Journal of Sustainable Development Studies
ISSN 2201-4268
Volume 15, **2022**, 1

INFINITY PRESS
www.infinitypress.info

Macroeconomic and Welfare Effects of Alternative Fuel Subsidy Switch and Policy Draw-backs in Nigeria

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Abstract: The purpose of this research is to examine the impact of premium motor spirit (PMS) subsidy reform and the deviant price increase on macroeconomic and household responses in Nigeria. The study employed a computable general equilibrium framework, using the Nigerian input-output table, 2011 as base of analysis. Results showed that subsidy reallocation policy favoured all households. The incidence of 14% PMS mark-up price contributed to the maximum income earnings and expenditure of urban agricultural households by 2.89% each than other households. Consequently, mark-up price contributed more (₦22.35 billion) to social welfare loss in response to total subsidy withdrawal reallocation policy, than on phased-out subsidy reallocation policy (₦20.46 billion). Also, mark-up price favoured most macroeconomic aggregates excluding export and government spending. Thus, fuel subsidy reallocation could effectively curtail price shocks at any rate of subsidy withdrawal, provided the fuel market system is devoid of its pump price excesses.

Keywords: Macroeconomic effect, welfare, fuel, subsidy, policy draw-back, Nigeria.

Introduction

Premium Motor Spirit (PMS) is the most common and widely consumed refined petroleum products in Nigeria. It is the leading fuel for road transportation accounting between 1 million to 1.2 million metric tonnes consumed per month and used to generate electricity (Badmus *et al*., 2012; Chukwu *et al*., 2015; Eklavya, 2020). Importantly, the product has huge benefit in the activity sectors of the economy serving as input for production (Akinyemi et al., 2015). The volume of PMS consumed annually is about 13.3 billion litres which amounts to 83.9% of the total refined petroleum products domestically consumed (CBN, 2018). Meeting the volume has posed a big challenge by the domestic refineries due to the low production capacity, this lead to a critical policy of import intervention which allows the importation of over 70% of PMS so as to curb scarcity. A pricing policy which paved room for fuel price subsidization and ensure pump price equalization across the nation as means of boosting social welfare then followed (NNPC, 2011). Consumers enjoy the subsidy policy as they pay relatively low prices for most commodities. However, financing fuel subsidy which is a gain to Nigerian citizens became a burden to the economy and unsustainable due to the annual rising cost. Remarkably, the cost took about 39% of the 2011 year's budget; reasons are associated to rising demand, rise in international oil price and Naira fall (Okogu, 2015 and CBN, 2017). Such huge expenses on subsidy and its continuity do not commemorate a progressive welfare mechanism as the bulk of the benefits accrue to the rich, the large consumers of the product (CPPA, 2015; Ismail and Xiaoyi, 2015). On this stance, an outright fuel subsidy withdrawal became a thoughtful policy measure to the shortfall, however it was reversed to a gradual phase-out due to envisaged high cost of living by a large number of the masses. On the other hand, the citizens excised fear on the price shock curtailing scheme set up by the government through Subsidy reinvestment and empowerment programmes (SURE-P) in 2011. The scheme appeared quite appealing to curtail price shocks from the partial reform. However, the partial

reform in the year 2012, and beyond, did not leave fuel price equal across the federation. Pump price varied from place to place. Most importantly in rural areas, generating a significant price variation from the regulated pump price which could be referred to as mark-up price. Thus, the mark-up price over the government control pump price of PMS widely varied in 2013. It attracted about 2.6% increases on the pump price in urban areas and 24.9% in rural areas as shown in Table 1. Obviously, certain level of power and reasons among the petroleum products marketers influences fuel pump price variation across the federation. In the wake of this, the Petroleum Products Price Regulatory Agency and Consumer Protection Agency are weak to monitor regulated PMS pump price and protect the interest of consumers. This has left a gap to fill as to which viable measure could help avert price shocks rising from fuel subsidy withdrawal.

Table 1: Petroleum products retail prices (₦/Litre) for the 2013

		PMS	
Geopolitical Zone	State	Urban	Rural
South South	Bayelsa	97.00 – 110.00	180.00 – 200.00
	Edo	97.00	97.00
South West	Lagos	97.00	97.00
	Ondo	97.00	97.00
North West	Kaduna	97.00	97.00
	Sokoto	97.00	110.00
North East	Bauchi	97.00 – 99.00	105.00 – 110.00
	Taraba	97.00 – 110.00	110.00 -130.00
% Change		2.62	24.93

Source: Ozo-Eson and Muttaga (2013)

A partial fuel subsidy reform saddled with pump price variation has a transfer effect or distributive effect on other commodity prices as well as the end-user's consumption demand and behaviour. The large price shock of partial reform stems from the indirect impact of other commodity prices on end users (Granado *et al*., 2010). Intuitively, the rise in the commodity price of which its subsidy is withdrawn contributes less to consumption loss relative to the whole lots of other commodities. This is obvious in that, the whole lots of other commodities have larger share in the household budget, whereby any rise in their prices raise household budget, than for PMS budget. The implication of such policy reform and its draw-back on Nigerian citizens is worrisome. Nigeria has experienced a significant rise in poverty even in the midst of subsidy reinvestment programme stablished to cushion price shocks. Poverty rates between the rural and urban dwellers stood at 71.1% and 13.7%, respectively in 2013 against 68.4% and 27.4% in 2008 (Oxford Poverty and Human Development Initiative, 2017). The wide poverty margin remains even in recent years at 52.10% in rural and 18.04% in urban areas (NBS, 2019). In addition to this, wide income inequality prevails in rural (32.8%) and urban (31.9%) areas (NBS, 2019), as well as between persons in agriculture and employment jobs across the geopolitical zones of the country (Oyekale *et al*., 2006 and NBS, 2019). These deficiencies have a magnitude of impact on the consumption variation following fuel pricing policy reform. Thus, a lower standard of living or worst still a sizable degenerated welfare of the Nigerian citizens compared to prior the shocks, is highly feasible. First, among the rural households and could be prevalent among the rural farm household whose income are limited due to the small scale of farming and mode of farm operations (Nwafor *et al*. 2006 and Agboje, 2018). The problem remains in that, an attempt to curtail the welfare shocks rising from either phased or total withdrawal of PMS subsidy could be made worse-off by the poor execution of the policy. However, a poorly executed re-investment policy which considers less the rural households, most importantly the rural farm household who could likely suffer the

most, may fore-tell policy failure. Thus, this posits the need of considering the re-investment of the proceeds from PMS subsidy savings into the agricultural sector and other sector that may have large impact on rural households.

