Journal of Empirical Studies
2021 Vol. 8, No. 1, pp. 25-35.
ISSN(e): 2312-6248
ISSN(p): 2312-623X
DOI: 10.18488/journal.66.2021.81.25.35

DO PETROLEUM PRODUCT PUMP PRICES INFLUENCE ECONOMIC GROWTH IN NIGERIA? AN EMPIRICAL ANALYSIS

Jude Chukwunyere Iwuoha[1+]
Florence Chigozirim Awoke[2]
Chiwuike Ubah[3]

[1,3]*Department of Economics, Enugu State University of Science and Technology, Nigeria.*
[1]*Email: jizwuohac@gmail.com*
[3]*Email: chizwuike@gmail.com*
[2]*Department of Economics, Ebonyi State College of Education, Ikwo, Nigeria.*
[2]*Email: awokeflorence@yahoo.com*

(+ Corresponding author)

Article History
Received: 4 August 2021
Revised: 8 September 2021
Accepted: 24 September 2021
Published: 18 October 2021

Keywords
Premium motor spirit
Dual purpose kerosene
Automotive gas oil
Economic growth
Petrol pump price
Economic growth
Pump price adjustment.

JEL Classification:
A19; E20; O10.

ABSTRACT

This study examined the impact of fuel pump price adjustment and the causal relationship between fuel pump price adjustments and economic growth in Nigeria using secondary data extracted from the Central Bank of Nigeria annual report and National Bureau of Statistics publications spanning from 1980 - 2019. Descriptive statistics, unit root test, Johansen cointegration test, VECM and Granger causality test were employed to analyse the data. The result showed that a 1% increase in the prices of PMS and AGO increased economic growth by 0.014%, 0.038% and 0.018% respectively while AGO is reduced by 0.002%. Also the prices of PMS, AGO and DPK does not granger cause economic growth in Nigeria within the period under this study meaning that any macroeconomic policy that affects economic growth should be pursued independent of fuel pump prices as any policy aimed at influencing economic growth through pump price adjustments seems to be ineffective.

Contribution/Originality: This study is one of very few studies which have investigated the impact of fuel price adjustments on Nigeria's economic growth, with data covering various government regimes up to 2020. The linear model allowed us to introduce an index called index of labour input proxied by exchange rate – EXR.

1. INTRODUCTION

Economic growth is determined by economic activity. In speeding up economic activity, energy comes into play as a strong indicator. This, therefore, makes crude oil and its products outstandingly important the world over. This has made economists to be of the opinion that there exists a strong correlation among the prices of oil, its value chains and economic growth – be it in any of its processed forms or not (Ghalayini, 2011). Crude oil in any of its processed forms is used in the generation of energy. In spite of the abundant oil reserves in Nigeria and its neighboring countries, they still have a low capability of energy generation with its inhabitants suffering the highest form of energy poverty in the world. In trying to bridge the gap, residents of urban areas litter every neighborhood with generators powered by fossil fuel, thereby endangering the environment. It is, yet astonishing that for a region naturally endowed with rich fossil fuel and abundant sources of renewable energy to be suffering energy poverty (Ifediora, 2020; Njiru & Letema, 2018). It is obvious that the scramble for fossil fuel increases its demand in Nigeria and thus it's pricing too.

