

PETROLEUM SUBSIDY REFORMS AND ITS IMPLICATION ON POVERTY REDUCTION: CHOOSING BETWEEN THE SUBSIDY AND INFRASTRUCTURAL SERVICES

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Abstract: *Energy pricing has implication on the indigent, it can either aggravate or alleviate poverty. Petroleum among the energy sources available in Nigeria, its price effect cut across all households in the country. Therefore, it becomes imperative to assess a probably better option between subsidy on petroleum and provision of infrastructural services. Data were sourced from the Nigerian National Petroleum Corporation (NNPC) Monthly Financial Operations, NNPC Annual Statistical Bulletin, Central Bank of Nigeria Statistical Bulletin and Annual Reports. Exploratory analysis carried out on extracted data to generate other variables of interest (such as PMS_DWL) before proceeding to other estimations. Vector Autoregression was used, first to regress subsidy on petrol (PMS_SUB) on poverty incidence (POVI), and secondly, the deadweight value from subsidy (PMS_DWL) on POVI. Then, this paper found that there is barely any difference between the contributions of both variables to poverty reduction as both coefficients stand to be 0.02 and 0.01 percent respectively; that is both reduce poverty incidence to this magnitude with a point increment. Thereby, there is no ideal option between subsidy on PMS and investing the value of deadweight loss towards poverty reduction. However, health investment stands to be an effective but not silver bullet. Neither PMS subsidy nor investment of its opportunity cost in infrastructural services is an option for this country; rather policy makers and implementers should search out efficient and effective means of intervention for the poor.*

Keywords: *Energy reforms, Petroleum, Subsidy, Poverty Incidence, Education, Health Sector*

1. INTRODUCTION

“If a free society cannot help the many who are poor, it cannot save the few who are rich.” – John F. Kennedy

Subsidy is a common concept in life sphere, especially when it comes to political economy circle. In relation to energy, subsidy is the government interventions that affect prices or cost of energy products and in general influence the energy market outcomes (IEA, 2010). Energy subsidy is usually promoted by the government in order to cater for the poor populace. According to Inchauste and Victor (2017) subsidy reform is a policy that changes the size and allocation of a subsidy. Like the petrol subsidy reform in Nigeria is an instance of pricing reform in the sector because it borders on the wholesale and retail prices of the product. The indigent is always at forefront of consideration when energy subsidy is mentioned, however, they might not be the priority deep inside the policymakers. There was a mixed reaction about the fuel subsidy reforms in Nigeria. According to Umar and Umar (2013) there are two opposing views about fuel subsidy reforms; one claimed that removal of fuel subsidy will enhance efficiency that is remove market distortion –Adenikinju (2009) subscribed to this view and the other claimed that removal of subsidy will be harmful for the lower income groups in the country. Subsidy in a way serves as the shock absorber for the poor households’ consumption because it is largely observed from studies that indigent population occupy the least quintile of subsidy beneficiary. Although, removal of petroleum subsidy will have a way of hurting the indigent because it’s pricing effect cut-across almost every non-petroleum commodity in Nigeria.

Fuel subsidy reforms in Nigeria becomes imperative as almost all that was channeled through fuel subsidy to the indigence could not get to them because the poorest 20 percent of the population consumes only 2.1 percent of the subsidized fuel, while the richest 40 percent consume 85 percent of