This study examined the implications of the alternative PMS subsidy reallocation policy and the drawbacks of its pricing policy on households and macroeconomic components. Past studies which considered the effect of the rise in refined oil prices on household, to a limited extent examined the effect of the policy on household income, consumption and poverty among the urban and rural households. Also, some of the reallocation policy measures considered raising government expenditure, others examined household transfers, infrastructure use and raising investment demand in the industrial sector (Nwafor *et al*., 2006; Omenka and Adenikinju 2013; Breisinger *et al*. 2012 and Fathurrahman 2014). Limited studies examined the reallocation of the proceeds into the agricultural industry as production subsidies such that could cushion household consumption shock (Maipita et al., 2012). Therefore, this study examined the relevance of the later policy options among rural and urban households in two major occupational sectors (agricultural and non-agricultural sectors) in Nigeria, in order to examine the effect of the policy on the larger group of the population. On the other hand, it evaluated the effect of PMS mark-up price (subsidy reform drawback) following the reallocation policies on household welfare to ascertain the cost of poor policy execution. Thus, a comparative judgment on whether the magnitude of policy re-adjustment (phased and total withdrawal of subsidy) on households performed differently and which posit greater shock on social welfare was brought to the fore. Hence, the rest of the study consists of brief discussion of PMS subsidy policy in Nigeria and the SURE-P Programme, literature review on past studies, methodologies applied, results and discussions, and conclusion followed.

Subsidy and Re-Investment Policies in Nigeria

Premium Motor Spirit Subsidy in Nigeria

The fuel pricing policy (petroleum product subsidy) began in the 1980s and was targeted for diesel, gasoline otherwise known as PMS and dual-purpose kerosene (DPK). All these refined petroleum products have their domestic pump prices subsidized until lately in 2005, when a clear platform of subsidy was made official, diesel oil had its subsidy withdrawn while PMS continued to enjoy subsidy over the international spot market price. The PMS subsidy also has to do with price equalization across the country by reimbursing marketers' transportation differentials for product's movement from depots to their sales outlets (filling station), in order to ensure that the product is sold at a uniform pump price throughout the country (Nigeria Extractive Industries Transparency Initiative, 2013).

Table 2: Summary of PMS subsidy costs in Nigeria between 2006 and 2018

Year	PMS Imported (Billion liters)	Subsidy Paid (Billion Naira)	Average Subsidy (₦/liter)	Average Open Market Price (OMP) (₦/liter)
2006	1.90	35.90	16.30	74.94
2007	2,20	49.43	18.40	88.44
2008	4.27	181.91	22.70	98.57
2009	5.34	158.90	29.30	91.39
2010	6.23	278.06	42.70	111.67
2011	13,07	1,128.91	80.50	145.80
2012	15.66	913.79	58.35	155.35
2013	17.56	878.19	46.39	147.76
2014	18.53	861.91	45.53	126.89
2015	14.14	654.00	46.25	133.25
2016	18.60	24.00	1.29	146.29
2017	17.30	145.00	8.38	153.38
2018	20.14	119.00	5.91	150.91

Sources: Adapted from CPPA (2015); NEITI (2013) and (2014); NBS (2017) and BUDGIT 2019

The government offset cost on PMS subsidy by paying the difference between the open market price and the government approved retail pump price required of the marketers to sell product below market rates as shown in Table 2, even when there is a big gap between its import price and domestic price or regulated price. The government-approved retail PMS pump price set by the Presidency has no clear indices that determine such price. The price difference between the open market price (OMP) and government-approved retail price does not remain constant. The OMP follows fluctuations in international oil market price and exchange rate while the government price does not change. These variables affect the final pump price and the subsidy relegated by the government on a liter of PMS. This form of subsidy in Nigeria has failed to stabilize pump price across states in the country. Subsequently, pump price also vary from urban to rural areas in most states, posting a problem of effective policy execution which triggers some level of price shocks on the masses. Notwithstanding, fuel subsidy administration is beset with inefficiencies, leakages, corruption and resource diversion among others.

Subsidy Reinvestment and Empowerment Programme

The subsidy re-investment and empowerment programme was established by the Federal Government in 2011 under President Goodluck Jonathan administration and was aimed to reduce the huge unsustainable subsidy burden, stop the unprogressive benefit of the product, curb the inefficiencies, leakages and corruption be-deviled of the subsidy administration and to encourage competition and investment in the downstream sector among other objectives. The SURE-P programmes are to ensure that the Federal Government's part of the savings from fuel subsidy reduction is reinvested to stimulate the economy and alleviate poverty. This reinvestment is tailored to two broad programmes of social safety programmes and critical infrastructure. The social safety net programme comprises of series of programmes ranging from maternal and child health, employment and vocational programmes, urban mass transit programme,

water and agriculture projects; and the infrastructural developments involve road construction, rail construction and maintenance. Subsidy re-investment and empowerment projects are executed through the Project Implementation Units domiciled across the Federal Government Ministries, Department and Agencies. The funds are shared among the three tiers of government: the Federal Government, 36 States Governments, the Federal Capital Territory and 774 Local Government Councils. The Federal Government gets 41% of the subsidy revenue, while the state and local government share the remaining 59% (Amakom, 2013). From the year 2011 to 2015, huge sums of fund have been injected into the programmes by the Federal Government. The SURE-P appropriation bill in the year 2013 had a total of about ₦941.87 billion, having over 40% allocated for critical infrastructure and only 17% for social safety programmes. Similarly, in 2014 and 2015, critical infrastructure took the lion's share of not less than 68% and social safety programme had about 26% (Budget Office, 2015). Following this and the poverty statistics in the country, the scope of the programme appears ambitious and has failed to address the effect of its price shock. Also, the structure lacks the definition and means to identify the target beneficiaries.

