in the long run. Hence, the welfare of agents in the economy is affected in two ways. First, is how agents respond to government policy within a specific period and the second is how they adjust to the new normal as time goes on (Oduyemi et al., 2021).

Empirical Review

Ikenga and Oluka (2023) accessed the benefits and challenges of fuel subsidy removal on national economy in Nigeria. Descriptive analysis was employed, and the paper recommends that the central government should pay special attention to the effects of the policy on the masses by providing palliatives to alleviate the suffering of the people. In addition, the government should provide steady electricity, regulate prices of goods and services, including transportation fare, and provide adequate social amenities and infrastructures to cushion its effects on the citizens.

More so, De Bruin and Yakut (2023) explored the impact of removing fossil fuel subsidies and increasing carbon taxation in Ireland. Coal, diesel, kerosene, natural gas, gasoline, fuel oil, electricity, and LPG were employed as the variables. Dynamic intertemporal CGE model of Ireland was adopted, and the result revealed that carbon taxation has a lower negative impact on investments and GDP and subsidy removal has a lower negative impact on employment.
Between 2011 and 2014, Khalifa, et al., (2023) Linear quadratic storage model and Partial equilibrium model were employed, and the variables used were Import of white sugar, import of raw sugar and total sale of sugar. The findings reveals that an increase in the selling price leads to a slight variation in the level of sugar imports and production.

Dauda (2022) explored the implications of fuel subsidy removal on social spending in Nigeria. Stylized facts were used. The paper concludes that Fuel subsidy reform should discourage fuel consumption, reduce greenhouse gas emissions, and improve environmental quality. The paper recommends that government must ensure the consumer protection agency is functional and continue to monitor market prices of goods and services. This is because fuel subsidy removal will trigger inflation in the short run, which will trigger a marginal increase in transport costs, thus leading to a rise in the cost of production and food prices. This, by implication, will bring about a decline in disposable income and social welfare. In addition, the agency must put in place an appropriate mechanism to protect consumers against arbitrary price increases and sharp practices of producers who may want to cut corners by reducing product quality.

Between March 2017 and August 2020, Oduyemi, et al., (2021) examined the impact of the removal of petroleum subsidies on welfare in Nigeria. Consumer price index and pump price petrol were used as the variables and Autoregressive Distributed Lag and Non- Linear Autoregressive Distributed Lag were employed. The paper concludes that the impact of the removal of petroleum subsidy on welfare in Nigeria is a short-term phenomenon. The paper recommends that government should appropriate the fund earlier slated for petroleum subsidy in Nigeria to other development projects that would cushion the effect of petroleum subsidy removal in the short run.

that accounts for pass-through effect of international Omotosho (2020) studied the effect of oil price shocks, fuel subsidies and macroeconomic stability in Nigeria between 1980 and 2018. The paper used New-Keynesian DSGE model approach oil price into the retail price of fuel. The empirical results revealed that oil price shocks generate significant and persistent impacts on output, accounting for 22 percent with fuel subsidies. More so, revealed that a negative oil price shock contracts aggregate output, boosts non-oil output, increases headline inflation, and depreciates the exchange rate. However, results generated under the model without fuel subsidies indicate that the contractionary effect of a negative oil price shock on aggregate GDP is moderated, headline inflation decreases, while the exchange rate depreciates more in the short run. Counterfactual simulations also reveal that fuel subsidy removal leads to higher macroeconomic instabilities and generates non-trivial implications for the response of monetary policy to an oil price shock. Thus, this study cautions that a successful fuel subsidy reform must necessarily encompass the deployment of well-targeted safety nets as well as the evolution of sustainable adjustment mechanisms.

Gelb and Mukherjee (2019) examined the effect of fuel subsidy reforms and green taxes on digital technologies in Washington DC. It was said that increasing energy prices will have adverse impact on poorer consumers, who may spend substantial budget shares on energy and energy-intensive products even though the rich typically appropriate more of the price subsidy.

Adekunle and Oseni (2021) examined the effect of fuel subsidies and carbon emissions in Nigeria. Non-linear Autoregressive Distributed Lag was adopted while fuel subsidy, GDP per capita, population growth rate, energy use per capita, and carbon dioxide emission were used as the variables in this paper. The paper found that subsidy removal in the short run and long run inversely relates to the carbon emission of Nigeria. The paper recommends that there should be a complementary policy option that ensures additional financial savings to the government should be invested in public sector growth that can cushion the effect of relative income loss to the citizenry.

