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GROWTH AND WELFARE IMPLICATIONS OF FULL MARKET PRICING OF PREMIUM MOTOR SPIRIT IN NIGERIA: POLICY ANALYSIS IN A STRUCTURALIST CGE MODEL

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ABSTRACT

This study provides an insight into sustainability issues arising from a full market pricing of premium motor spirit (PMS) (a 1 00% fuel subsidy removal) in Nigeria and its implications on macroeconomic growth and public welfare. Methodologically, t he study used a Structuralist Computable General-Equilibrium model to run simulations that indicate the nature of the effects of PMS full market pricing over the period 2015 – 2020. The findings show that 100% increases in PMS will amplify both th e income and consumption losses of households, worsen inflation and better-off government account balance. The findings al so show that, government income witnessed positive growth, while output, investment and current account had both positive and negative effects. This study provides a basis for recommendations on the adjustment path that the country need to take in order to mitigate the adverse impact of 100% fuel subsidy removal and draws some useful policy options for a sustainable de velopmental reform in Nigeria.

Keywords: Growth, Welfare, Fuel Subsidy, Computable General-Equilibrium

INTRODUCTION

Fuel subsidies have a variety of aggregate impacts on the economy. At their core, fossil-fuel subsidies, which include; coal, diesel, gasoline, natural gas, kerosene, electricity and energy, have an economic impact by distorting prices and therefore affe cting production and consumption decisions. Increases in petrol, coal, oil and natural gas prices etc. would ripple throughout other sectors of the economy, affecting the costs of production, and therefore the prices of other goods, particularly energy-int ensive ones.

Subsidies also affect government accounts, the balance of payments and government budgets by imposing fiscal burdens, wh ich in turn reduce the amount of money available to spend on social programs (Saunders and Schneider, 2000; World Bank, 2 010). According to a recent study by the International Monetary Fund (IMF) in its latest survey on 'Counting the Cost of Ene rgy Subsidies', most of this arises from countries setting energy taxes below levels that fully reflect the environmental damag e associated with energy consumption. IMF projects subsidies to remain high despite sharp declines in international energy p rices. The International Monetary Fund has revealed that subsidies in energy are projected at $5.3 trillion in 2015, or 6.5 per c ent of global Gross Domestic Product (GDP) (IMF, 2015).

With the major buyers of crude oil becoming increasingly self-sufficient, the prices of crude oil have witnessed downward sli de in June, 2014, with Brent tumbling from $115 per barrel in June 2014 to a four-year low of $80.60, after a record peak of $147 in July 2008. As the prices are falling, OPEC has not yet indicated any plan to curb production to drive prices back up a nd the United States crude inventories has risen by 7.11 million barrels, more than double the 2.7 million-barrel increase anal ysts had predicted, according to EIA. With this scenario, it is expected that the prices will tumble below $80 per barrel, a pred iction that has forced the Nigerian Government to benchmark the 2015 budget to $78 per barrel, up from $77.50 in 2014 (Eji ofor**,** 2014).

Nigeria is the world's 14th largest producer of (index mundi) (with10th largest proven reserves) crude oil. It possesses the worl d's 8th largest proven natural gas reserves. The country has an installed production capacity of 445,000 barrels of fuel per day , adequate to meet its domestic needs with a surplus for export. Yet the country is a large net importer of gasoline and oth er petroleum products. The country relies on importation for most of its fuel needs as the country's four refineries are in a po or state of disrepair most often has witnessed a drop in importation of refined petroleum products in recent years, leading to a cute scarcity of the products across the country. With the consumption of 48 million litre of fuel per day, the country is expec ted to spend about N2.2 billion on fuel subsidy. From a theoretical perspective, in a solely dependent economy like Nigeria wh ere subsidies are the only existing price distortions, removing these subsidies should reduce energy related GHGs emissions, while bringing real income gains to the country that removes the subsidies. These gains originate from an increase of c onsumer welfare and from a more efficient reallocation of resources (Emeka, 2011; Izielen, 2012).

In 2010, fuel subsidy gulps ₦1.3 trillion according to the Nigerian Government. Also, in 2015, the Nigerian Government clai med that it spends ₦1.69 billion daily to subsidise petrol consumption despite the decline in the country's oil exports and the resultant squeeze on the nation's revenues. Some analysts who argued in support of fuel subsidy reform or removal said that

even if the government doesn't reform or remove subsidy now, it must certainly remove it's sometime in the future, adding th at Nigerians' refusal of subsidy removal or reform is mere delay of the evil day (*Esiedesa, 2015). According to them,* the refo rm or the removal of the fuel subsidy is fundamental to the overhaul of the Nigerian economy and achievement of inclusive a nd sustainable economic diversification and growth. Because in recent years, fuel subsidy has taken up over a third of the rec urrent budget, constituting a huge waste of resources that could have been spent more effectively on pro-poor interventions in the economy.

It is the task of balancing the cost and benefit of fuel subsidy on the sustainable development social welfare that constitute on e of the policy dilemmas on subsidy reforms, particularly in Nigeria. Evaluating fuel subsidies from the perspective of sustain able development requires that these consequences be considered as a guiding principle for policy. Because the cost of the fu el subsidy has continued to grow exponentially. This is partly due to the rising cost of fuel which meant that the government had to spend even more to keep domestic prices low and also due to Nigeria's increasing population which resulted in increas ed fuel consumption; together these pressures made the cost of the fuel subsidy unsustainable.

On the current debate on removal of fuel subsidy in Nigeria, there are two major concerns of the Nigeria citizens: one that the current high price of PMS will lead to increase in poverty and two, that the removal of fuel subsidy will exert insignificant i mpact on war against corruption rather worsen it. Generally, most of the studies carried out on this study have focused on the qualitative analysis of the fuel subsidy removal particularly in the developed economies. Few studies exist yet on the quantita tive analysis and the effect of fuel subsidy removal on key macroeconomic variables and welfare for an oil exporting country like Nigeria. This study intends to fill this gap. In view of the stated problems and the justification for this study, this study is set to address the following relevant policy questions. (1) To what extent will removal of fuel subsidy affect the general price level and the key macroeconomic variables in Nigeria? (2) To what extent will fuel subsidy removal impact on poverty and h ousehold income distribution in Nigeria? (3) How much gain will the removal of fuel subsidy accrue to government income? (4) What changes are needed in macroeconomic policies to ensure effective economic and welfare growth in the face of fuel s ubsidy removal?

This research examines aspects of fuel subsidy and tries to develop new and easy means of understanding the cost and benefit implications. It notes that the study implies that the existence of fuel subsidy which has been exploited by the players in the d ownstream Petroleum sector to garner illicit gains and impoverish the rest of the country. This study attempt to situate the ar guments for and against fuel subsidy removal and empirically determine its future economic implications in Nigeria. The ove rall objective of this study is to analyse the implication of fuel subsidy removal on key macroeconomic variables in oil export ing and importing country like Nigeria and measure the magnitude of such impacts on household welfare both on the short an d long run period

After the introductory part in section 1, the rest of the study is organised as follows; 2 is the brief review of literature. 3 provi de an overview fuel subsidy expenditure in Nigeria (2006 – 2015), section 4 is the computation of fuel subsidy and fuel subsi dy crisis in Nigeria**.** The analytical framework and methodology of the study are provided in section 5, while sections 6 cover

s the structuralist computable general equilibrium (SCGE) findings, section 7 is the summary of the keys issues and policy impli cations. Sections 8 and 9 are the study conclusion and policy responses and measures

BRIEF LITERATURE REVIEW

The oil and gas industry has an important role in sustainability and achieving a sustainable development. The balance betwee n all three pillars of sustainable development will be a challenge, and a "plentiful and economic supply of energy is a require ment for the economic and social pillars of sustainable development." According to Shields et al. (2013), Sustainability is ref erred to as the process of maintaining a certain level of productivity in an organization, community, etc. It is often used interc hangeably with the term "sustainable development," while sustainable development could be defining as the "development th at meets the needs of the present without compromising the ability of future generations to meet their own needs.

If the main goal of sustainability and sustainable development is to make sure that the world achieves a balance of economic development, environmental responsibility, and social progress, then there is no way to accomplish this if there are many cou ntries that do not have access to energy to develop, maintain, and improve qualities of life and societal progress. "Petroleum a nd its products will need to play a continuing role in extending modern quality-of-life benefits to an increasing share of the w orld's population (Arscott, 2003). Therefore, the issue of sustainable development and fuel subsidy reforms becomes very im portant in the light of on-going governments effort in this direction and the debate over the removal of the subsidy on petrole um products is not about its effectiveness (as an intervention program) or its sustainability (among other conflicting economi c demands).

A subsidy is a reverse tax. It is a deliberate attempt be government to support a chosen economic agent – a consumer and a pr ovider and it can be applied in any market that involves the buying and selling of products and or services. A subsidy as defin ed by the OECD in a study is basically government action that decreases the consumption price of the consumer and or increa ses the selling price of the producer (OECD, 2002).