Literature Review

Petroleum product price policy reform has some important connotation to economic indicators with variant effect at different magnitudes in countries (Gupta *et al*., 2002; Chitiga *et al*., 2010 and Ayele, 2014). Importantly, it has been deduced that a strong positive correlation exist between fuel subsidy removal and price changes in several sectors of countries such as Nigeria, Indonesia, Mali, South Africa (Nwafor, et al., 2006; Hamadache and Drouge, 2014). Findings have revealed that such reforms raised government income, savings, total food consumption, investment, production, decreased import, export and value added. In another, it triggered inflation, reduced income, consumption, set-up unemployment and consequently welfare reduction,

raised poverty and reduced standard of living (Manzoor *et al*., 2009; Chitiga *et al*., 2010; Breisinger *et al*., 2012; Ayele, 2014 and Groot and Oostveen, 2019).

On the other hand, subsidy withdrawal with mitigation measures has proven to reduce the adverse negative effect of price shocks. Durand *et al*. (2015) reported that a direct cash transfer, support to labour incomes and subsidies on food products paid-off if Indonesia were to remove its fossil fuel and electricity consumption subsidies. They asserted a rise in real GDP gains from 0.4% to 0.7% in 2020. Furthermore, in all scenarios, fuel and electricity prices increased between 80% and 100%, price of transport increased by 7% while other non-energy sectors experienced price increase lower than 1%, real CPI increased excluding in food subsidies scenario. Return on land decreased in all scenarios and increased by 10% on food subsidy that compensate for energy subsidy phased-out. Ayele (2014) asserted that a 30% subsidy reduction accompanied with cash transfers to households in Kuwait increased GDP by 0.3%, balance of payment by 0.9%, but government savings declined by 0.5%. Fathurrahman (2014) observed that total withdrawal of fuel subsidy paid-off than partial reform in the various strategies. While savings redirected to the electricity and gas sector shrank production in the refinery sector by 10.74% on partial reform and by twice of this, on total withdrawal. Consequently, output in electricity and gas sectors expanded. GDP at factor cost and agricultural labour increased. In support of these findings, Breisinger *et al*. (2012) declared that all macro account in Yemen increased under the withdrawal policy scenario than the gradual policy option considering a transfer of part of the savings to households and public infrastructure investment. They further stated that consumption increased by 20.9% and 13.6%, under each alternative scenario, investment increased under all scenarios, export and import increased by 5.9% and 6.9% only under the withdrawal scenario and declined under the gradual reform scenario. Higher prices of fuel products increased cost of production, reduced production and profitability mainly in energy intensive sectors.

Durand *et al*. (2015) found that the aggregate future welfare gains for consumers in Indonesia arising from allocation of resources across sectors on phasing-out energy subsidies ranged from 0.8% to 1.6% in 2020. Ayele (2014) admitted that shocks from subsidy reduction accompanied with household compensation increased households' consumption by 0.93%. Breisinger *et al.* (2012) presented a contrary report of worsen household's poverty from the experiments on fiscal consolidation and direct transfers of savings to households. Nevertheless, the biggest beneficiaries under the scenario of direct transfers and productivity investment were the rural households as poverty rates declined by 6.76% and 5.00% for the withdrawal and gradual reforms, respectively. The findings by Fathurrahman (2014) claimed that targeted subsidy increased most households' income levels, showing negative income level changes for only urban high income households in Indonesia. Contrarily, sectoral subsidy reduced all households' group income levels except high-income households in urban and rural areas. Agricultural household's income decreased. Maipita *et al*. (2012) admitted that a substantial amount of subsidy reform where the savings were transferred to food-crop subsector had a substantial increase in income of most households, leaving the urban poor with reduced income. Consequently, poverty gap and severity worsened for both urban and rural poor households on subsidy cut and reduced among rural poor households by 0.36% and 0.32%. Abolished fuel subsidy yielded a greater effect on poverty indices than on subsidy-cut. Conversely, a transfer of subsidy to other crop subsector favoured all categories of households. Subsequently, the greater the transfer of subsidy, the greater the increase in income levels experienced among households groups and the lower the poverty rate. Dartanto (2012) results showed that, a re-injection of the proceeds from subsidy-cut through raising government spending and transfers cancelled out the adverse negative impact on poverty by 0.27% and 0.28% on outright removal of fuel subsidies. On the other hand, the mark-up in prices performed by agents, in order to seek fuel gains, reduced the effectiveness of budget reallocation

policies in reducing poverty. On the aggregate, countries with high subsidy expenditure have large welfare improvement for the poor (Groot and Oostveen, 2019). Groot and Oostveen, further stated that an equal cash transfer strategy to replace subsidies among country population, lead to a high welfare gain of the poor, against a modest welfare loss for the rich households.

Thus, while addressing the macroeconomic variables of interest through subsidy withdrawal, the household variable and welfare are better managed by redirecting the proceeds from subsidy to other sectors or through cash transfers.

Methodology

Model

The study is based on a static comparative analysis of a general equilibrium model, which examines the effect of the magnitude of price changes due to subsidy reform with reallocation option and price variation possibilities in a short run new equilibrium. Therefore, the results were compared with the sense of balance before the policy change to evaluate the impact of the new policies in several segments of the economic system. The study mainly covered some selected macroeconomic aggregates and household segment of the economy.

The study followed the mathematical notations of the PEP Computable General Equilibrium model in 2013. The equations are organized into blocks. The model is based on a Walrasian system (neoclassical context) with the assumption of general equilibrium, which can be obtained when supply equals demand across all connected markets in the economy at a matrix of relative prices (Dervis *et al*., 1982). The model is defined by a set of constraints of product and factor markets supply-demand balances (market clearing conditions). The macroeconomic balances are characterized by flexible government savings with fixed direct tax rates, fixed foreign savings and exchange rate (savings-investment balances). The equations 1 through 10 are the few highlighted from the series of equations in the CGE model which include;

i) Production and Factor Demand Block

The production block takes the nested structure. Sectoral output of each productive activity combines value added and total intermediate consumption in fixed shares as shown in equation 1.