III. METHODOLOGY

The present study employed a purposive sampling method, utilizing 307 structured online surveys to gather data from participants across all geopolitical regions of Nigeria. We examined agricultural support programs, social safety nets, and infrastructural development as the potential models for addressing the challenges posed by fuel subsidy removal. Drawing from Aminu et al.'s work in 2021, we utilized the Structural Equation Model (SEM) to identify the most effective approach for mitigating the impact of completely removing fuel subsidies in Nigeria. The survey was crafted to encompass three distinct models, each based on global governmental strategies aimed at alleviating the repercussions of fuel subsidy elimination.

SEM offers advantages over descriptive statistics, Multiple Regression Techniques, and Factor Analysis due to its combination of factor analysis and multiple regression analysis. Unlike the aforementioned methods, SEM can assess proposed causal relationships among variables within a model. This approach enables the exploration of connections between one or more independent variables (IVs) – whether continuous or discrete – and one or more dependent variables (DVs).

Moreover, SEM employs confirmatory factor analysis to minimize measurement errors by employing multiple indicators for each latent variable. It evaluates the overall model rather than focusing solely on individual coefficients, and it can test models with multiple dependent variables. SEM's capabilities extend to handling intricate and challenging data that might be non-normally distributed or incomplete, a feature not overlooked by Tabachnick and Fidell in 2014.

Model Specification

The configuration of structural relationships among latent variables is defined by considering the impact of subsidy removal (ESR) as the dependent variable and agricultural support programme (ASP), social safety net (SSN), and infrastructural development (IDC) as the independent variables, as illustrated below:

The equation is formulated as:

$$ESR = \alpha_0 + \alpha_1 ASP + \alpha_2 SSN + \alpha_3 IDC + \varsigma - - - - - - - - - - - - - - - - - (3.3)$$

In this context, ESR represents the effects of removing fuel subsidies, ASP stands for the agricultural support programme aimed at alleviating the repercussions of fuel subsidy removal, SSN signifies the social safety net designed to mitigate the impact of fuel subsidy elimination, and IDC refers to infrastructural development implemented to lessen the consequences of fuel subsidy removal in Nigeria. The vector ς accounts for error terms.

As stated by Hair et al. (2012), the testing of the latent structural equation constitutes the initial step in the theoretical framework. However, this testing holds little significance unless it is first confirmed that the measurement model is valid. According to Hair et al., in models involving latent structural equations, it is imperative to specify and assess the measurement model before proceeding to test the structural equation itself.

Diagnostic Test

Test of Model Fitness

Assessment of the validity of the Structural Equation Model involves determining its adequacy based on certain criteria. A suitable fit is indicated when the Chi-square test statistic holds little significance and when at least one of the incremental fit indices – such as the Comparative Fit Index (CFI), the root mean square error of approximation (RMSEA), the Goodness of Fit Index (GFI), the Tucker-Lewis Index (TLI), the adjusted goodness of fit index (AGFI), and the Normed Fit Index (NFI) – satisfies the predefined benchmarks outlined in the provided table.

In the context of the Structural Equation Model (SEM), it is essential to perform an evaluation of various goodness-of-fit indicators that demonstrate how well the model aligns with the available data. Among these indicators, the commonly highlighted measures include RMSEA and CFI. However, the selection of which indices to present is influenced by individual inclination and, potentially, the preference of the journal editor (Hu & Bentler, 1999).

Table 1: Index Table

S/N	Name of category	Name of index	Index full name	Level of acceptance
	Absolute fit	Chisq	Discrepancy chi square	P>0.05
		GFI	Goodness of fit index	GFI>0.90
	Incremental fit	AGFI	Adjusted Goodness of fit index	CFI>0.90
		CFI RMSEA	Comparative fit index The root mean square error of approximation	CFI>0.90 RMSEA≤ 0.08
		TLI	Tucker – Lewis index	TLI>0.90
		NFI	Normed fit index	NFI>0.90
	Parsimonious fit	Chisq/DF	Chi square/Degree of	Chisq/DF <5.0

Source: Adopted from Aminu et al. (2021)

Normality test
Traditionally, it is customary to examine normality and identify outliers as crucial steps in ensuring the integrity of research. Hence, a normality test was undertaken to rectify any potential data discrepancies. According to Byrne (2010), within statistical investigations, skewness exerts a more pronounced impact on the mean. Consequently, building upon this perspective, DeCarlo (1997) proposed that, in the context of Structural Equation Modeling, special attention should be paid to kurtosis since it significantly influences the testing of variances and covariances. Viewing SEM as a method for analyzing covariance structures, Byrne (2010) underlined the significance of remaining attentive to kurtosis.