Marc Burniaux and Chateau (2010) viewed the economic implications of phasing-out fossil-fuel subsidies in non-OECD cou ntries. According to them, if each non-OECD country were to remove its fossil-fuel subsidies unilaterally, it would generally record welfare gains, in line with what is suggested by the theory. Most countries or regions report welfare gains ranging fro m 0.3% in the rest of the world regional aggregate to more than 4% in the oil-exporting countries in 2050. These gains corres pond to the welfare improvement associated with the subsidy removal together with, in most cases; a more efficient allocatio n of resources across sectors. Therefore, from this perspective, the removal of fossil fuel subsidies brings in both environment al and economic benefits

In view of Grosh et al (2008), if subsidies linked to the price of energy are to be phased out, there are a number of alternative policies that can provide direct assistance to the poor who would be adversely affected by the subsidy removal. These policie s, known as social safety nets, can take a number of forms. Direct transfers may include targeted cash payments, or near-cash

payments (such as vouchers and food stamps), while indirect transfers may include fee waivers for essential services such as health, education, or transport. The advantage of these policies is their ability to be well targeted to the poor, resulting in a lo wer cost to the government to deliver the same benefits to low-income households. In particular, in countries where several di fferent consumer goods are subsidized, there can be an important economy of scale and scope in using a social safety net pro gram to protect poor households from the removal or reduction of all these different subsidies.

Clements et al (2003) constructed a CGE model to explore the impact of subsidy removal on petroleum products in Indonesia . Two scenarios were run. The first used a Keynesian scenario in which real output declined, leading to a fall in household inc omes. The second was a non-Keynesian scenario that left aggregate output unchanged. In both scenarios the prices of all goo ds rose as a result of the subsidy removal. Although the higher-income households were more affected by the subsidy remova l, the overall level of poverty in the economy increased, in part because employment fell among low-income households. The authors suggest that these results point to the need for targeted support to the poor if universal subsidies were to be removed.

OVERVIEW FUEL SUBSIDY EXPENDITURE IN NIGERIA (2006 – 2015)

In mid-2015, the Nigerian Extractive Transparency Initiative, NEITI, released its audit report indicating that the Federal Gov ernment spent about ₦4.5 trillion between 2006 and 2012, a period of seven years, as subsidy on petroleum products importe d into the country. The breakdown shows that ₦816.554 billion was paid between 2006 and 2008. While the Business Day's analysis of figures on fuel subsidies from 2006 to 2008, has shown. In 2006, subsidy cost on petrol was ₦151.9 billion, ₦188 billion in 2007, ₦256.3 billion in 2008 (from January to July).

The Petroleum Products Pricing and Regulatory Agency (PPPRA) put the amount spent on fuel subsidy from 2006 to 2008 to be ₦1.185 trillion. PPPRA said that it paid a total subsidy of ₦272.713 billion in 2006 out of which the Nigerian National Pe troleum Corporation (NNPC) got ₦243.603 billion, while the oil majors and independent marketers received ₦19.212 billion. According to PPPRA, "In 2007, the people of Nigeria, through their government, paid a total subsidy of ₦278.86 billion; NN PC took ₦227.47 billion and the oil majors and independent marketers received ₦51.388 billion. In 2008 according to PPPR A, a total subsidy of ₦633.192 billion was paid, out of which NNPC received ₦370.490 billion and oil majors and marketers received ₦260.08 billion. NNPC, in the three years that you (PPPRA) administered the subsidy, received ₦841.536 billion w hile oil majors and independent marketers received ₦330.016 billion, and a total of ₦1.185 trillion was paid as subsidy in the last three years (PPPRA, 2009). The drastic increase in cost was partly attributed to a depreciation of currency and the very hi gh global prices of oil products.

The breakdown of the ₦4.5 trillion spent by Nigerian Government between 2006 and 2012 also showed that ₦3 trillion was p aid on subsidy between 2009 and 2011 and ₦690 billion in 2012. According to the then Executive Secretary of NEITI, Zaina b Ahmed, the Audit report of 2012 showed that a total of ₦1.355 trillion was processed for payment as subsidy. Out of this a mount, ₦690 billion was actually paid, putting a debt burden of ₦665 billion on the government. Specifically, in 2009, ₦421. 5 billion was spent, ₦673 billion in 2010, and ₦1.3 trillion spent in 2011 was revised up to 2.19 trillion by the Ministry of Fi

nance, after arrears were paid in 2012 for PMS consumption in 2011. Fuel subsidy cost the Nigerian state ₦1.3 trillion (about $8.38 billion) in the 2010 fiscal year alone, about 25 per cent of the entire budget expenditure for the year under review

In January 1, 2012, according to the pricing template posted on the website of the PPPRA, a litre of petrol should have been s old in Nigeria at ₦142.92 as against the official price of ₦65, if petrol prices remain at the present level when the subsidy on the product is withdrawn. Nigerians would have paid ₦142.92 for a litre of petrol. Because by then Nigeria was consuming a bout 32 million litres of petrol daily for ₦65, while the expected price for the product is ₦142.92, which means government p ays a subsidy of ₦77.92 per litre. In 2012, the sum of ₦888 billion was allocated for subsidy payments in the budget for petro leum product importers (Asu, 2013).
Okonjo-Iweala (2013) also shown that Nigeria spent a total of ₦971 billion naira ($5.99 billion) on fuel subsidy payments in 2013. The amount the Federal Government is paying on subsidy for Premium Motor Spirit (PMS) has dropped to ₦4.48 per li tre, as global oil prices continue to decline. The Petroleum Products Pricing Regulatory Agency (PPPRA), at December 12, 2 014 put the market price of PMS at ₦101.48 per litre. While the Petroleum Products Pricing Regulatory Agency (PPPRA) sta ted that it paid about ₦832.06 billion in 2013 as subsidy claims to petroleum products marketers under the Petroleum Support Fund (PSF) (PPPRA, 2014).

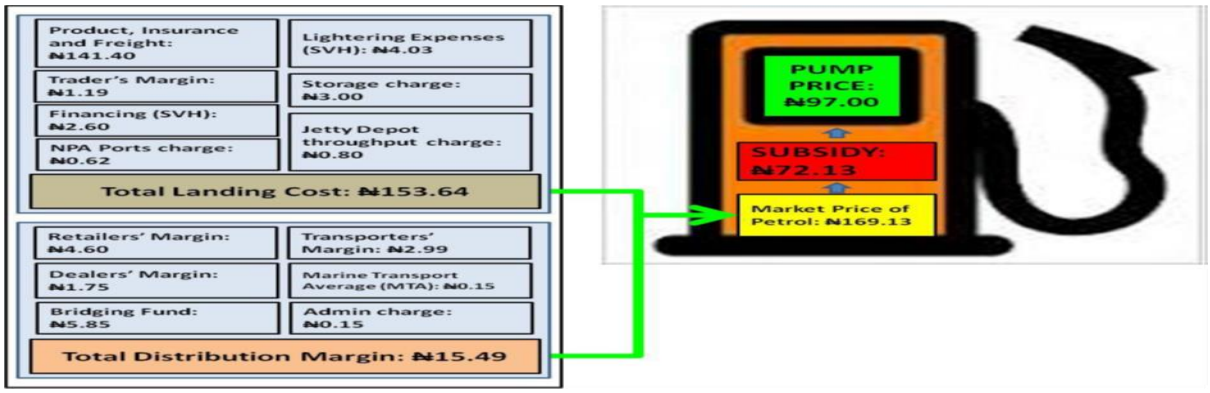
On the flip side of the decline in crude oil prices, which has affected the country's revenue from oil exports, analysts expect t he Federal Government's spending on fuel subsidy to reduce by up to ₦600 billion in 2014 (Asu, 2014). In 2015, Governmen t planned the sum of ₦971 billion to subsidise the supply of petrol to Nigerians, an indication that the administration has no p lan to do away with subsidising petrol. In the same vein, the government plans to give out a total of ₦260 million to the Subsi dy Reinvestment Programme, SURE-P, for intervention in various development agencies. This was contained in the 2015-20 17 Medium Term Expenditure Framework and Fiscal Strategy paper, which President Goodluck Jonathan sent to the Nationa l Assembly for approval as the basis for the 2015 budget (Soni, 2014). According to the argument, Nigerian domestic consum ption and demand for the key petroleum products, the Premium Motor Spirit (PMS) was 30 to 34 million litres per day and th e Federal Government spent over ₦1trillion on the payment of petroleum subsidy in 2015 (Kachikwu, 2015).

COMPUTATION OF FUEL SUBSIDY AND FUEL SUBSIDY CRISIS IN NIGERIA

(a) Computation of Fuel Subsidy

According to information derived from the website of Petroleum Products Pricing Regulatory Agency (PPPRA) - the agency charged with the control and regulation of domestic fuel consumption, Petroleum Product Pricing templates are being used – a formatted and standardized formula for calculating the final landed cost of petroleum products (see CPPA, 2011)

Figure 1: 2013 Subsidy Computation



Source: Ezeigbo**,** 2013

The PPPRA templates gives the approved list of components of PMS cost, (Cost + Freight) being the largest. The Gasoline (P etrol) Price per Metric Ton being the most important, and is largely determined by factors beyond their control. The freight is the amount charged for transporting a metric ton of PMS from a refinery (Mostly Europe or Eastern US seaboard to Nigeria). The exact freight costs used by the PPPRA to know if it is competitive and this omission might lead to exploitation as every $10 per metric ton in freight costs would lead to a ₦1.3 increase in PMS cost per Litre.