Industrial Output

$$XS_j = VA_j + CI_j \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Value Added

The value added consist of composite labour and composite capital following a constant elasticity of substitution specification as in equation 2

$$VA_j = \beta_j^{VA}\left[\beta_j^{VA} LDC_j^{-pVA} + \left(1-\beta_j^{VA}\right) KDC_j^{-pjVA}\right]^{-1/pjVA} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where

VA_j : Value added of industry j

XS_j: Total aggregate output of industry j

CIj: Total intermediate consumption of industry j

LDC_j: Demand for composite labour by industry j

KDC_j: Demand for composite capital by industry j, (assuming capital is not mobile)

B_j^{VA}: Scale parameter (CES- value added)

^{pjVA}: Elasticity parameter (CES – Value added)

ii) Income and Savings Block

In this model, household income comes from three sources; labour income, capital income and transfers received from other agents (transfers from firms, government and the rest of the world) as shown in equation 3.

Household income

$$YH_h = YHL_h + xYHK_h + YHTR_h \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

iii) Demand for Commodities and Utility Block

Household's demand is assumed to have a Stone Geary utility function from which its linear expenditure system was derived. The utility function is based on the assumption that there is a minimum level of consumption of each commodity. Hence, each type of household demand for each good is determined by utility maximization subject to household's budget constraint.

Household demand for commodities is expressed in equation 4 and utility in equation 5.

$$PC_i C_{ih} = PC_i C_{ih}^{MIN} + \Upsilon_{i,h}^{LES}\left(CTH_h - \sum_{ij} PC_{ij} C_{ij,h}^{MIN}\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

$$U_h = In\left\{(C_{ih} - C_{ih}^{MIN}) \sum \gamma_{ih}^{LES}\right\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where

Y_{ih} : Total income of type h households

YHK_h: Capital income of type h households

YHL_h : Labour income of type h households

YHT_h : Transfer income of type h households

PC_i: Purchaser price of composite commodity i (including all taxes and margins)

C_{ih}: Consumption of commodity i by type *h* households

C_{ih}^{MIN}: Minimum consumption of commodity i by type h households

CTH_h: Consumption budget of type h households

γ_{ih}^{LES}: Marginal share of commodity i in type h household consumption budget

ln: Natural logarithm

U_h: Household utility level

iv) Purchase price of composite commodity

Commodities purchased in the domestic market are composites. The price of the composite is a weighted sum of the price paid for domestically produced and imported goods as expressed in equation 6. Equations 7 and 8 explain the mathematical relations of prices of domestic (PD) and imported (PM) commodities.

$$PC_i = \left\{\frac{PM_i IM_i + PD_i DD_j}{Q_j}\right\} pcrti \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Where

$pcrt_i$: Commodity i price adjustment factor

PM_i: Price of imported product i (including all taxes and tariffs)

PD_i: Price of local product i sold in the domestic market (including all taxes and margins)

IM_i: Quantity of product i imported

DD_i: Domestic demand for commodity i produced locally

$$PD_i = (1 + ttic_i)\left[PL_i + \sum_{ij} PC_i tmrg_{ij,j}\right] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

$$PM_i = (1 + ttim_i)\left[(1 + ttim_i)ePWM_i + \sum_{ij} PC_{ij} tmrg_{ij,j}\right] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Where

$ttic_i$: Tax rate on commodity i

$ttim_i$: Rate of taxes and duties on imports of commodity i

$tmrg_{ij,i}$: Rate of margin i applied to commodity ij

e: Exchange rate; price of foreign currency in terms of local currency

PWM_i: World price of imported product i

PLi: Price of local product i (excluding all taxes on products)

v) Hicksian equivalent variation model

Hicksian equivalent variation estimator in equation 9 was used to evaluate the gain or loss of phasing-out and total withdrawal of PMS subsidy and their reallocation policies on households following the pattern of Obi-egbedi *et al*. (2012). The equivalent variation (EV) takes the old equilibrium income and prices to compute the change required to achieve utility levels reached in the new equilibrium.

$$EV_h = \frac{(U_h^1 - U_h^o)}{U_h^o} Y_h^0 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Where

U_h^0: Initial utility level of a typical household before price change

U_h^1: Utility level of a typical household after price change

Y_h^0: Initial income of typical household

When EV > 0, signifies increase in household welfare and if EV < 0 signifies decrease in household welfare.

Data and Sources of Data

The Social Accounting Matrix (SAM) of Nigeria prepared from the Input-Output table of Nigeria, 2011 by the Nigerian Institute of Social and Economics Research is the database used for model calibration. The input-output table is a matrix of 45 rows by 48 columns dimension consisting data on 41 industries and 3 agents as well as import, export and investments. The data from this table were complemented by data from other sources such as the Central Bank of Nigeria, Nigerian Extractive Industries Transparency Initiative (NEITI) and the Nigerian National Petroleum Corporation. By the direction of this study, the 41 sectors of the input-output table were aggregated into 9 sectors in the SAM used for this study. The PMS account was disaggregated from the oil refining sector. Thus, the SAM became a 48 x 48 square matrix account consisting Food-Crop, Livestock, Mining, Premium Motor Spirit (PMS), Dual Purpose Kerosene (DPK), Manufacturing, Electricity, Transport and Services, 2 factors of production (labour and capital), 9 commodities and 4 agents (4 households, government and the

rest of the world). The households were aggregated into rural agricultural household (RAH), rural non-agricultural household (RNAH), urban agricultural household (UAH) and urban non-agricultural household (UNAH) categories participating in agricultural and non-agricultural sectors. The agricultural households include household whose primary occupation is in various farm activities ranging from crop, animal production, forestry to fishery activities while non-agricultural households include those whose primary occupation is in off-farm activities and employed jobs not related to agriculture. The data for grouping the representative households is the Harmonized Household Survey of 2010 by the National Bureau of Statistics. Household expenditures were re-grouped to reflect the sectoral distribution of household use of goods and services as in the SAM. Other information used includes elasticity parameters and other indexing parameters to determine the general equilibrium dataset.