However, Kline (2005) pointed out that a clear consensus regarding the specific threshold for extreme kurtosis is lacking. Despite this, West, Finch, and Curran (1995) identified values exceeding 7 as indicative of a noticeable deviation from normality.

IV. RESULTS AND DISCUSSION

Reliability Test
In this context, the data gathered from the study underwent an assessment of reliability to ensure the coherence of the collected data. The threshold for acceptable reliability is set at a minimum of 0.70 (Kerlinger & Lee, 2000). Thus, Table 3 presents the reliability examination outcomes for the research, wherein the Cronbach's alpha coefficients span from 0.70 to 0.823. This implies that the instrument (questionnaire) used in this study is reliable.

Table 2: Reliability Coefficients for the study

Variables	Final test (n = 307)	
	No. Items	Alpha (α)
Impact of subsidy removal	5	0.700
Agric Support Programme	6	0.806
Social Safety Net	8	0.762
Infrastructural Development	5	0.813
Overall Model	24	0.823

Source: Author’s computation using SPSS Version 21

Assessing the Measurement Model
The Measurement Model constitutes an integral part of data preparation, as it serves to evaluate the construct validity by analyzing factor loadings and assessing the normality of the measurement tools. Consequently, the study's proposed measurement model, as shown in Figure 1, underwent multiple adjustments, leading to the modified Measurement Model depicted in Figure 2. The Goodness-of-Fit indices for this modified measurement model are as follows: Chi-Square (χ^2) = 252.02, degrees of freedom (df) = 95, p-value = .000, Relative χ^2 (χ^2/df) = 2.91, GFI = 0.913, CFI = 0.906, IFI = 0.907, and RMSEA = .073. These Goodness-of-Fit indices collectively lead to the conclusion that the measurement model aligns well with the data.

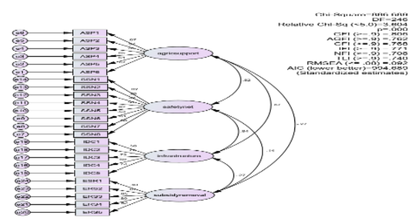

Figure 1: Proposed Measurement Model

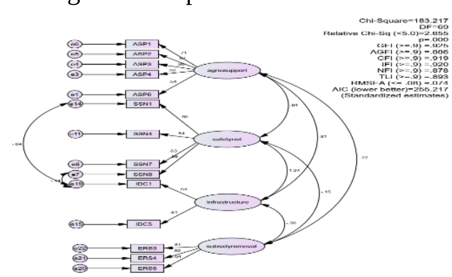

Figure 2: Modified Measurement Model

Convergent Validity using Confirmatory Factor analysis (CFA)
In this study, Confirmatory Factor Analysis (CFA) was employed to evaluate the convergent validity of the distinct constructs within the research questionnaire, in line with the insights provided by the aforementioned scholars. This evaluation was based

on factors like assessing factor loadings, calculating Average Variance Extracted (AVE), and considering the Modification Index (MI). The process is illustrated in Table 3, showcasing both the primary and secondary CFAs for the construct items. During this process, items failing to meet the criterion of having MI values below 15 were eliminated from the path diagrams of the CFAs. Furthermore, AVE values were calculated.

Illustrated in Table 3, the "Impact of Subsidy Removal" (ESR) construct initially comprised 5 items. Following the first-order CFA, which bears resemblance to exploratory factor analysis (EFA), the items were streamlined to 3, yielding an AVE of 0.585. For the "Agricultural Support Programme" (ASP) construct, with an original item count of 6, one items were removed following the first-order CFA, resulting in 5 items and an AVE of 0.500 . Similarly, the " Social Safety Net " (SSN) construct initially had 8 items, and after the first-order CFA, 3 items were eliminated, leaving 5 items with an AVE of 0.365 . Likewise, the "Infrastructural Development " (IDC) construct, consisting of 5 items, underwent the removal of 2 items after the first-order CFA, resulting in 3 items and an AVE of 0.512 .