Another Component of the PPPRA template, the traders' margin is also another point of worry as it is difficult to know what exactly it is. It is the profit of the trader who sells the petrol and brokers the deal that set the figure ($10), despite fluctuations in crude oil prices. There is no a trading desk in the National Oil Company, NNPC. Traders margin yields 100 million dollars per annul for the trader. The PPPRA maintained that the traders' margin is factored into freight costs. It appears as a separate component from cost and freight. (PPPRA, 2014)

Fuel Subsidy Crisis

Fuel price increase, otherwise tagged removal of subsidy, in the country dates back to 1977 when government first increased the price to 8.5 kobo per litre in 1978 from 3 kobo per litre in 1977. In 1990 the government further increased the price to 60 kobo per litre, and two years later, precisely 1992, an additional 10 kobo raised the price to 70 kobo per litre. In 1993 it was j erked up to ₦3.25 and further to ₦11.00 per litre in 1994.

In 1986, the military administration of General Ibrahim Babangida declared that due to the devaluation of the Naira, the dome stic price of fuel had become unreasonably cheap and was therefore burdensome to the federal government's purse. The price of petroleum products was thus raised from 23 kobo per litre through a negotiation process, eventually settling at 70 kobo pe r litre. Chief Ernest Shonekan, the brief successor to the Babangida regime, cried out in dismay at the fiscal state of affairs up on taking over. The price of fuel was identified as one of the primary budgetary burdens based on the fact that the currency h ad further been acutely devalued. In 1993, the price of gasoline (petrol) was therefore increased to ₦5/litre.

Shortly after General Abacha grabbed power from the tethering administration of Ernest Shonekan, he would reduce the price of petroleum products slightly to gain public support. With gasoline (petrol) now priced at ₦3.25/litre, fuel price adjustment had become a tool in the hands of the government for manipulating the support and mood of the people. Just over a year later in 1994, the government announced a sharp increase in the price of petroleum products. PMS (petrol) would now cost a fears ome ₦11 per litre. Upon the death of Abacha and the ascension of General Abdulsalami, the price was once again reviewed a nd increased to ₦25/litre. An outcry by the public and resistance from the labour congress forced the administration to reduce the price to a 'paltry' ₦20/litre in January of1999.

In the space of 8 years, the price of petrol went from ₦20/L to ₦30/L in 1999 but was reduced to ₦22/L because of public res istance in 2000. The commodity enjoyed some stability until mid-1999 when based on the claim of subsidy removal, the gove rnment moved the price to ₦20 per litre and by 2000 increased it further to ₦22.00 per litre.

Barely a year after, in 2001, the commodity's price went up to ₦26 per litre where it enjoyed some level of stability until 200 3 before it went up to ₦40, with the usual claim that the subsidy had been removed. Before President Olusegun Obasanjo left office, he jerked up the price of petrol to, first, ₦65 per litre and later to over ₦100 per litre.

In 2002 prices went to ₦26/L, however, in 2003 it was increased to ₦40/L but reviewed back to ₦34/L because of another sti ff resistance from the public. In 2006 however, the price was revised up to ₦40/L again and finally as a parting gift in 2007, t he reprobate president would foist a criminal and sudden increase to ₦75/litre on the citizens.

It is on record that when the late President Umaru Musa Yar'Adua assumed office, the Nigeria Labour Congress, NLC, resist ed the increase and forced him to revert to the ₦65 per litre. For his part, President Yar'dua who succeeded Obasanjo, showe d some compassion and reduced the official price of petrol to ₦65/litre.

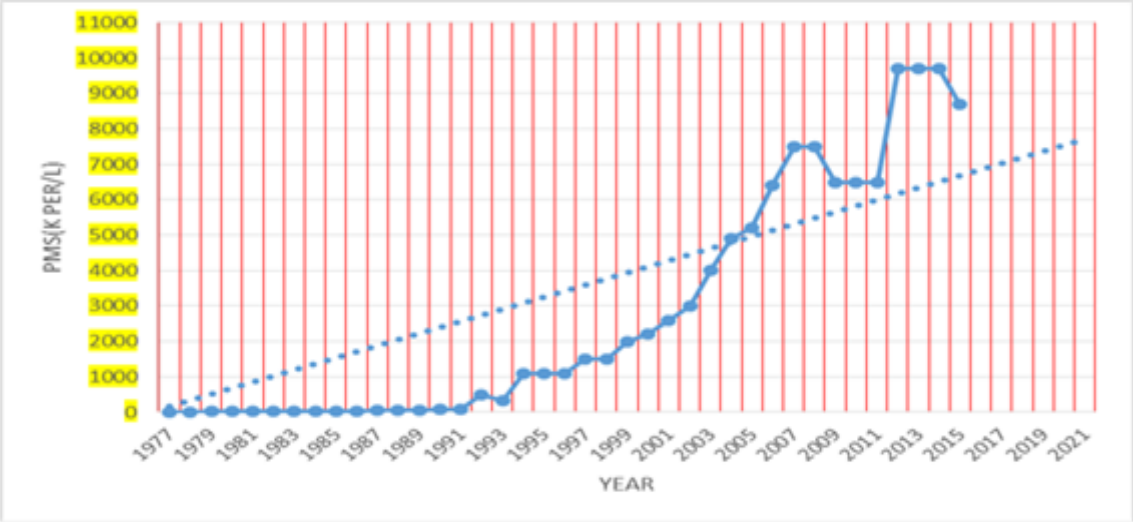
In January 2012, the government of former President Goodluck Jonathan attempted to remove the acclaimed subsidy by incre asing the price of fuel in January 2012, but this was stoutly resisted and the commodity which was billed to sell for ₦97 per li tre was later pegged at ₦87 per litre. President Muhammadu Buhari did just that in May 2016. Nigerians have now been aske d to buy the product at a peak price of ₦145 per litre. Government said its decision in this regard is informed by the fact that despite the decline in the price of crude oil in the international market, marketers are finding it increasingly difficult importin g refined petroleum products due to scarcity of foreign exchange.

Table 1: Typical Retail Price of PMS in Nigeria (1977 to 2015)

YEAR	PMS(K PER/L)	PMS (₦ PER/L)	PMS($ PER/L)	PMSGR	CHANGE	GOVT
1977	3	0.03	0.05	-	-	Military
1978	8.5	0.09	0.14	183.3	Increase	Military
1979	13.5	0.14	0.23	58.8	Increase	Mil/Civ
1980	15	0.15	0.27	11.1	Increase	Civilian
1981	15	0.15	0.25	0.0	Stable	Civilian
1982	20	0.20	0.30	33.3	Increase	Civilian
1983	30	0.30	0.41	50.0	Increase	Civilian
1984	30	0.30	0.39	0.0	Stable	Military
1985	39.5	0.40	0.44	31.7	Increase	Military
1986	39.5	0.40	0.20	0.0	Increase	Military
1987	51	0.51	0.13	29.1	Stable	Military
1988	60	0.60	0.13	17.6	Increase	Military
1989	60	0.60	0.08	0.0	Increase	Military
1990	70	0.70	0.09	16.7	Increase	Military
1991	70	0.70	0.07	0.0	Stable	Military
1992	500	5.00	0.29	614.3	Increase	Military
1993	325	3.25	0.15	-35.0	Decrease	Military
1994	1100	11.00	0.50	238.5	Increase	Military
1995	1100	11.00	0.50	0.0	Stable	Military
1996	1100	11.00	0.50	0.0	Stable	Military
1997	1500	15.00	0.69	36.4	Increase	Military
1998	1500	15.00	0.69	0.0	Stable	Military
1999	2000	20.00	0.22	33.3	Increase	Civilian
2000	2200	22.00	0.22	10.0	Increase	Civilian
2001	2600	26.00	0.23	18.2	Increase	Civilian
2002	3000	30.00	0.25	15.4	Increase	Civilian
2003	4000	40.00	0.31	33.3	Increase	Civilian
2004	4900	49.00	0.37	22.5	Increase	Civilian
2005	5200	52.00	0.39	6.1	Increase	Civilian
2006	6400	64.00	0.50	23.1	Increase	Civilian
2007	7500	75.00	0.60	17.2	Stable	Civilian
2008	7500	75.00	0.63	0.0	Stable	Civilian
2009	6500	65.00	0.44	-13.3	Decrease	Civilian
2010	6500	65.00	0.42	0.0	Stable	Civilian
2011	6500	65.00	0.41	0.0	Stable	Civilian
2012	9700	97.00	0.63	49.2	Increase	Civilian
2013	9700	97.00	0.63	0.0	Stable	Civilian
2014	9700	97.00	0.63	0.0	Stable	Civilian
2015	8700	87.00	0.44	-11.5	decrease	Civilian

Sources: Ogunbodede et al, 2010 and Author's Computations, 2017

Figure 2*:* Linear Analysis (If PMS Assumed a Deterministic Trend) *(1977 – 2020)*