Simulation

Simulation of PMS subsidy savings reallocation policies to food-crop and service sectors were executed on equal amount to the sectors. The sectors contribute to household largest consumption shares. Mark-up pricing of regulated petroleum products have varied from place to place since the inception of partial reform but were hardly documented, until in recent times by Nigerian Bureau of Statistics. However, Ozo-Eson and Muttaga in 2013 conducted a rural and urban survey on retail pump price of petroleum products in selected geopolitical regions of the country. They observed that the pump price per litre of PMS moved at an average change of 2.62 % (urban) and 24.9% (rural) from an official pump price of ₦97 per litre. To assess the impact of these imperfect price transmissions on macroeconomic aggregates and the household sector in any policy reform, the study assumed that the production sectors purchased at the prevailing market price to produce (since fuels are not dispensed at different prices to various sectors) and transfers the effect to final consumers. The mean PMS mark-up price (urban and rural regions) of 14% was used for simulation as the model cannot

simulate the outcome of a mark-up price just on a particular household without passing the effect to other class of households. The mark-up price shock was introduced by altering the endogenously determined composite price adjustment factor and the new equilibrium price was therefore relative to the exchange rate. The mark-up pricing simulations were examined under the reallocation policies to investigate the effect of policy reform drawbacks. Thus, simulations were executed as;

(a) 49% phased-out PMS subsidy reallocation to food-crop and service sectors

(b) 100% withdrawal of PMS subsidy reallocation to food-crop and service sectors

(c) 49% phased-out PMS subsidy reallocation to food-crop and service sectors and 14% PMS mark-up price

(d) 100% withdrawal of PMS subsidy reallocation to food-crop and service sectors and 14% PMS mark-up price

Subsidy rates for this study were computed using the PMS pump price changes as adopted by Ayele (2014) who simulated the effect of a threefold increase in electricity tariff on households as a 30% reduction in electricity production subsidy, in Kuwait. Subsidy paid on the part of the government was computed using price gap following the procedure by Gupta *et al*. (2002) and Durand *et al*. (2015). This is concisely written as;

Import Subsidy (I_iS) = wholesale spot price of PMS (W_i) at a particular period plus transportation, distribution and marketing costs (D_i), plus all general consumption taxes (T_i - vat etc) less prevailing market price (M_i) times volume of consumption. Equation 13 gave the mathematical illustration of import subsidy computation.

$$I_iS = (W_i + D_i + T_i - M_i)C_i \quad \text{……………………………………………………} \quad (10)$$

The amount of subsidy computed was treated as negative import tax in the SAM. It is regarded as import subsidy paid by the government on PMS in the domestic market. For calibration, the import tax rate was adjusted as stipulated in (a) to (d).

Results and Discussions

Consumption profile

The profiles of households' consumption pattern in Table 3 reveal that service, food-crop and livestock have the largest shares in each household's budget. It implies that these commodities account as the largest income burden across each household group. The premium motor spirit expenditure share is low relative to food-crop, manufactured goods, transport and service. This could be premised on the vast use of these later commodity groups than the consumption of premium motor spirit. The PMS sector has an inter-sectoral relationship with the transport sector. Its indirect effect on the household budget is also very vital. In this instance, the expenditure share of transportation is about twice or more the amount spent on PMS among the rural households and at close share among the urban households. Hence, there is possibility that, changes in the pump price of PMS in the advent of any policy shift might likely have the largest effect on urban household expenditure for PMS while the rural household would likely bear the largest expenditure effect of PMS price change on transportation. Peradventure prices of other commodities are affected; all household expenditure burdens are likely to enlarge for service, food-crop and livestock. Nevertheless, such commodities might have larger expenditure shares than PMS and transportation depending on their demand responses and magnitude of price changes. Consequently, households are most likely to alter their budget allocations if their incomes are not sufficient to maintain the expenditures than they would have done for a price change.

Table 3: Consumption profile

Sector commodities	Households shares				
	Rural Agricultural	Rural Non-Agriculture	Urban Agriculture	Urban Non-Agriculture	All
Food-crop	19.76	19.97	10.90	11.18	16.61
Livestock	7.95	8.97	6.83	7.33	7.83
Mining	0.00	0.00	2.26	2.16	0.81
Premium Motor Spirit	2.05	1.66	3.92	4.72	2.74
Dual Purpose kerosene	0.52	0.53	0.42	0.41	0.49
Manufacturing	3.83	3.66	4.55	4.25	4.02
Electricity	0.56	0.58	1.50	1.53	0.91
Transport	4.61	4.34	4.05	3.85	4.32
Service	60.73	60.29	65.57	64.57	62.27
Total	100	100	100	100	100

Source: Computed from Input-Output Table of Nigeria, 2011

Effect on macroeconomic aggregates

Results from the reinvestment of proceeds from subsidy reform as shown in Table 4, reveal positive impact on most macroeconomic components, but export, government revenue and expenditure as well as real GDP fell. The export decline relative to its base value could be due to higher export price arising from high cost of production. Government revenue fell indicating that raising the designated sectors subsidies, reduced government income as revenue from taxes were not sufficient to finance production subsidies, government expenses declined due to a fall in PMS consumption as price was raised, while a fall in real GDP reflects a loss in the nominal GDP at basic price due to inflationary pressure. Subsequently, a larger impact is evident in the counter scenario with mark-up price. Furthermore, the out-right subsidy withdrawal simulation showed the largest impact, excluding that government revenue increased as