Table 3: Convergent Validity and Construct Reliability using Confirmatory Factor Analysis (CFA)

CONSTRUCTS	ITEMS	Factor Loading ≥ 0.5		AVE ≥ .5 MI> 15
		1st Order CFA	2nd Order CFA	
Impact of Subsidy Removal (ESR)				0.585
	ESR 1	0.49	Deleted	
	ESR 2	0.07	Deleted	
	ESR 3	0.85	0.81	
	ESR 4	0.80	0.82	
	ESR 5	0.62	0.65	
Agric Support Programme (ASP)				0.500
	ASP 1	0.67	0.71	
	ASP 2	0.57	0.57	
	ASP 3	0.78	0.80	
	ASP 4	0.65	0.62	
	ASP 5	0.64	Deleted	(MI>15)
	ASP 6	0.57	0.54	
Social Safety Net (SSN)				0.365
	SSN 1	0.62	0.65	
	SSN 2	0.28	Deleted	
	SSN 3	0.42	Deleted	
	SSN 4	0.56	0.54	
	SSN 5	0.62	Deleted	(MI>15)
	SSN 6	0.53	Deleted	
	SSN 7	0.64	0.63	
	SSN 8	0.58	0.59	
Infrastructural Development (IDC)				0.512
	IDC1	0.58	0.64	
	IDC 2	0.72	Deleted	
	IDC 3	0.73	Deleted	(MI>15)
	IDC 4	0.69	Deleted	(MI>15)
	IDC 5	0.73	0.51	

Source: Author's computation using SPSS Version 21
Note: AVE: Average Variance Extracted
MI: Modification index

Table 4: Assessment of Normality

Variable	min	max	skew	c.r.	kurtosis	c.r.
ERS3	1.000	5.000	.484	3.464	-1.030	-3.682
ERS4	1.000	5.000	.424	3.032	-1.086	-3.883
ERS5	1.000	5.000	.129	.922	-1.323	-4.732
IDC1	1.000	5.000	-1.255	-8.974	1.458	5.214
IDC5	1.000	5.000	-.948	-6.782	.627	2.243
SSN1	1.000	5.000	-1.227	-8.774	.976	3.491
SSN4	1.000	5.000	-1.515	-10.835	2.287	8.180

Variable	min	max	skew	c.r.	kurtosis	c.r.
SSN7	1.000	5.000	-1.320	-9.439	1.511	5.403
SSN8	1.000	5.000	-1.117	-7.993	1.221	4.368
ASP1	1.000	5.000	-.990	-7.078	.016	.058
ASP2	1.000	5.000	-.916	-6.552	-.023	-.081
ASP3	1.000	5.000	-1.142	-8.171	.778	2.784
ASP4	1.000	5.000	-1.014	-7.253	.427	1.526
ASP6	1.000	5.000	-1.166	-8.341	1.394	4.985
Multivariate					58.396	24.170

Source: Author's computation using SPSS Version 21

Note: Min.: Minimum; Max.: Maximum; c.r.: Critical Ratio.

Discussion of Normality Test Results on Causes of Farmers-Herder's Conflict

For this study, a test of normality has been conducted to assess the normality of the data and it was found out that all the latent constructs and measured variables were < 5. Table 4 illustrates the respective Kurtosis values for the latent constructs and measured variables. Kurtosis for all items ranges from a maximum of 2.287 to a minimum of –1.323 which all falls within the values of less than 5. And also, the overall multivariate Kurtosis = 58.40 is low, which implies that the data is normally distributed. Large multivariate Kurtosis indicated that the sample has severely multivariate non-normal distribution. Certainly, if the data is normally distributed then, it is a clear indication that there are no outliers in the data set.

In this study, a normality test was carried out to evaluate the normal distribution of the data. The results revealed that all latent constructs and measured variables exhibited values of less than 5 in terms of Kurtosis. The Kurtosis values for each item are presented in Table 4, ranging from a maximum of 2.287 to a minimum of -1.323, all falling within the range of less than 5.