the subsidized fuel (McCulloch & Okigbo-III, 2015). Meanwhile, government expended USD10 million on fuel subsidy in a space of 18 months between January 2012 and July 2013, a figure which was between 2 to 5 times of the education budget and 7 times of the health budget (McCulloch & Okigbo-III, 2015). Also, according to Adenikinju (2009) fuel subsidy gulped USD 9.7 billion (N1,173.2 billion) between 2006 and 2008. Despite the fact that fuel subsidy failed to alleviate the poverty as supposed, it equally came with some attendant costs such as its contribution to the collapse of local refineries due to price effect; reluctance of private investors to invest in refineries; sporadic fuel shortages at fuel stations as the subsidy encouraged smuggling and adulteration of products among others. The magnitude of the mess in the fuel subsidy made some stakeholders and policymakers to advocate for fixing of subsidy rather than the fuel price and abolishment of subsidy entirely at least for PMS (McCulloch & Okigbo-III, 2015). On this backdrop, this paper focuses on the premium motor spirit (PMS) or petrol subsidy, which is the most widely consumed petroleum product with the attendant impact on households and businesses, and consider its implication on poverty reduction; testing whether subsidy alleviates poverty better than the welfare loss in place of subsidy. Meanwhile, the welfare loss in place of subsidy could be in form of any of these programmes: cash transfer, free education, free healthcare, transportation subsidies, pensions for the elderly, cash for work scheme and fertilizer vouchers among others.

There is a general concern from both the government and the policy experts about sustainable development and fuel subsidy reforms in Nigeria (Ekong & Akpan, 2014). Government is facing fiscal constraint in the face of a number of developmental projects needed for inclusive and sustainable growth and on the other hand, policy experts are concerned with the alarming rate of poverty incidence. The salient concern of subsidy and subsidy reforms at any time is the welfare of the populace, especially the indigent. Thereby, relating fuel subsidy reforms to welfare is an appropriate direction for this paper because welfare concern is the basis of any subsidy. Therefore, subsidy package needs a regular spot check to ensure it serves its essence. Subsidy reforms are not out of order because it is a move of ensuring intended welfare that subsidy is taken care of. At any angle the discussion about subsidy is coming up, it centres on welfare.

Ekong and Akpan (2014) followed up on Coady et al., (2010) to discuss the subsidy measurements in Nigeria with regards to fuel. According to the Petroleum Product Pricing Regulatory Agency (PPPRA) in Nigeria, its pricing template for PMS includes landing and distribution costs, with whatsoever amount the expected open market price (EOMP) is greater than the government announced price is the amount of subsidy to be claimed. Unfortunately, these two costs categories for EOMP is tax-free, which means the government did sacrifice a lot by both direct intervention through cash payment and indirectly through sacrificing tax-revenue.

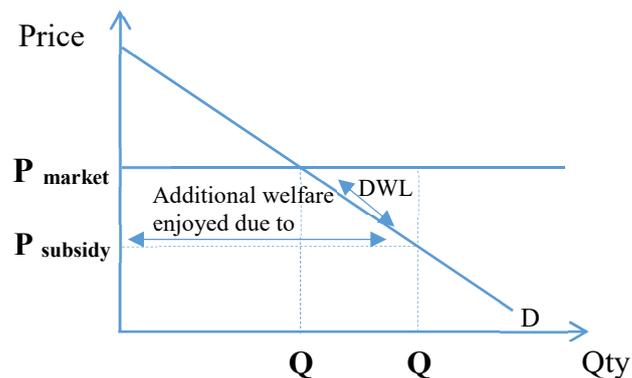


Figure 1: Subsidy and Its Implication

Consider Fig. 1, in the absence of fuel subsidy, the prevailing market price would be P_{market} and the market would clear at quantity Q_m . The P_{market} will equally be the supply curve assuming a perfect competitive market where a region is price taker. But with the introduction of subsidy in the market, consumer buys more because purchasing power would increase with additional welfare to enjoy. Therefore, the market would clear at quantity Q_s and at price P_{subsidy} (implies market price minus subsidy). The increasing quantity consumed and the additional welfare have an opportunity cost for it, which is

the efficiency loss or deadweight loss (DWL). In a real sense, someone pay for the subsidy because it has opportunity cost. Ekong and Akpan (2014) asserted that the trade-off for subsidy could be higher taxes, poor infrastructures, and low stock of human capital among others. The concern of this paper is investigation on a separate analysis in this paper, the extent to which subsidy and its opportunity cost (DWL) serve the poor population. As earlier stated, the opportunity cost of fuel subsidy could be any or more of these: cash transfer, free education, free healthcare, transportation subsidies, pensions for the elderly, cash for work scheme and fertilizer vouchers among others. Furthermore,

$$\text{Deadweight Loss is measured thus: } DWL = (P_{\text{market}} - P_{\text{subsidy}})Q_s - \frac{A}{(1+\epsilon)} [P_{\text{market}}^{(1+\epsilon)} - P_{\text{subsidy}}^{(1+\epsilon)}]$$