Author's Computations

ANALYTICAL FRAMEWORK AND METHODOLOGY

Model Structure and Description of the CGE Model

The analysis is based on a structuralist computable general-equilibrium (SCGE) model of a small-open economy. The appr oach of this study proposed model belongs to the class of new open-economy macroeconomic models, which have become th e main tool used in modern international and developmental macroeconomics and increasingly sought by international organi zations around the world. The model is flexible enough that it can capture the complex realities of the Nigerian economy. In order to apply the framework to the Nigerian economy, the model is modified to fit the real data and to handle the policy issu es. The model is calibrated using data for 2014 and Existing Social Accounting Matrices (SAMs) of the Nigerian economy, w hen the price of fuel was relatively stable (₦97 per litre). The SAMs have the following accounts: commodity accounts, activ ity accounts, household accounts, value-added accounts (sale tax and export duty accounts), government accounts, capital (sa vings- Investments) accounts and Rest of the World accounts (see the appendix for SAM structure). The Nigerian's SAMS is updated to 2014 base values to suit our current analysis. In updating the Macro SAM data, the SAM is weighted by GDP shar e and its average annual growth rate from 1999-2014 (IFS, 2014, WDI, 2014). Each entry was normalized to shares of GDP a t market prices. The constant elasticity of substitution (CES) and the constant elasticity of transformation (CET) values used i n the calibration of the model were derived from literatures (Deverajan et al, 1999)

Model Specification

The primary interest of this study is to ascertain the effect (positive or negative) of 100% removal of fuel subsidy on some ma croeconomic variables and national poverty level by evaluating the overall effects of the removal on the national household i

ncome and household consumption volume. The analysis and specifications of the removal scenarios in this model are done with a standard model structure derived from Dervis et al (1984), Devarajan, et al, 1993). It is a general equilibrium model in which the tradable sector is divided into importables and exportables.

Specification of Equations of the Model

A non-linear programming (NLP) model of five blocks of 28 simultaneous equations are specified as follows;

Price Block

PMDEF: PM =E= pwm * (1+TMS) * ER (1)

PEDEF: PE =E= pwe * (1+TE) * ER (2)

PDSDEF: PDS =E= PDD (3)

PQDEF: PQ*(1-TS)*Q =E= (PDD*DD) + (PM*M) (4)

PXDEF: PX*X =E= (PDS*GDP) + (PE*E) (5)

Supply Block

CET: X =E= at*(gamma*E**rhot + (1-gamma)*GDP**rhot)**(1/rhot) (6)

ESUPPLY: E =E= XD*((PE/PDS)*((1-gamma)/gamma))**(1/(rhot-1)) (7)

ARMINGTON: Q =E= ac*(delta*M**(-rhoc)+(1-delta)*DD**(-rhoc))**(-1/rhoc) (8)

COSTMIN; M =E= DD*((PDD/PM)*(delta/(1-delta)))**(1/(1+rhoc)) (9)

(where ρ = rho, γ = gamma, δ = delta)

Income Block

YHEQ: YH =E= (PX*X) + hogovconst + (howor*ER) (10)

YGEQ: YG =E= TARIFF + STAX + HTAX + (govwor*ER) (11)

TOTSAVEQ: TOTSAV =E= (CAPHOSH*(YH*(1-TY)))+(CAPWOR*ER)+CAPGOV (12)

Expenditure Block

CDEQ: CD*PQ =E= (YH*(1-TY))*(1-CAPHOSH) (13)

INVESTEQ: INVEST =E= (PQ*INVD) (14)

TARIFFEQ: TARIFFE=E= (TMS*pwm*ER*M) (15)

STAXEQ: STAX =E= (TS*PQ*(CD+GD+INVD)) (16)

HTAXEQ; HTAX =E= (TY*YH) (17)

EXSUBEQ: EXSUB =E=(TE*pwe*ER*E) (18)

GOVSUEEQ: GOVSUE=E=(TMS*pwm*ER*DD) (19)

Market Clearing Block

QEQUIL: Q =E= CD + GD + INVD (20)

DOMEQUIL: DD =E= GDP (21)

CAPWOREQ: CAPWOR =E= pwm*M – pwe*E – howor – govwor (22)

CAPGOVEQ: CAPGOV =E= YG – (PQ*GD) – hogovconst –GOVSUE (23)

WALRASEQ: TOTSAV =E= INVEST + WALRAS (24)

Elasticity Related Parameters

Trade substitution elasticity: rhoc = $\rho c = (1/\sigma) - 1$ (25)

Export transformation elasticity: rhot = $\rho t = (1/\Omega) + 1$ (26)

Where σ =sigma and Ω =omega

Fuel subsidy Variable Initialisation

GOVSUE.L = (TMS.L*pwm*ER.L*DD.L) (27)

pwm = PM0/((1+TMS0)*ER0) (28)

Thus, the complete model has twenty-eight (28) equations with equation (27) capturing the fuel subsidy variable initialization (see Appendixes 5, 6 and 7 for the definition of variables of the model, definition of the parameters of the model, the specific ation of variables as positive or free positive variables and the model Blocks)

Hypothesised Issues

There are many factors that may be affected as a result of fuel subsidy removal. 100% fuel subsidy removal in Nigeria combi ne with the devaluation or depreciation of the naira would have a complex effect on macroeconomic performance and the lev el of poverty and may also have multiple implications for the economy. If there is 100% fuel subsidy removal, it is hypothesi sed that household income would decrease, since part of the workers' income paid by Government is paid to subsidy. That is, effect of fuel subsidy or removal may cause large changes also on macro performance and total household disposable income , savings and consumption income could be affected. In other words, it is the believed that, fuel subsidy removal has had a sta gflationary effect on the economy: it slow down rates of economic growth and increase the domestic price level. In addition, i t has reduced the level of domestic investment and worsened the government account and income position.

Model Calibration

Thus, whether macroeconomic and welfare variables decrease or increase in response to the 100% removal of fuel subsidy de pends on the CES. We analyzed the impact of 0 and 100 percent fuel subsidy removal effects on macroeconomic and welfare variables in Nigeria base on the trade elasticities, which fall within the range $0 < \sigma < 1$ for the world price of imports of oil (P

WM*)* and $0 < \Omega < 2$ for the world price of exports (PWE*)*. The growth rate of any economy by destination is defined by arbitrary constants (α_{0s}), the accelerators (α_{1s}), and the elasticities (β_{1s}). So our model is calibrated with respect to Government fuel subsidy expenditure (GOVSUE), and World Price of Imports of oil, (PWM), is the elasticity with respect to the level of Government subsidy payment (γ_1) is capacity utilization (u_i) and World Price of Exports of oil (PWE).

Definition of Policy Simulation Experiments

This policy analysis examines the impact of an increase in the price of fuel on domestic output and production, government income and consumption, government account balance, households saving, investment, consumption volume, domestic demand, domestic price (inflation), household income household consumption and external reserve. These experiments assign values to the world price of fuel import. The policy analysis is driven by the imperative of achieving a more efficient way of reallocating the fuel subsidy budget for developmental activities that directly benefit the poor. Because the federal government of Nigeria has taken the view that subsidy removal is an important element in the larger scheme to sustain Nigeria's economic development that will benefit both the present and the future generations. In other words, reforming fuel subsidy in Nigeria offers greater opportunities in putting the country on a sustainable path of development.

The other one simulation involves maintaining constant decrease of subsidy value or increasing the percentage of removal by the Nigerian government and ascertaining the short, the medium and long run distributional effect from 2014/2015 to 2020. One assignment value is needed for each member of the simulation experiments. This study carried out two experiments of fuel subsidy removal scenarios, including the base experiment of 2014/2015. The "base" in the set serves as comparator.

i. Simulations involves maintaining constant reduction in fuel subsidy rate, and ascertaining the medium and long run distributional effect. That is, stimulate with the removal of subsidy by 100% adding to base-run ₦97 per litre, using different elasticity of fuel import (elasticity demand) and ascertaining the short, the medium and long run distributional effect from 2014/2015, 2016, 2017, 2018, 2019 and 2020

Table 2: Fuel Subsidy Reduction (Full market Pricing)

Base Year Subsidy (₦)	Subsidy Reduction (%)	Reduction (₦)	Base Year Price(₦)	Pump Price (₦)	Index	Remark
72.13	100.0	72.13	97	169.13	100% over the base year price = 2.00	Total removal of 72.13 subsidy

Source: Author's Computation, 2017

i. With Zero reduction of fuel subsidy. A litre of fuel was sold for ₦97.00
ii. With 100% removal of fuel subsidy. A litre of fuel will sells for ₦169.13

Base Year: 2014/2015

Base Year Pump price of fuel = ₦97.00

Base Year: Subsidy = ₦72.13

Base Year Market price of petrol = Pump price + Subsidy = ₦97.00 + ₦72.13 = ₦169.13

Thus, the second simulation experiments add a terms-of-trade shock (deviates from the base-run, 2014/2015). These deviations are dynamic effects from 2016-2020. The normalized prices are *PDD0* = 1, *PDS0* = 1, *PE0* = 1, *PM0* = 1. While, *PX* is a weighted average of prices that are initially normalized, since the model is homogeneous of degree zero in prices, one good must be chosen as the numéraire. The default numéraire is the exchange rate or, equivalently, a price index representing the bundle of imports. Hence *PX0* = 1, *ER0* = 1 (see model equations)

Data Requirement and Sources

Data were obtained for income, expenditure, trade export supply, import demand, government, investment, balance of payment, among others secondary data for growth and poverty measures for Nigeria is compiled from International Agencies such as the UNDP, World Bank's Economic and Social Database, IMF CD-ROMs, ADB, UNIDO, IFS CD-ROMs, etc., and other relevant sources. Other sources include data from the Nigerian National Bureau of Statistics (NBS), the Central Bank of Nigeria (CBN), Nigeria National Data Bank,

STRUCTURALIST COMPUTABLE GENERAL EQUILIBRIUM FINDINGS

Base Scenario and Analysis of Simulation Results

Two fuel subsidy reduction simulations experiments are considered under our scenarios. Base parameter values are simulated from social accounting matrix. The base year period 2014/2015 parameter share is maintained throughout the simulation period for the variables given the rate changes. *The findings from this study tend to confirm a priori expectations* on the effects of fuel subsidy reduction by the Nigerian government on macroeconomic variables and poverty/household welfare in Nigeria. An unexpected decrease in fuel subsidy reduction may have effect on the variables of interest which include the Consumer and Producer Prices for Domestic Supply of Output, Domestic Price of Competitive Imports of Commodity, Composite Price of Output by Activity, Domestic Output (GDP)/aggregated Domestic Demand for Commodity, Savings/Investment, Current Account Balance, and Household income, Household Consumption, Government Income and Government Account Balance.