the return on tax increased relative to the counter experiment. Thus, government expenditure fell less by ₦20.00 [twenty Naira (₦)] in every ₦100.00 prior the base value. The reason for such adjustment relates to larger transfers from government to other agents in response to general price increases of commodities. On the other hand, export further fell due to higher price of produce at the international market which could reduce demand and real GDP fell by 3K in every ₦100.00 of the base value prior to the shock as inflation intensified. It is optimistic to note that mark-up price contributed to the fall in export demand as high as ₦1.18K, raised the government expenditure by about 36K and caused a 0.01K decline in real GDP in every ₦100.00 of their base values prior the shock, respectively, due to inflationary pressure. Conversely, the rise on government savings stemmed as a result of a fall in PMS consumption, while import increased by reason of larger demand for foreign substitute over high-priced domestic commodities. Production subsidies were raised outrageously relative to the base value due to energy subsidy savings transferred to the selected sectors. Government savings increased because government reduced their spending on PMS subsidy as demand for stock declined due to higher price. Also, government income arose as tax base increased and a higher CPI reduced the purchasing power of consumers. The GDP increased because total output arose due to a re-injection of subsidy savings, and that could be responsible for higher investments. Obviously, mark-up price contributed to raising up the values of the aggregates in various magnitudes, encouraged more government savings, taxes, production subsidies and investment even as the CPI arose. Hence, mark-up price favoured most macro-economic performances.

Table 4: Effect on macroeconomic aggregates

Aggregates	Base value (₦'billion)	Change from base year (%)					
		Subsidy reallocation		Subsidy reallocation and mark-up price		Differences due to mark-up price	
		Phased-out PMS subsidy (a)	PMS subsidy withdrawal (b)	Phased-out PMS subsidy (c)	PMS subsidy withdrawal (d)	(c-a)	(d-b)
Export	21961.85	-3.90	-6.02	-5.08	-7.12	-1.18	-1.10
Import	7289.30	0.42	0.89	0.96	1.55	0.54	0.66
Taxes	2511.59	7.68	12.25	9.69	14.19	2.01	1.94
Government Revenue	7189.24	-1.15	-2.49	0.20	-1.39	1.35	1.10
Government Savings	2904.09	15.90	25.23	19.34	27.43	3.44	2.20
Government expenditure	4285.15	-12.71	-21.28	-12.78	-20.92	-0.07	0.36
Production subsidies	15.86	3699.62	6186.21	3819.98	6374.47	120.36	188.26
GDP	36615.96	5.95	9.36	7.90	11.25	1.95	1.89
Real GDP	36615.96	-0.01	-0.02	-0.01	-0.03	0.00	-0.01
Investment	3579.02	47.57	75.94	59.97	87.24	12.40	11.30
Consumer Price Index	1.00	5.95	13.13	10.87	16.10	4.92	2.97

Source: CGE Model Simulation Results

Effect on household income

The simulation outcome on income changes in Table 5 shows that, household incomes were raised in all scenarios either due to subsidy reinvestment or by the impact of PMS mark-up price. This is buttressed by the findings of Fathurrahman (2014) depicting that savings from fuel subsidy reform to gas sector improved household income in most

classes. The largest impact was encountered as a result of out-right subsidy withdrawal and the mark-up price effect. Subsequently, the urban farm households and rural non-farm households had the largest income growth rate by closely 16.16% and 16.68%, respectively, out of which about 2.71% and 2.89% were due to PMS mark-up price. In other words, out of the income growth by ₦16.16 among the urban farmers and ₦16.68 among rural non-farmers in every ₦100.00, about ₦2.71 and ₦2.89 respectively, were the income effects due to ₦14.00 PMS mark-up price. However, the rural farm and urban non-farm households' income grew relatively less. On the other hand, the less income changes among the rural farmers might be related to limited farm activities which are mostly at small scale, while the other households had their incomes largely grown due to their diversified income sources, such as their involvement in enterprise, labour employment as well as in agriculture (NBS 2013). Hence, mark-up price could boost nominal income of families.

Table 5: Effect on household income

		Change from base year (%)					
		Subsidy reallocation		Subsidy reallocation and mark-up price		Differences due to mark-up price	
Household	Base value (₦' billion)	Phased-out PMS subsidy (a)	PMS subsidy withdrawal (b)	Phased-out PMS subsidy (c)	PMS subsidy withdrawal (d)	(c-a)	(d-b)
Rural Agriculture	6,243.14	7.67	12.28	9.84	14.43	2.17	2.15
Rural Non-Agriculture	8,235.13	8.39	13.45	11.05	16.16	2.66	2.71
Urban Agriculture	4,693.02	8.58	13.79	11.40	16.68	2.82	2.89
Urban Non-Agriculture	10,284.31	7.24	11.97	9.49	13.96	2.25	1.99

Source: CGE Model Simulation Results

Effect on household expenditure

The results on expenditure changes in Table 6 reveal that all households had their expenses increased for all commodity groups, either by subsidy reallocation or the effect of mark-up price. This stipulates that subsidy withdrawn influenced the rise in commodity prices and consequently, raised household consumption expenditure. More so, the reallocation policy aids consumption as households' incomes grew. This was buttressed by Benjamin *et al*. (2011) who asserted that an increase in total income would lead to a corresponding increase in each of the disaggregated expenditure groups. However, the proportion of additional income spent on them may fall due to the desire for qualitative necessity of commodities (Todaro and Smith 2009). Furthermore, the rise in commodity prices were retained as the proceeds from subsidy savings increased and became worse as mark-up price sets in. Invariably, ₦14.00 mark-up price contributed to extra cost on household consumption. Relatively, the urban non-farm households paid the largest extra cost on PMS of ₦78.33, while rural non-farmers spent relatively less of about ₦68.40 in every ₦100. 00 spent on PMS prior the policy change, on the account of out-right subsidy withdrawn in the face of its mark-up price. Apparently, the effect of mark-up price exceedingly raised the food-crop expenditure of all household groups. Hence, the urban non-farm households paid much more by ₦3.84 in every ₦100.00 spent before the price change. Similarly, the rural farm households were the least affected because of their involvement in the food-crop sector, as their spending increased relatively by ₦3.00. Other expenditure changes for most commodity groups increased less compared to food-crop which could be due to their fewer shares and relatively low prices. However, it is obvious that higher commodity prices may not lead to increase in quantity demanded.