Where ‘A’ is defined as a scalable parameter and measured thus: $A = \frac{Q}{P\epsilon}$; Epsilon (ϵ) which is minus slope multiply by price divided by quantity is measured to be between -0.6 and -0.8 according to estimates in the literature for the long-run elasticity of demand for transportation fuels (Sterner, 2007; Brons, Peter, Eric, & Piet, 2008 as cited in Davis, 2017). This implies that a 10 percent increase in the price of PMS will lead to 8 percent decrease in demand for PMS. This paper adapts -0.8 as its epsilon in calculating the DWL. The welfare consumer enjoys from subsidy is less than the opportunity cost borne by the government on the same subsidy Katz and Rosen (1994).

2. MATERIALS AND METHODOLOGY

2.1 Research Design and Sources of Data

This paper examines the causal relationship between PMS subsidy, PMS subsidy deadweight and poverty incidence, thereby, quantitative method of analysis is applied. Data used for analysis were sourced from the NNPC Annual Statistical Bulletin (ASB) for the year 1997, 2005, 2008 and 2016; Central Bank of Nigeria (CBN) Statistical Bulletin and Statement of Accounts and Annual Reports. Variance Autoregressive Regression (VAR) was carried out. Only the equation of interest is specified and reported, others were generated but not reported.

2.2 Model Specification:

Equation 1:

$$POVI_t = \beta_0 + \sum_{j=1}^{n=5} \beta_j POVI_{t-j} + \sum_{j=1}^{n=5} \beta_j PMS_{Sub\ t-j} + \sum_{j=1}^{n=5} \beta_j EINV_{t-j} + \sum_{j=1}^{n=5} \beta_j HINV_{t-j} + v_t^{POVI}$$

Equation 2:

$$POVI_t = \beta_0 + \sum_{j=1}^{n=5} \beta_j POVI_{t-j} + \sum_{j=1}^{n=5} \beta_j PMS_{DWL\ t-j} + \sum_{j=1}^{n=5} \beta_j EINV_{t-j} + \sum_{j=1}^{n=5} \beta_j HINV_{t-j} + v_t^{POVI}$$

Table 2.2.1: Variable Definition

POVI	Poverty Incidence
PMS_SUB	PMS Subsidy
PMS_DWL	PMS Deadweight Loss from Subsidy
EINV	Investment in Education
HINV	Investment in Health
INF	Inflation

Stationarity Test

This test is carried out before estimation of the specified model. This paper used Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. Testing the stationarity of the data becomes imperative in order not to estimate spurious regressions, which implies significant coefficients without a long-run relationship. The test was performed at the level and beyond but only the stage at which each of the

variables exhibited stationarity that is reported. ADF is used at first but where an ideal result is not obtainable using it, PP test is applied because it is more powerful than ADF due to its relaxation of homoscedasticity assumption, and thus it works better in the presence of heteroskedasticity (Hamilton, 2006).

$$\Delta y_t = \alpha_0 + \gamma y_{t-1} + \sum_{j=2}^{\beta} \beta_j \Delta y_{t-j} + \varepsilon_t \quad \varepsilon \sim IID(0, \sigma^2)$$

$H_0: \gamma = 0$ (nonstationary, i.e. presence of a unit root)

$H_1: \gamma < 0$ (stationary, i.e. no presence of a unit root)

Where: y in the equation represent each of the variables in the specified model; ε is an error term; γ is the stationarity coefficient; α_0 and β_j are parameters to be estimated.