The results of marginal effects of reduction of fuel subsidy of the policy simulations for all the macroeconomic indicators and household welfare are summarized in Appendixes 1 and 2. The Appendix 1 show the summary of parameters results in percent deviation from base period values of the stated variables changes in the major components, while the Appendix 2 show the magnitudes of the parameter growth rates of the stated variables, The short run effects are capture in 2016, the intermediate effects captured 2017 – 2019, while the long run aggregate effects are capture in 2020. The policy simulations experiments are performed under a flexible exchange rate regime with depreciation of Naira. That is with constant exchange rate fluctuation and falling oil price.

Macroeconomic Growth and Welfare Effects of 100% Fuel Subsidy Reduction (a full market pricing of PMS)

Simulation with 100% Reduction of Fuel Subsidy: Appendixes 1 and 2

This section examines the effect such 100% reduction on general price levels. With the fuel subsidy reduction simulation sce narios under a 100% reduction of fuel subsidy over base period value ₦97.00 of 2014/2015. It implies that ₦72.13 was added to pump price of petrol then causing an increase of a litre of fuel to ₦169.13.

Effects on General Price Levels

The simulation scenarios in Appendixes 1 and 2 shows the distributional effects of the 100% reduction of fuel subsidy over b ase period value ₦97.00 of 2014/2015 on consumer and producer prices for domestic supply of output, domestic price of com petitive imports of commodity and composite price of output by activity. From the exposition, Appendix 1 analyses the devia tion from the base period and Appendix 2 illustrates the growth rate overtime. The deviation from the base period helps to sh ow the distributional effect in which the 100% reduction of fuel subsidy has on general price level. Appendix 1 is the accumu lated effect of 100% reduction of fuel subsidy over base period on consumer and producer prices for domestic supply of outp ut, domestic price of competitive imports of commodity and composite price of output by activity in Nigeria from a cumulati ve basis for the period of 2014/2015 to the long run period of 2020. The accumulated effect increased by 1.31, 5.744 and 0.86 respectively (see Appendix 1).

Examining Appendix 2, it is observed that consumer and producer prices for domestic supply of output had a 0.36 positive gr owth in the short run which is 2016; it then had a negative growth in the intermediate and long run which are -0.08, -0.04, -0. 07 and -0.09 respectively amounting to accumulated 0.08 growth rate over the period 2016 till 2020. The intermediate run ha s remained relatively steady on the negative side. The result also as reported in Appendix 2 shows that domestic price of com petitive imports of commodity experienced constant positive growth rate in the short run, intermediate run and long run perio d; thus the accumulated growth for this period amounted to 1.447. Appendix 2 shows that composite price of output by activit y experienced positive growth rate in the short run at 0.27 and then negative growth rate in the intermediate and long run peri od.

Appendix 1 reports 100% reduction of fuel subsidy over the base period 2014/2015. The result reveals that in the short run, th e fuel subsidy reduction simulation scenarios under a 100% of fuel subsidy reduction has a 0.36 distributional impact on Con sumer and Producer Prices for Domestic Supply of Output. The result in the intermediate run reveals distributional impact of 0.28 for 2017, 0.24 in 2018 and 0.17 in 2019. The long run distributional impact shows an increase of 0.08. The accumulated effect over the period of 2014/2015 to 2020 shows an increase of 1.13, 5.744 and 0.86 for consumer and producer prices for d omestic supply of output, domestic price of competitive imports of commodity and composite price of output by activity, resp ectively.

The simulation result in Appendix 1 under a 100% of fuel subsidy reduction shows that it has a 0.62 distributional impact on Domestic Price of Competitive Imports of Commodity in Nigeria in the short run, while considering the intermediate run, it h as a 1.156 increase in 2017, 1.209 increase in 2018 and 1.312 increase in 2019. In the long run of year 2020, the 100% fuel su bsidy reduction will have a 1.447 distributional impact.

Composite Price of Output by Activity from Appendix 1 reports an increase of 0.27 from the 2014/2015 base period to 2016. In the intermediate run period, there was an increase of 0.22 in 2017, increase of 0.18 in 2018 and increase of 0.13 in 2019. T he long run effect shows an increase of 0.06 in 2020 as reported in Appendix 1.

Effects on External Trade

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Reduction of fuel subsidy by 100% over base period value ₦97.00 of 2014/2015 leads to a litre of fuel selling for ₦169.13 im plying that ₦72.13 was added to the pump price of fuel per litre and the fuel subsidy reduction simulation scenarios is present ed in Appendix 1 and Appendix 2.

The simulation scenarios in Appendixes 1 and 2 shows the distributional effects of the 100% reduction of fuel subsidy over b ase period value ₦97.00 of 2014/2015 on imports of commodity, domestic output exported by activity and current account ba lance. From the exposition. The deviation from the base period helps to show the distributional effect in which the 100% redu ction of fuel subsidy has on external trade. Appendix 1 shows the accumulated effect of 100% reduction of fuel subsidy over base period on imports of commodity, domestic output exported by activity and current account balance from a cumulative b asis for the period of 2014/2015 to the long run period of 2020. The accumulated effect decreased by 24.989 on imports of co mmodity, 3.018 and 11.886 increase on domestic output exported by activity and current account balance respectively (see A ppendix 1).

Examining Appendix 2, it is observed that imports of commodity had negative growth in the short run, intermediate and long run which are -3.091, -1.038, -1.548, -0.118 and -0.502 respectively amounting to accumulated -6.297 negative growth rate o ver the period 2016 till 2020. The result also as reported in Appendix 2 shows that domestic output exported by activity exper ienced constant positive growth rate in the short run, intermediate run but negative in 2019; thus the accumulated growth for t his period amounted to positive of 1.085. Also, Appendix 2 shows that current account balance experienced positive growth r ate in the short run at 3.833 and then negative growth rate in the intermediate and long run period.

Appendix 1 reports 100% reduction of fuel subsidy over the base period 2014/2015. The result reveals that in the short run, th e fuel subsidy reduction simulation scenarios under a 100% of fuel subsidy reduction has a -3.091 distributional impact on im ports of commodity. The result in the intermediate run reveals distributional impact of –4.129, -5.677 and -5.795 in 2019. Th e long run distributional impact shows a growth of -6.297.

Appendix 1 reports the simulation result under a 100% of fuel subsidy reduction. It can be seen that it has a 0.165 distribution al impact on domestic output exported by activity in the short run, while considering the intermediate run; it has a 0.485 incre ase in 2017, 0.723 increase in 2018 and 0.56 increase in 2019. In the long run of year 2020, the 100% fuel subsidy reduction will have a -1.085 distributional impact.

Current Account balance from Appendix 1 shows a trend of the effect of a 100% fuel subsidy reduction on it. The simulation scenarios show an increase of 3.833 from the 2014/2015 base period to 2016. In the intermediate period, there was an increas e of 2.999 in 2017, increase of 2.553 in 2018 and increase of 1.737 in 2019. The long run effect shows an increase of 0.764 in 2020.

Effects on Household Welfare (Measurement of Poverty)

Given the fuel subsidy reduction simulation scenarios under a 100% reduction of fuel subsidy over base period value ₦97.00 of 2014/2015, we ascertain the distributional effects from 2016 to 2020, these for the short run, intermediate run and long run are showed in Appendixes 1 and 2 on household welfare. Appendixes 1 and 2 shows the effect which 100% Reduction of fue l subsidy will have.

The simulated results of the effect of 100% fuel subsidy reduction simulation scenarios on household real income and househ old consumption are reported in Appendixes 1 and 2. The Appendix shows the effect of 100% reduction of fuel subsidy over base period value ₦97.00 of 2014/2015. Appendix 1 analysis the deviation from the base run period of 29.658 for household real income and 21.519 for household consumption, while Appendix 2 shows the growth rate overtime. The results show that the accumulated effects of household real income reduced by 11.322 implying a tremendous increase poverty level and house hold consumption decreased by 10.433 from a cumulative basis for the period of 2014/2015 to the long run period of 2020 re spectively. The result shows that household real income and household consumption experienced negative growth rate (see A ppendix 2).