Thus, this infers that all household categories may suffer losses of their real incomes by paying more to consume limited quantities (this is in line with the findings by Moradkhani *et al*. 2010). Therefore, an enlarged spending coupled with a fall in quantity

demanded due to higher costs and insufficient income growth may reduce the well-being of household consumers.

Table 6: Effect on household expenditure

			Change from base year (%)					
			Savings reallocation Measures		Subsidy reallocation and mark-up price		Differences due to mark-up price	
Household	Commodities	Base value (₦' billion)	Phased-out PMS subsidy (a)	PMS subsidy withdrawal (b)	Phased-out PMS subsidy (c)	PMS subsidy withdrawal (d)	(c-a)	(d-b)
Rural Agriculture	Food-crop	1212.98	8.30	13.02	11.33	16.02	3.03	3.00
	Livestock	487.92	7.14	11.24	8.78	12.79	1.64	1.55
	Mining	1.00E-03	6.86	10.89	8.30	12.19	1.44	1.3
	Premium Motor Spirit	125.86	28.84	55.07	42.08	71.84	13.24	16.77
	Dual Purpose Kerosene	32.03	3.41	5.53	4.34	6.47	0.93	0.94
	Manufacturing	235.07	7.11	11.18	8.68	12.65	1.57	1.47
	Electricity	34.43	5.87	9.33	7.31	10.71	1.44	1.38
	Transport	282.75	7.48	12.17	9.49	14.22	2.01	2.05
	Service	3727.87	6.92	10.89	8.58	12.43	1.66	1.54
	Total	6138.91	7.67	12.28	9.84	14.43	2.17	2.15
Rural Non-Agriculture	Food-crop	679.27	8.98	14.15	12.56	17.78	3.58	3.63
	Livestock	304.95	7.82	12.42	9.97	14.55	2.15	2.13
	Mining	1.00E-03	7.26	11.54	8.93	13.11	1.67	1.57
	Premium Motor Spirit	56.29	27.64	52.46	40.31	68.40	12.67	15.94
	Dual Purpose Kerosene	18.03	4.29	6.92	5.49	8.14	1.20	1.22
	Manufacturing	124.56	8.38	13.33	10.75	15.72	2.37	2.39
	Electricity	19.78	6.92	11.02	8.80	12.89	1.88	1.87
	Transport	147.58	8.21	13.36	10.65	15.90	2.44	2.54
	Service	2050.33	7.81	12.39	10.02	14.58	2.21	2.19
	Total	3400.77	8.39	13.45	11.05	16.16	2.66	2.71

Source: CGE Model Simulation Results

Table 6: Effect on household expenditure (continued)

			Change from base year (%)					
			Savings reallocation Measures		Subsidy reallocation and mark-up price		Differences due to mark-up price	
Household	Commodities	Base value (₦' billion)	Phased-out PMS subsidy (a)	PMS subsidy withdrawal (b)	Phased-out PMS subsidy (c)	PMS subsidy withdrawal (d)	(c-a)	(d-b)
Urban Agriculture	Food-crop	400.00	8.97	14.02	12.79	17.86	3.82	3.84
	Livestock	247.82	7.45	11.70	9.51	13.69	2.06	1.99
	Mining	82.93	7.25	11.40	8.94	12.97	1.69	1.57
	Premium Motor Spirit	268.30	30.62	58.42	44.94	76.51	14.32	18.09
	Dual Purpose Kerosene	31.43	6.42	9.98	8.24	11.75	1.82	1.77
	Manufacturing	154.28	8.46	12.98	10.84	15.27	2.38	2.29
	Electricity	55.07	7.28	11.33	9.31	13.29	2.03	1.96
	Transport	143.57	8.27	12.84	10.65	15.18	2.38	2.34
	Service	2401.53	7.44	11.59	9.60	13.65	2.16	2.06
	Total	400.00	8.58	13.79	11.40	16.68	2.82	2.89
Urban Non-Agriculture	Food-crop	200.58	8.46	13.16	12.00	16.66	3.54	3.50
	Livestock	129.93	6.61	10.29	8.12	11.65	1.51	1.36
	Mining	38.78	6.53	10.21	7.74	11.23	1.21	1.02
	Premium Motor Spirit	158.25	31.20	59.90	45.70	78.33	14.50	18.43
	Dual Purpose Kerosene	15.05	4.93	7.31	5.51	7.62	0.58	0.31
	Manufacturing	70.38	5.48	7.87	5.81	7.78	0.33	-0.09
	Electricity	27.53	5.53	8.19	6.20	8.56	0.67	0.37
	Transport	66.76	5.76	8.52	6.42	8.85	0.66	0.33
	Service	1156.20	6.00	9.11	7.15	10.01	1.15	0.9
	Total	200.58	7.48	11.97	9.49	13.96	2.01	1.99

Source: CGE Simulation Results

Effect on household welfare

Household welfare gain or loss was estimated in monetary value using Hicksian equivalent variation in income estimator. The monetary value explains the worth of the utility gain or loss in relation to household income due to the various policy changes and illustrates how much households gave-up, to avert the negative effect of price shock following a shift in PMS pricing policy (Bhattacharga, 2001; Olopoenia and Aminu. 2007; Holland *et al.*,2007 and Obi-Egbedi *et al*., 2012).

The results from equivalent variation analysis in Figure 3 reveal that the whole households referred to as social populace experienced larger welfare shock by subsidy withdrawal in comparison with the phased reform, irrespective of the fact that the savings were diverted into the designated sectors. However, the rural non-farm and urban farm household had some tangible welfare gains by the subsidy withdrawal reallocation policy. This result is in tandem with the findings by Nwafor, *et al*. (2006) and Maipita *et al.* (2012) who inferred that rural households were better-off where there is some form of re-investment of proceeds. Furthermore, the larger the amount diverted in subsidizing the food-crop and service sectors, the more the tangible benefit accrued to the households. On the other hand, the rural farm and urban non-farm household welfare losses deteriorated on the account of mark-up price which accompanied subsidy reallocation. Mark-up price contributed about ₦4.5 billion and ₦17 billion, respectively. On the aggregate, mark-up price contributed about ₦22.35 billon to social welfare loss. This implies that any subsidy reinvestment policy targeted at curtailing price shock could worsen the suffering of the masses if the policy is poorly implemented. Thus, excess PMS pump price over the government regulated pump price, relegates the benefit of any subsidy withdrawal curtailing measure.