Cointegration Test

Johansen and Juselius Cointegration Test was used to assess the existence of a long-run relationship among the variables. If at all the variables involve are not stationary at a level, then the variables involve will be differenced so that their linear combination will cancel out the stochastic trends in them (Johansen, 1991).

3. RESULTS AND DISCUSSION

The results of the data analysis are arranged in the order at which it was carried out. Descriptive statistics first, then, unit-root tests followed by the cointegration test which verify the existence of a long-run relationship between the variables in the model. More so, these tests point out an appropriate method of analysis for the data. Vector Autoregression (VAR) estimates were estimated based on unit-root and cointegration tests outcomes.

3.1 Descriptive Statistics

Table 3.1 shows the descriptive statistics of the variables in the specified model, which are measured in billions of naira with the exception of poverty incidence (POVI) and inflation (INF) measured in percentage. Following the Central Limit Theorem (CLT), it is assumed that each of the time series variables is normally distributed irrespective of its Jarque-Bera's probability value since the observation is up to 30. Less attention is given to the maximum and minimum values towards data cleaning, since, the data is from the emerging economy.

Table 3.1: Descriptive Statistics

	POVI	PMS SUB	PMS DWL	EINV	HINV	INF
Mean	54.06884	11114.40	7663.630	101.1447	65.04517	20.42241
Median	54.20000	85.92449	56.26878	39.25487	16.82668	12.92101
Maximum	81.20000	87903.49	71652.78	390.4200	257.7200	76.75887
Minimum	21.30000	0.517849	-5.752632	0.343800	0.110810	0.223606
Std. Dev.	16.84170	24177.48	19288.15	127.5716	83.44862	18.75673
Skewness	-0.316111	2.134244	2.493111	1.101389	0.972039	1.535531
Kurtosis	1.795118	6.252046	7.900406	2.771866	2.415406	4.356386
Jarque-Bera Probability	2.777167 0.249428	43.19369 0.000000	73.31459 0.000000	7.356419 0.025268	6.181780 0.045461	16.90681 0.000213
Observations	36	36	36	36	36	36

Source: Authors' computation using Eviews 8

3.2 Unit-Root Tests

The unit root test results summarized in table 3.2 shows that all the variables are not stationary at level but at an induced level of one. Thereby, there is need to test for the existence of a long-run relationship in order to override any possible chances of running a spurious regression.

Table 3.2: Unit Root Tests

Variable	Test statistics	t-statistics	Prob.	Significance Level	Order of integration
POVI	ADF	-10.83774	0.0000	1 percent	I(1)
PMS_SUB	PP	-2.557022	0.0122	1 percent	I(1)
PMS_DWL	PP	-2.335317	0.0209	1 percent	I(1)
EINV	ADF	-4.684561	0.0051	1 percent	I(1)
HINV	PP	-7.722402	0.0000	1 percent	I(1)
INF	ADF	-3.167696	0.0026	1 percent	I(1)

Source: Authors' computation using Eviews 8

3.3 Cointegration Estimation

The unit root tests show that all the variables of concern are not stationary until first difference; testing for cointegration becomes imperative to ascertain whether the variables in the model share long-run relationship. The test results as shown in tables 3.3.1 and 3.3.2 for the two specified models indicate no long-run relationship, which implies the impossibility of relating the variables at long-run. In response to this, only the short-run relationship estimation is possible.

Table 3.3.1: Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eigen0.05 Statistic	Critical Value
At most 1	0.399601	41.04099	47.85613	0.1874
At most 2	0.383572	23.69551	29.79707	0.2136
At most 3	0.184445	7.245851	15.49471	0.5492
At most 4	0.009185	0.313720	3.841466	0.5754

Source: Authors' computation using Eviews 8

Trace test indicates no cointegrating eqn(s) at the 0.05 level

Max-eigenvalue test indicates no cointegrating eqn(s) at the 0.05 level (sic)