On the Household Real Income, with the fuel subsidy reduction simulation scenarios under a 100% of fuel subsidy reduction, the short run distributional impacts show for -0.65 in 2016. The intermediate effect shows -5.34 in 2017, -5.05 in 2018, -6 fal l in 2019 and (long run distributional effects) -11.32 in 2020 (see Appendix 1). This shows that 100% of fuel subsidy reductio n will worsen household welfare in terms of household real income.

Household Consumption also show decreases in their trend analysis in short, intermediate and long run with percentage chan ges value of -0.47 in 2016 in the short run and -3.87 in 2017, -3.67 and -4.35 decrease in 2019 in the intermediate run and -10 .43 decrease in 2020 on the long run.

Effects on Government Revenue

With the fuel subsidy reduction simulation scenarios under a 100% reduction of fuel subsidy over base period value ₦97.00 o f 2014/2015, we ascertain the distributional effects from 2016 to 2020, these for the short run, intermediate run and long run a re showed in Appendixes 1 and 2 on government revenue. Appendixes 1 and 2 shows the effect which 100% Reduction of fu el subsidy will have on government revenue. The effect will follow the transmission mechanism on government income and government account balance.

The results show that the accumulated effects of government income increased by 0.271 and government account balance inc reased by 0.124 from a cumulative basis for the period of 2014/2015 to the long run period of 2020 respectively.

On the Government income, with the fuel subsidy reduction simulation scenarios under a 100% of fuel subsidy reduction, the short run distributional impacts show for 0.307 in 2016. The intermediate effect shows 0.303 in 2017, 0.459 in 2018, 0.401 i n 2019 and (long run distributional effects) 0.271 in 2020.

Government account balance in short, intermediate and long run with percentage changes value of -0.662 in 2016 in the short run and 0.511 in 2017, 0.431 in 2018, and 0.289 increase in 2019 in the intermediate run and 0.124 increase in 2020 on the l ong run distributional effects, while the accumulated effect shows 2.017 increase above the base value period of 2014/2015 to 2020.

Effects on Growth

Reduction of fuel subsidy by 100% over base period value ₦97.00 of 2014/2015 led to a Litre of fuel sells for ₦169.13 meani ng that ₦72.13 was added to the pump price of fuel per litre and the fuel subsidy reduction simulation scenarios is presented i n Appendices 1 and 2.

The simulation scenarios in Appendixes 1 and 2 shows the distributional effects of the 100% reduction of fuel subsidy over b ase period value ₦97.00 of 2014/2015 on domestic output (GDP)/Domestic Demand for commodity, Supply of composite co mmodity, Total Savings/Investment Expenditure and Investment Consumption Volume. From the exposition, Appendix 1 ana lyses the deviation from the base period and Appendix 2 illustrates the growth rate overtime. The deviation from the base peri od helps to show the distributional effect in which the 100% reduction of fuel subsidy has on growth. Appendix 1 shows the a ccumulated effect of 100% reduction of fuel subsidy over base period on domestic output (GDP)/Domestic Demand for com modity, Supply of composite commodity, Total Savings/Investment Expenditure and Investment Consumption Volume from a cumulative basis for the period of 2014/2015 to the long run period of 2020. The accumulated effect increased by 10.46 on domestic output (GDP)/Domestic Demand for commodity, increased by 11.813 on Supply of composite commodity, increase d by 10.057 on Total Savings/Investment Expenditure and 10.481 increases Investment consumption volume.

Examining Appendix 2, it is observed that Domestic output (GDP)/Domestic demand for commodity had accumulated positi ve growth rate over the period 2014/2015 till 2020, Supply of composite commodity had accumulated positive growth rate ov er the period 2014/2015 till 2020, Total Savings/Investment Expenditure had accumulated positive growth rate over the perio d 2014/2015 till 2020 and Investment Consumption Volume had accumulated positive growth rate over the period 2014/2015 till 2020.

Appendix 1 reports 100% reduction of fuel subsidy over the base period 2014/2015. The result reveals that the fuel subsidy re duction simulation scenarios under a 100% of fuel subsidy reduction has a -0.17, -0.5, 1.27, 2.92 and 6.94 distributional impa ct on Domestic output (GDP)/Domestic Demand for commodity for 2016, 2017, 2018, 2019 and 2020 respectively.

Appendix 1 reports 100% reduction of fuel subsidy over the base period 2014/2015. The result reveals that the fuel subsidy re duction simulation scenarios under a 100% of fuel subsidy reduction has a 3.79, 2.978, 2.541, 1.736 and 0.768 distributional i mpact on Supply of composite commodity for 2016, 2017, 2018, 2019 and 2020 respectively.

Appendix 1 reports 100% reduction of fuel subsidy over the base period 2014/2015. The result reveals that the fuel subsidy re duction simulation scenarios under a 100% of fuel subsidy reduction has a 3.252, 2.545, 2.165, 1.467 and 0.628 distributional impact on Total Savings/Investment Expenditure for 2016, 2017, 2018, 2019 and 2020 respectively.

Appendix 1 reports 100% reduction of fuel subsidy over the base period 2014/2015. The result reveals that the fuel subsidy re duction simulation scenarios under a 100% of fuel subsidy reduction has a 3.345, 2.633, 2.251, 1.548 and 0.704 distributional impact on Investment Consumption Volume for 2016, 2017, 2018, 2019 and 2020 respectively.

FINDINGS AND POLICY IMPLICATION

Using the accumulated effect, *the* simulation results show that the removal of fuel subsidy does lead to an increase in the gener al price. *Domestic price of competitive imports of commodity experienced constant positive growth rate* with Domestic Price of Competitive Imports of Commodity rising by 136% above the normalized price index of 100% between 2015 and 2020. O n the effects on external trade, the accumulated effect decreased by 10.486 on imports of commodity and increased by 0.924 and 17.254 on domestic output exported by activity and current account balance respectively. The results affirm to apriori ex pectation as the accumulated effect is more negative on household real income and less on household consumption with the e ffect been cushioned by savings. The result shows that household real income and household consumption experienced accu mulated decrease 2.43% and 1.81% and negative growth rates of 4.038% and 2.856% respectively. The effect follows the tra nsmission mechanism on government income and government account balance. The results show that the accumulated effect s of government income increased by 0.372 and government account balance decreased by 0.617 from a cumulative basis for the period of 2014/2015 to the long run period of 2020 respectively. Accumulatively, GDP, supply of composite commodity and total savings/investment expenditure increased by 7.48%, 17.072% and 14.906%, respectively (see Appendixes 1 and 2).

Appendixes 1 and 2 show the results of marginal effects and growth rates of 100% reduction of fuel subsidy and their correspon ding pump prices of ₦169.13 for 100% fuel subsidy removal. The domestic price of competitive imports of commodity rose by 474% above the normalized price index of 100% from 2015 to 2020 for 100%. This might result to hyperinflation. The ext ernal trade accumulated effect reduced further on imports of commodity 24.898% and domestic output exported by activity in creased by 3.018% and current account balance increased by 11.886% for a 100% fuel subsidy reduction.

The long run accumulated effect on household real income and consumption show that household experienced further decrea se by -28.36% and -22.8% for 100% respectively. The removal of fuel subsidy has impacted negatively on household income, consu mption and welfare in Nigeria. The findings have the implication of worsening the incidence of poverty in the Nigeria. At the level of each Nigerian, the reduction in income and consumption of the households tends to increase the number of people living below the poverty line. The effect of the subsidy reduction on household poverty is more important for informal and formal urban households than informal and fo rmal rural household because energy is consumed more in the urban than rural areas.

The results of government income and government account balance show that the accumulated effects on government income and account are better off by 100%. GDP, supply of composite commodity and total savings/investment expenditure experie nced more increased by with 100% than the base year period. GDP experienced long run accumulated growth rate of 6.941% with 100% fuel subsidy reduction than the base year period. The deterioration in the general price level, external trade, household welfare, effects on government revenue and growth is highest as fuel subsidy removal percentages increases, this has greater implicati ons. For example, the deterioration in the general price level has greater implications for inflation.

The effect of these on imports is transmitted through increased prices of imported intermediates and finished goods, both of which worsen t he current account balance. The implication of the worsened terms of trade and current account balance position is the tendency for the exte rnal debt of the Nigeria to increase or their external reserves to deplete. In the sphere of trade both price and income effects are in operation. But which of these effects dominates is an empirical issue.

CONCLUSION

This study used a structuralist CGE methodology to examine the effects of distributional effects of 100% removal of fuel subs idy on macroeconomic variables and household welfare in Nigeria from 2015 to 2020. This study shows how the removal of the fuel subsidy, transmitted through decreased prices of oil exports and depreciation and devaluation of naira to the Nig erian economy. The results show that increase in the fuel pump price in the country as a result of reduction in fuel subsidy ha ve severe distributional consequences on the Nigerian macroeconomic variables and household welfare.