Furthermore, the overall multivariate Kurtosis was determined to be 77.95. This value suggests that the sample data follows a normal distribution, as the multivariate Kurtosis is not significantly high. Elevated multivariate Kurtosis would indicate a pronounced departure from multivariate normality. The normal distribution of data implies the absence of outliers within the dataset.

Regression Result for the impact of fuel subsidy removal

The analysis of Structural Equation Modeling using AMOS in Figure 3 illustrates the following Goodness-of-Fit indices; Chi – Square χ^2 (CMIN) = 183.22 (df = 69), Relative χ^2 (CMIN/df) = 2.66, p = 0.000, GFI = 0.925, CFI = 0.919, IFI = 0.920, and RMSEA = 0.074. According to Hair et al., (2012) if any 3 or 4 of the Goodness-of-Fit indices are within the threshold then the entire model is fit, therefore, based on this reason the Structural Model for this study fits the data.

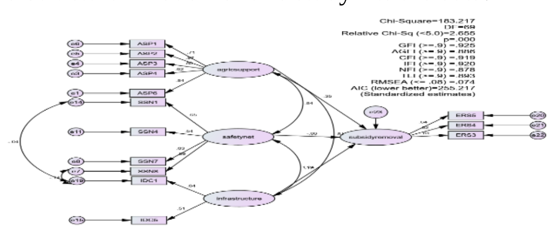

Figure 3: Structural Model

Table 5: Unstandardized and standardized regression weight in the hypothesized path model

Hypothesized relationships			B	S.E	Beta	*CR*	*P*
ESR	<---	AGS	-0.597	0.258	-0.352	-2.312	0.021**
ESR	<---	SSN	-0.095	0.256	-0.062	-0.372	0.710
ESR	<---	IDC	0.291	0.224	0.165	1.296	0.195

Source: Author's computation using SPSS Version 21
Note: ESR:- Impact of fuel subsidy removal; ASP:- Agricultural Support Programme; SSN:- Social Safety Net; IDC:- Infrastructural Development B:- Unstandardized Regression Coefficient S.E.:- Standard Error; CR:- Critical Ratio.

Table 5 presents the coefficients of structural equation on the mitigating role of agricultural support programme, social safety net and infrastructural development on fuel subsidy removal in Nigeria. The coefficients of agricultural support programme of -0.352 and the probability value of 0.021 suggest that agricultural support programme could significantly mitigate the impact of fuel subsidy removal. To be precise, a percent increase in agricultural support programme may likely reduce the impact of fuel subsidy removal by 0.352 percent. Similarly, a negative but insignificant relationship was found between the social safety net and the impact of fuel subsidy removal. This is not surprising, as the vast majority of Nigerians live in rural areas whose occupation is agriculture. Any support in that regard could increase agricultural production, boost food production, reduce prices and tame inflation, particularly food inflation. The coefficient of sociali. safety net of -0.062 and the probability value of 0.710 suggest that a percent increase in social safety net mayii. likely lead to 0.165 reduction in the impact of fueliii. subsidy removal but not significant. This could be attributed to the fact that money and items given in theiv. form of social safety are not to be used in productionv. but for consumption, hence would not have any multiplier effect on output and by extension prices. Onvi. the contrary, infrastructural development was found tovii. have a positive but insignificant impact on fuelviii. subsidy removal.

This study suggests that the model of agricultural support is the best to be adopted to mitigate the impact of fuel subsidy removal in Nigeria.

V. CONCLUSION AND RECOMMENDATIONS

Conclusion
The objective of this study was to determine the most effective model for alleviating the consequences of removing fuel subsidies in Nigeria, using the Structural Equation Model (SEM). The findings of the study revealed that the agricultural support programme stands out as the optimal approach for mitigating the effects of fuel subsidy removal. This conclusion is supported by a significant negative coefficient associated with this model.

Conversely, the social safety net and infrastructural development exhibit a non-significant negative and positive relationship, respectively, with the impact of subsidy removal. Based on the results, the study suggests that the government and relevant authorities should prioritize the adoption of the agricultural support programme to effectively address the repercussions of fuel subsidy removal.

Recommendations
The study further proposes several recommendations:
Establishment of an E-wallet system for smallholder farmers;

Implementation of favorable tax incentives on essential commodities;

Provision of support in the form of agricultural inputs for smallholder farmers;

Construction of dams to facilitate dry season farming;
Nationwide distribution of grains; and Revival of extension services without cost for farmers.