** denotes rejection of the hypothesis at the 0.05 level

Table 3.3.2: Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eigen0.05 Statistic	Critical Value
At most 1	0.492099	45.32883	47.85613	0.0848
At most 2	0.352970	22.29489	29.79707	0.2824
At most 3	0.191529	7.492558	15.49471	0.5211
At most 4	0.007729	0.263818	3.841466	0.6075

Source: Authors' computation using Eviews 8

3.4 Vector Autoregressive (VAR) Estimates

VAR was used to estimate the relationship between the Poverty incidence (POVI) and PMS subsidy, PMS deadweight loss; and other control variables due to the fact that the variables are of induced stationarity at first difference and there is no existence of long-run relationship among the variables in both models specified. VAR estimation in the both table 3.4.1 and 3.4.2 have poverty incidence as their dependent, so to say because no particular variable is dependent in VAR estimation. The two estimations maintained 5 period lag as the ideal lag based on the lag selection with the supported statistical criterion. The two tables only summarized the statistically relevant coefficient among the estimated output table from the statistical package deployed. PMS subsidy was only observed to be

reducing poverty incidence at 3 lagged period. This implies that subsidy in the last three year affects the present poverty incidence at an infinitesimal rate of 0.02 percent at an instance of a point increment in PMS subsidy. Meanwhile, health investment reduces poverty the more at 1.26 and 2.02 percent when considering the health expenditure in the last three and five year respectively. All these findings are statistically relevant, mostly at 1 percent significance level.

Table 3.4.1: Vector Autoregression (VAR) Estimation

Variable	Coefficient	t-statistics	Prob.
D(LOG(POVI(-1)))	0.958835	4.993338	0.0041
D(LOG(PMS_SUB(-1)))	0.001912	4.050303	0.0098
D(LOG(PMS_SUB(-3)))	-0.014580	-4.522750	0.0063
D(LOG(EINV(-5)))	1.293073	3.720406	0.0137
D(LOG(HINV(-2)))	0.838499	3.720868	0.0137
D(LOG(HINV(-3)))	-1.261305	-2.816818	0.0372
D(LOG(HINV(-5)))	-2.016440	-7.125334	0.0008
D(LOG(INF(-4)))	0.094784	2.511213	0.0537
R-squared	0.996351		
Adj. R-squared	0.978106		
F-stat	54.60842		

Source: Authors' computation using Eviews 8

Likewise in the second model, deadweight loss from the PMS subsidy reduces poverty at an infinitesimal rate of 0.01 percent when considering the deadweight loss on last three year to a present year poverty incidence. Also, health investment negatively impacts poverty incidence up to 1.97 percent at an instance of a point increment in the health expenditure. Even, the time taken for impact is high and makes the impact slow. The findings are in consonance with the position of Katz and Rosen (1994) who observed that direct intervention is the most ideal means of assisting the poor rather than subsidy. By implication, removal of subsidy should be maintained and direct intervention to help the poor should be encouraged.

Table 3.4.2: Vector Autoregression (VAR) Estimation

Variable	Coefficient	t-statistics	Prob.
D(LOG(POVI(-1)))	0.956690	4.284952	0.0078
D(LOG(PMS_DWL(-3)))	-0.011946	-2.491964	0.0550
D(LOG(EINV(-5)))	0.933701	2.568174	0.0501
D(LOG(HINV(-5)))	-1.974300	-5.025721	0.0040
R-squared	0.994818		
Adj. R-squared	0.968909		
F-stat	38.39632		

Source: Authors' computation using Eviews 8

4. CONCLUSION

There is barely any difference between the contribution of PMS subsidy and efficiency loss due to the subsidy to the poverty reduction. Removal of PMS subsidy and for onward investment may not contribute more to the reduction of poverty incidence in the country. Since there is no substantial difference between the impact of the subsidy and the efficiency loss due to the subsidy; it is better that both the subsidy on PMS and its opportunity cost should be forgone for efficient and effective direct interventions for the poor. However, investment in health care services, especially, at the grassroots where the majority of the indigent are living may be highly rewarding in fighting poverty. Improving primary health might be a first giant step to reduce poverty incidence in the country.

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