This study shows that the Nigerian economy is very vulnerable to removal of fuel subsidy. The findings from this study tend to confirm a p riori expectations on the effect of removal of fuel subsidy on macroeconomic variables and poverty/household welfare in the Nigeria. The r emoval of fuel subsidy in Nigeria has had a stagflationary effect on the economy as it slowed down economic growth and increased the do mestic price level. Also, it reduced the level of domestic investment and increased the government account and income position.

Also, reduction in fuel subsidy increase the composite price of output by activity that is accelerating inflation, reduced the level of domestic investment and increased the government account position. Hence, consumer price of composite commodity and government income remain affected. Also, the findings of this study which confirm the lowering of domestic output growths, household incomes and consumption, worsening of inflationary trends, as a result of the persistent increase in oil import prices. The fuel subsidy reduction and depreciation of Nigerian currency threaten the attainment of the inflation targets under the Economic Convergence Programme by 2020. That is, increases in consumer prices reduce the purchasing power of money and the real income of the people and hence worsen the incidence of poverty.

In relation to the findings on household poverty and welfare, the distributional implications are notable. The fuel subsidy reduction and its accumulation effects affect the poor households more than the households with the highest income share. And the income loss would tend to be more pronounced for the households with the lowest income share in both the formal rural and formal urban sectors and informal rural and informal urban sectors. The adverse fuel subsidy reduction tends to increase the absolute numbers of the poor. But the increase in the number of the poor would be registered more in the urban areas than the rural areas even though the poverty gap index tends to be higher in the rural areas than urban areas. Finally, the households with lowest expenditure function or consumption volume, both in the rural and urban areas, tend to be more affected than the households with the higher expenditure function or consumption volume in both the rural and urban sectors. Poverty is at present the worst scourge in Nigeria.

Regarding the impacts on growth, the results of the experiments showed both positive and negative fuel subsidy removal effects both in the short and medium term on growth items. The GDP, supply of composite commodity, savings/investment and investment consumption volume (the percent deviations from the base run parameters and their marginal changes over the period of investigation) for the Nigerian economy. These have many implications for the growth rate of the Nigerian economy. This study has shown that, keeping the domestic price of oil artificially low with the fuel subsidy has implication for sustainable development. For example, discouraged additional investment in Nigeria and this much negative impact on growth both in the short and long run.

POLICY RESPONSES AND MEASURES

Attention to the long-term implications of a given policy is inherent in any definition of sustainable development, which concerns itself with balancing the welfare of both present and future generations. Instructively, energy subsidies have important implications for sustainable development. It is increasingly apparent that fuel subsidy being a “universal subsidy” for all categories of income groups does not offer the most efficient way of addressing the needs of the poor. The scheme has constituted a huge drain on government purse and ending it offer greater opportunities to expand the scope of social safety nets for the vulnerable groups and protect them from the price shock, and sustainably grow the economy (**Christopher and Usenobong, 2014).**

In view of the serious effects of fuel subsidy removal on the Nigerian economy the government needs to determine the appropriate monetary, fiscal and exchange rate policy responses. Also, and very importantly, it needs to institute measures to reduce oil dependence, as some ot

her countries have tried to do, and improve the non-oil sector considerably. Measures are also required to moderate inflationary pressures, s timulate savings and investment and improve the current account balance. These will depend on policy possibilities in Nigeria.

(a) Monetary and Fiscal Policy Response

The nature of fiscal and monetary policy response is crucial because the wrong policy response may actually worsen the situa tion. However, effective policy responses are rather difficult because expansionary policy would exacerbate the inflationary p ressures while contractionary policy would exacerbate the contraction in output. Generally, expansionary fiscal or monetary p olicy increases aggregate demand and inflationary pressures. And if policy makers use expansionary fiscal or monetary policy to offset the fall in output, prices may rise further and inflation expectations could become endemic. On the other hand, wher e the monetary authorities tighten monetary policy to contain the inflationary impact, the result may be decreased consumptio n and investment and a contraction of output further.

In the light of the foregoing, some notable key lesions are as follows:

i. Where there is a typical downturn, monetary and fiscal policy can be expansionary without triggering a significant increase in inflation because the fall in demand reduces inflationary expectations.
ii. Where the inflation rate is already high and subsidy is rather decrease, a policy of monetary easing, for example, a lowering of interest rates would feed inflation expectations and worsen the inflation situation.
iii. When inflation is low and falling, and subsidy occurs, particularly a transitory one, the government could afford not to worry about inflation and worry instead only about growth and unemployment. In this situation, an easy monetary and fiscal policy option is suggestive even where oil prices are rising.

(b) Price-based Policies versus Subsidies

A country operating the laissez-faire system may allow higher oil import prices to be fully reflected in domestically refined p etroleum product prices or imported refined petroleum products. In other words, full market pricing of petroleum products ma y prevail. But given the high oil intensity of many production activities in Nigeria, coupled with high oil import dependence, f ull market pricing will contract output, worsen inflation, reduce real consumption and worsen poverty. Essentially, this policy would amplify both the consumption an income losses and increase the incidence of poverty. In the light of this, in order to st abilize output and minimize the negative effect of the fuel subsidy, the government may choose to stabilize domestic oil prices.

Subsidies can be provided by a number of different mechanisms which include direct subsidies to users, indirect subsidies thr ough the reduction of taxes on petroleum products, and targeted income subsidies. These, however, tend to put pressure on go vernment revenue and aggravate the budget deficit. Thus, while full market pricing has implications for growth and poverty, generalized fuel subsidies have their own problems. Therefore, Nigeria governments may need to turn to targeted assistance a s was introduced by Ghana in 2005 when it embarked on eliminating fuel price subsidies. But then, countries would need to p roperly identify the poor households and develop a delivery mechanism for income transfer and other types of compensation t hat target low-income households.

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Appendix 1: Simulation with 100% Reduction of Fuel Subsidy: ₦72.13 over Base Period Value = ₦97.00 of 2014/2015
Macro and household Welfare effects resulted from a Litre of Fuel sells for ₦169.13

Macro and Sectoral Items	Marginal Effects of 100% Reduction of Fuel Subsidy						Summary of Parameters Results in Percent Deviation from Base Period Values					
	Summary of Parameters Results						Short run Effect	Intermediate Effect	Intermediate Effect	Intermediate Effect	Long Run Effect	Accumulated Effect
	2014/2015 Base value	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020	2015-2020
Effects on General Price Levels												
Consumer and Producer Prices for Domestic Supply of Output	1	1.36	1.28	1.24	1.17	1.08	0.36	0.28	0.24	0.17	0.08	1.13
Domestic Price of Competitive Imports of Commodity	1	1.62	2.156	2.209	2.312	2.447	0.62	1.156	1.209	1.312	1.447	5.744
Composite Price of Output by Activity	1	1.27	1.22	1.18	1.13	1.06	0.27	0.22	0.18	0.13	0.06	0.86
Effects on External Trade												
Imports of Commodity	12.096	9.005	7.967	6.419	6.301	5.799	-3.091	-4.129	-5.677	-5.795	-6.297	-24.989
Domestic Output Exported By Activity	6.24	6.405	6.725	6.963	6.8	7.325	0.165	0.485	0.723	0.56	1.085	3.018
Current Account Balance	-2.363	1.47	0.636	0.19	-0.626	-1.599	3.833	2.999	2.553	1.737	0.764	11.886
Effects on Household Welfare												
Household Real lncome	29.658	29.005	24.322	24.608	23.659	18.336	-0.65	-5.34	-5.05	-6	-11.32	-28.36
Household Consumption	21.519	21.045	17.647	17.854	17.166	11.086	-0.47	-3.87	-3.67	-4.35	-10.43	-22.8
Effects on Government Revenue												
Government Income	3.738	4.045	4.041	4.197	4.139	4.009	0.307	0.303	0.459	0.401	0.271	1.741
Govt. Account Balance	1.874	1.212	1.363	1.443	1.585	1.75	-0.662	-0.511	-0.431	-0.289	-0.124	-2.017
Effect on Growth												
Domestic Output (GDP)/ Domestic Demand for Commodity	19.15	18.982	18.648	20.419	22.069	26.091	-0.17	-0.5	1.27	2.92	6.94	10.46
Supply of Composite Commodity	31.247	35.037	34.225	33.788	32.983	32.015	3.79	2.978	2.541	1.736	0.768	11.813
Total Savings/Investment Expenditure	5.472	8.724	8.017	7.637	6.939	6.1	3.252	2.545	2.165	1.467	0.628	10.057
Investment Consumption Volume	5.436	8.781	8.069	7.687	6.984	6.14	3.345	2.633	2.251	1.548	0.704	10.481

Source: Authors' Computations from Simulated Results of Structuralist Nonlinear Programming CGE (NLPCG). Note: Base Period = 2014-2015; Average fuel price for Base Period = ₦97.00. The Base Year value has a Normalized Index Price = 1.00. With constant exchange rate fluctuation and falling oil price.