Implementing these recommendations is expected to significantly contribute to alleviating the challenges posed by the removal of fuel subsidies in the country.

REFERENCES

[1] Adekunle, I. A., & Oseni, I. O. (2021). Fuel subsidies and carbon emission: evidence from asymmetric modeling. *Environmental science and pollution research*, *28*, 22729-22741.

[2] Dauda, R. O. S. (2022). Fuel subsidy and implications for social spending in Nigeria: A research note. *Economic and Policy Review*, *20*(1), 26-36.

[3] de Bruin, K., & Yakut, A. M. (2023). The Impacts of Removing Fossil Fuel Subsidies and Increasing Carbon Taxation in Ireland. *Environmental and Resource Economics*, 1-42.

[4] Gelb, A., & Mukherjee, A. (2019). Fuel Subsidy Reform and Green Taxes: Can Digital Technologies Improve State Capacity and Effectiveness? *CGD Policy Paper*, *149*.

[5] Ikenga, A. F., & Oluka, N. L. (2023). An Examination of the Benefits and Challenges of the Fuel Subsidy Removal on the Nigerian Economy in the Fourth Republic. *International Journal of Applied Research in Social Sciences*, *5*(6), 128-142.

[6] Khalifa, N. B., Abbassi, A., & Dakhlaoui, A. (2023). Evaluating the Impacts of Subsidy Removal by Using a Linear-Quadratic Storage Model: The Case of Tunisian Sugar Industry. *Journal of the Knowledge Economy*, 1-18.

[7] Oduyemi, G. O., Lawal, N. A., Onayemi, O. O., Philips, A. S., & Kasali, S. O. (2021). Assessment of the Impact of Petroleum Subsidy Removal on Welfare in Nigeria. *College of Management Sciences, Bells University of Technology, Ota, Ogun State, Nigeria*, 181.

[8] Omotosho, B. S. (2020). Oil price shocks, fuel subsidies and macroeconomic (in) stability in Nigeria. *Fuel Subsidies and Macroeconomic (In) stability in Nigeria (February 20, 2020)*.

[9] Byrne, B. M. (2010). Structural Equation Modeling with AMOS: Basic Concepts, Applications, and Programming (2nd Ed.). Taylor and Francis Group, LLC.

[10] DeCarlo, L. T. (1997). On the meaning and use of kurtosis. Psychological Methods,2(3), 292 – 307.

[11] Hair, J.F., Sarstedt, M., Pieper, T.M. & Ringle, C.M. (2012). The use of partial least squares structural equation modeling in strategic management research: a review of past practices and recommendations for future applications, Long Range Planning, 45(5), 320-340

[12] Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling, 6, pp.1 55.

[13] Kerlinger, F. N. & Lee, H. B. (2000). Foundations of Behavioral Research (4th Ed.).

[14] Kline, R. B. (2005). Principles and Practice of Structural Equation Modeling (2nd ed.). New York: Guilford.

[15] Tabachnick, B. G. & Fidell, L. S. (6th ed)(2014), Pearson New International Edition, Using Multivariate Statistics.England and Associated Computer throughout the world. Pp.770 780

[16] West, S. G., Finch, J. F., & Curran, P. J. (1995). Structural Equation Models with nonnormal variables: Problems and Remedies. Retrieved January 20, 2013, from http://www.psycnet.apa.org

[17] Adeoti, J. O., Chete, L., Beaton, C., & Clarke, K. (2016). Compensation Mechanisms for Fuel Subsidy Removal in Nigeria. Nigerian Institute of Social and Economic Research (NISER) International Environment House 2, 9 Chemin de Balexert 1219 Châtelaine Geneva, Switzerland Canada R3B 0T4

[18] Udo, B. (2015, Jan. 26). New petrol price: How we arrived at N87 per litre Alison-Madueke.

[19] Premium Times. Retrieved from *http://www.premiumtimesng.com/business/175634-new petrol-price* arrived-n87-per-litre-Alison-Maduek

[20] Ohaeri, V. & Adeyinka, T. (2016, July). Policy brief: Kerosene subsidy reform and the burden of supply. Gender & Energy Policy, 1(2). Spaces for Change. Retrieved from