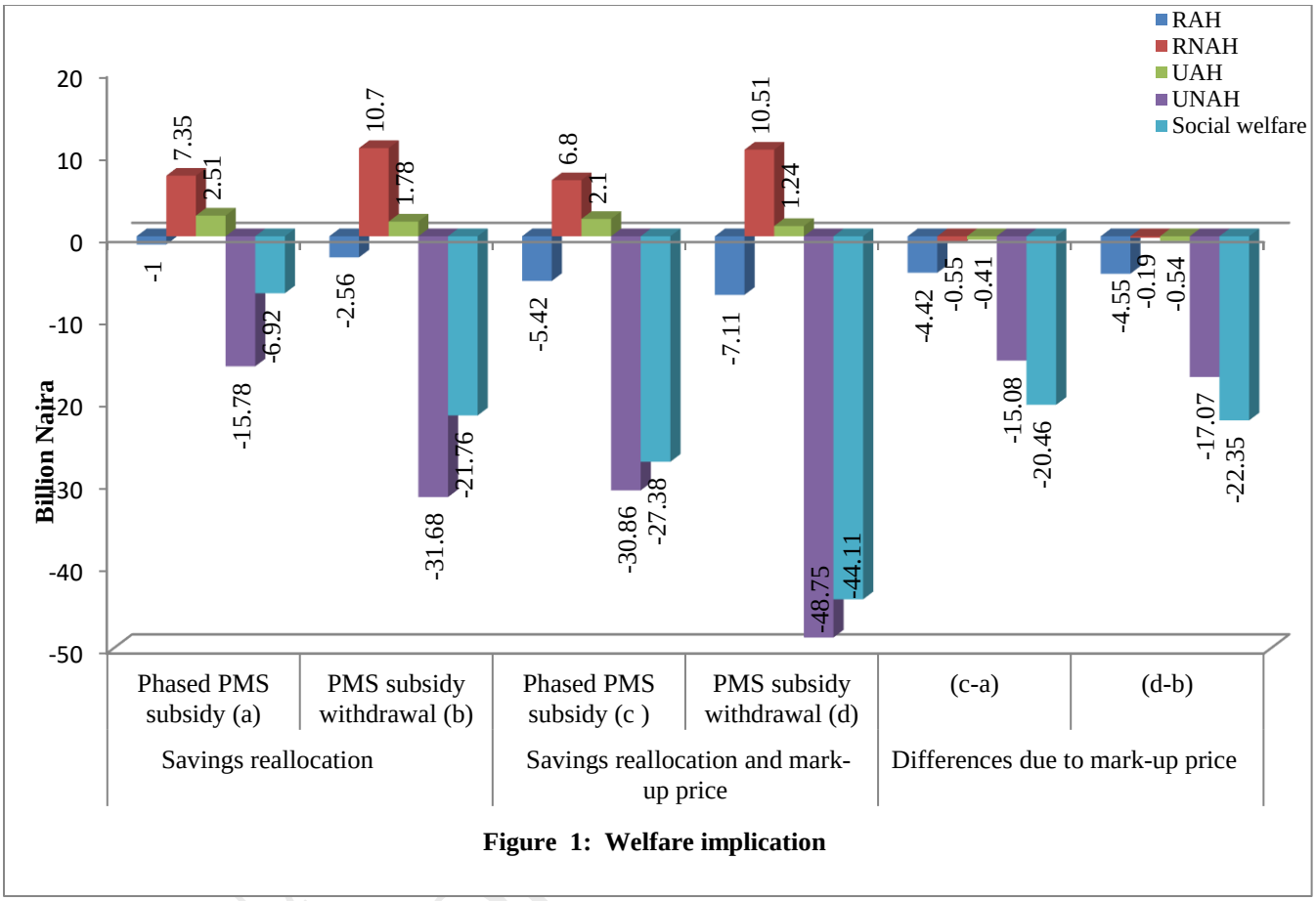

Figure 1: Welfare implication

Conclusion

The study compared the implications of PMS subsidy reallocation policy and the policy drawback on the macroeconomic aggregates and social welfare in Nigerian. Findings revealed that subsidy reallocation policy improved two of the household categories and most household variables, but the mark-up price associated with subsidy reallocation policy options exhibited negative effect on families. Even though the mark-up price raised the incomes of households, it resulted in enlarged price increases on commodities, expanding the amount spent on consumption, reducing the welfare of most household categories. Hence, the government reallocation measures to offset shocks from subsidy cuts or on total withdrawal could not effectively compensate for social welfare due to PMS mark-up price. However, mark-up price effect, favoured

most macroeconomic aggregates. As such, most variables considered increased excluding export and government spending. Therefore, a timely scrutiny of the market to ensure more stable PMS pump price and that the consumers receive the commodity at approved price is necessary. Furthermore, it is recommended that income of households should be raised at the rate the general prices of goods and services are raised to avert welfare loss. Measures of boosting incomes among low earners of the rural farm and urban non-farm households could be achieved through a multi-sector and government intervention programmes that support skill acquisition, agriculture and other entrepreneurship. Optimization of welfare gain on subsidy reinvestment could be attained by the transfer of subsidy savings to food-crop and service sectors as production subsidies, most especially in the rural areas. The reinvestment could be provided in form of credits, seed subsidies and rural infrastructure such as irrigation facilities and processing machines.

Acknowledgements

My profound appreciation goes to Professor A. Adenikinju, Director, Centre for Petroleum Energy Economics and Law, University of Ibadan, Nigeria, for providing the software used for data analysis and a partial CGE Workshop scholarship which was key instrument to the success of this study. I am also grateful to Dr. S. Omenka for his assistance rendered during the stage of data analysis.

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