Appendix 2: Simulation with 100% Reduction of Fuel Subsidy: ₦72.13 over Base Period Value = ₦97.00 of 2014/2015
Macro and household Welfare effects resulted from a Litre of Fuel sells for ₦169.13

Marginal Effects of 100% Reduction of Fuel Subsidy							Parameters Growth Rate (GR)					
Macro and Sectoral Items	**Summary of Parameters Results**						**Short run GR**	**Intermediate GR**	**Intermediate GR**	**Intermediate GR**	**Long Run GR**	**Accumulated GR**
	2014/2015 Base value	**2016**	**2017**	**2018**	**2019**	**2020**	**2016**	**2017**	**2018**	**2020**	**2020**	**2015-2020**
Effects on General Price Levels												
Consumer and Producer Prices for Domestic Supply of Output	1	1.36	1.28	1.24	1.17	1.08	0.36	-0.08	-0.04	-0.07	-0.09	0.08
Domestic Price of Competitive Imports of Commodity	1	1.62	2.156	2.209	2.312	2.447	0.62	0.536	0.053	0.103	0.135	1.447
Composite Price of Output by Activity	1	1.27	1.22	1.18	1.13	1.06	0.27	-0.05	-0.04	-0.05	-0.07	0.06
Effects on External Trade							0	0	0	0	0	0
Imports of Commodity	12.096	9.005	7.967	6.419	6.301	5.799	-3.091	-1.038	-1.548	-0.118	-0.502	-6.297
Domestic Output Exported By Activity	6.24	6.405	6.725	6.963	6.8	7.325	0.165	0.32	0.238	-0.163	0.525	1.085
Current Account Balance	-2.363	1.47	0.636	0.19	-0.626	-1.599	3.833	-0.834	-0.446	-0.816	-0.973	0.764
Effects on Household Welfare												
Household Real lncome	29.658	29.005	24.322	24.608	23.659	18.336	-0.653	-4.683	0.286	-0.949	-5.323	-11.322
Household Consumption	21.519	21.045	17.647	17.854	17.166	11.086	-0.474	-3.398	0.207	-0.688	-6.08	-10.433
Effects on Government Revenue												
Government Income	3.738	4.045	4.041	4.197	4.139	4.009	0.307	-0.004	0.156	-0.058	-0.13	0.271
Govt. Account Balance	1.874	1.212	1.363	1.443	1.585	1.75	0.662	0.151	0.08	0.142	0.165	0.124
Effect on Growth												
Domestic Output (GDP)/ Domestic Demand for Commodity	19.15	18.982	18.648	20.419	22.069	26.091	-0.168	-0.334	1.771	1.65	4.022	6.941
Supply of Composite Commodity	31.247	35.037	34.225	33.788	32.983	32.015	3.79	-0.812	-0.437	-0.805	-0.968	0.768
Total Savings/Investment Expenditure	5.472	8.724	8.017	7.637	6.939	6.1	3.252	-0.707	-0.38	-0.698	-0.839	0.628
Investment Consumption Volume	5.436	8.781	8.069	7.687	6.984	6.14	3.345	-0.712	-0.382	-0.703	-0.844	0.704

Source: Authors' Computations from Simulated Results of Structuralist Nonlinear Programming CGE (NLPCG). Note: Base Period = 2014-2015; Average fuel price for Base Period = ₦97.00. The Base Year value has a Normalized Index Price = 1.00. With constant exchange rate fluctuation and falling oil price.

Appendix 5: Definition of Variables and Parameters of the Model

Variable Listing

CAPGOV = Government Account Balance
CAPHOSH = Household Savings Rate
CAPWOR = Current Account Balance
CD = Household Consumption Volume
DD = Domestic Demand for Commodity
E = Domestic Output Exported by Activity
ER = Exchange Rate (Domestic per World Unit)
EXSUB0 = Export Subsidy Expenditure
GOVSUE = Government fuel Subsidy Expenditure
GD = Government Consumption Volume
HTAX = Household Direct Tax Revenue
INVD = Investment Consumption Volume
INVEST = Investment Expenditure
M = Imports of Commodity
PDD = Consumer Price for Domestic Supply of Commodity
PDS = Producer Price for Domestic Output of Activity
PE = Domestic Price of Exports by Activity
PM = Domestic Price of Competitive Imports of Commodity
PQ = Domestic Price of Competitive Imports of Commodity
PX = Composite Price of Output by Activity
Q = Supply of Composite Commodity
STAX = Sales Tax Revenue
TARIFF = Tariff Revenue
TE = Export Subsidy Rate
TMS = Import Subsidy Rate
TOTSAV = Total Savings
TS = Sales Tax Rate
TY = Household Income Tax Rate
WALRAS = Slack Variable for Walras's Law
X = Domestic Production by Activity
GDP = Domestic Output Supplied to Domestic Market by Activity
YG = Government Income
YH = Income to Household

Parameter Listing

ac = shift parameter for Armington CES function
at = Shift Parameter for Armington CET function
CAPGOV0 = Government Account Balance
CAPHOSH0 Household Savings Rate
CAPWOR0 = Current Account Balance
CD0 = Household Consumption Volume
DD0 = Domestic Demand for Commodity
Delta = Share Parameter for Armington CES Function
E0 = Domestic Output Exported by Activity
ER0 = Exchange Rate (Domestic per World Unit)
EXSUB0 = Export Subsidy Expenditure
gamma = Share Parameter for Armington CET function
GD0 = Government Consumption Volume
govwor = Transfers from Row to Government
hogovconst = Transfers from Government to Households
howor = Transfers from Row to Households
HTAX0 = Household Direct Tax Revenue

INVD0 = Investment Consumption Volume
INVEST0 = Investment Expenditure
M0 = Imports of Commodity
PDD0 = Consumer Price for Domestic Supply of Commodity
PDS0 = Producer Price for Domestic Output of Activity
PE0 = Domestic Price of Exports by Activity
PM0 = Domestic Price of Competitive Imports of Commodity
PQ0 = Domestic Price of Competitive Imports of Commodity
predelta = Dummy Used to Estimated Delta
Pwe = World Price of Exports of oil
Pwe0 = World Price of Exports of oil
Pwm = World Price of Imports of oil
Pwm0 = World Price of Imports of oil
PX0 = Composite Price of Output by Activity
Q0 = Supply of Composite Commodity
rhoc = Elasticity Parameter for Armington CES Function
rhot = Elasticity Parameter for Output Armington CET Function
STAX0 = Sales Tax Revenue
TARIFF0 = Tariff Revenue
EXSUB0 = Export Subsidy Expenditure
GOVSUE0 = Government fuel Subsidy Rate
TMS = Import Subsidy Rate
TOTSAV0 = Total Savings
TS0 = Sales Tax Rate
TY0 = Household Income Tax Rate
WALRAS0 = Slack Variable for Walras's Law
X0 = Domestic Production by Activity
GDP0 = Domestic Output Supplied to Domestic Market by Activity
YG0 = Government Income
YH0 = Income to Household

Appendix 6: The Specification of Variables as Positive or Free Positive Variables

PDD = Consumer Price for Domestic Supply of Commodity
PDS = Producer Price for Domestic Output of Activity
PE = Domestic Price of Exports by Activity
PM = Domestic Price of Competitive Imports of Commodity
PQ = Domestic Price of Competitive Imports of Commodity
PX = Composite Price of Output by Activity
ER = Exchange Rate (Domestic Per World Unit)
DD = Domestic Demand for Commodity
E = Domestic Output Exported by Activity
M = Imports of Commodity
X = Domestic Production by Activity
GDP = Domestic Output Supplied to Domestic Market by Activity
YH = Income to Household
YG = Government Income
GD = Government Consumption Volume
INVD = Investment Consumption Volume

Free Variables
CD = Household Consumption Volume
Q = Supply of Composite Commodity
CAPWOR = Current Account Balance
CAPGOV = Government Account Balance
TE = Export Subsidy Rate

TMS = Import Subsidy Rate
TS = Sales Tax Rate
TY = Household Income Tax Rate
GOVSUE = Government fuel Subsidy Rate
TARIFF = Tariff Revenue
STAX = Sales Tax Revenue
HTAX = Household Direct Tax Revenue
EXSUB = Export Subsidy Expenditure
CAPHOSH = Household Savings Rate
TOTSAV = Total Savings
INVEST = Investment Expenditure

Appendix 7: Model Blocks

Price Block

PMDEF = Domestic price of competitive imports of commodity
PEDEF = Domestic price of exports by activity
PDSDEF = Producer price for domestic output by activity
PQDEF = Domestic Price of Competitive Imports of Commodity
PXDEF = Composite price of output by activity

Supply Block

CET == Constant elasticity transformation function for domestic production
ESUPPLY== Export supply function (FOC)
ARMINGTON (CES) == Composite commodity aggregation function
COSTMIN == Cost minimization for composite commodity (FOC)

Income Block

YHEQ == Household income
YGEQ == Government income
TOTSAVEQ == Total savings

Expenditure Block

CDEQ == Household commodity consumption
INVESTEQ == Investment expenditure
TARIFFEQ = Tariff Revenue
STAXEQ = Sales tax revenue
HTAXEQ = Household direct tax revenue
EXSUBQ = Export Subsidy Expenditure
GOVSUEEQ = Government fuel subsidy expenditure

Market Clearing Block

QEQUIL = Commodity market equilibrium
DOMEQUIL = Domestic supply and demand equilibrium
CAPWOREQ = Current account balance (foreign trade equilibrium)
CAPGOVEQ = Government account balance (internal balance)
WALRASEQ = Capital account balance

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