Petroleum has its value chain products which include premium motor spirit (PMS) literally known as petrol, dual purpose kerosene (DPK) known as kerosene, automotive gas oil (AGO) known as diesel, cooking gas, bitumen etc, which are used both domestically for personal consumption and for industrial production of goods and services (Amagoh, Odoh, & Okuh, 2014; Eregha, Mesagan, & Ayoola, 2015). It is of note that the international oil price affects the domestic pricing of its products. This is because the domestic pricing of its products has been under the control of the government. The government therefore intervenes in the market, to influence the domestic market prices (Eregha et al., 2015; A. Iwayemi & Adenikinju, 2001). The interventions is termed fuel subsidy, which according to Majekodunmi (2013) makes Nigerians to pay less for petroleum products consumption; thus, ensuring they are protected from the international price volatility of crude oil viz-a-viz its value chains – PMS (petrol), AGO (diesel) and DPK (kerosene). Despite the availability of subsidy and a bridging fund, PEF (Petroleum Equalization Fund), there still exists petroleum pump price disparity among the different regions and states in Nigeria (Ozo-Eson & Muttaqa, 2016). Though this programme is popular in most countries that produces oil. Evidence abound that most successful countries usually take phased and gradual approach to its removal or not. As a result of in-depth and evidence-based researches before the policy formulation, effective communication and fair level of trust between government and citizens are built and sustained which guides its gradual removal (International Institute for Sustainable Development, 2012).

Nigeria has refineries that are able to give a refined daily output of about 445,000 petrol barrels. This volume of production should be adequate to take care of the daily domestic consumptions in addition to a surplus for exports. Unfortunately, despite the production capacity, the investments and the attendant negative implications on balance of payments and capital expenditures, Nigeria is by the day, becoming a large net importer of petroleum products. Nigeria's international financial market keeps bleeding; her exchange rate continues to weaken with the naira continually weakening against all known major currencies (Adelabu, 2012; Majekodunmi, 2013). Owing to this dismal outing of the economy, many businesses are unable to cope doing business in Nigeria, hence they are closing shops (Onyeizugbe & Onwuka, 2012). It is, therefore, certain that the pressure on government expenditures and balance of payment makes each government to tarry with the pump pricing of petroleum products (Table 1), to enable it make available more money to cover its expenditure profile.

Since the ongoing debate for the government to allow for the total deregulation of the oil industry, each successive government has been faced with strong resistance each time they remove fuel subsidy. The government, therefore, has continued to channel funds that should be used for infrastructural development to payment of oil subsidy. Every incoming administration, while pledging transparency in the execution of fuel subsidy, has identified the lack of transparency and corruption in the administration of fuel subsidy as the reasons for not fixing the nations refineries and poor growth of the economy.

With each government's inability to get the refineries working despite huge maintenance, operating and overhead costs, Nigeria as a major oil producing country still imports refined fossil fuel for its domestic consumption needs. The refining sector obviously is avoided by investors citing unfriendly pricing as an excuse, leaving fuel marketers with low margins that had to force the government into increased subsidy payments that really hurt the economy (Balouga, 2012).

While crude oil price fluctuations on the growth of the economy is transmitted via demand and supply channels, increases in international price of crude oil are transmitted into the Nigerian domestic economy through domestic prices of petroleum products (Awunyo-Vitor, Samanhyia, & Addo Bonney, 2018; Jiménez-Rodríguez* & Sánchez, 2005). Petroleum products being a major source of productive sector inputs in the Nigerian economy, increase in prices do have effects on the country's economic growth. Therefore this study explores the effect of petroleum price increments on economic growth of Nigeria.

Table-1. Trend and history of fuel price changes in Nigeria.

Name of Head of states / President	Year	Price variation
Gen. Yakubu Gowon	1973	6k to 8.45k
Gen. Muritala Muhammed	1976	8.45k to 9k
Gen. Olusegun Obasanjo	Oct 1,1978	9k to 15.3k
Alhaji Shehu Shagari	Apr 20,1982	15.3k to 20k
Gen. Muhamadu Buhari (Stable price)	Dec.1983-Aug.1985	15.3k to 20k
Gen. Ibrahim Babangida	Mar 31, 86:	20k to 39.5k
Gen. Ibrahim Babangida	10-Apr-88	39.5k to 42k
Gen. Ibrahim Babangida	1-Jan-89	42k to 60k
Gen. Ibrahim Babangida	6-Mar-91	60k to 70k
Chief Ernest Shonekan (82 days in power)	8-Nov-93	70k to N5
Gen. Sani Abacha-: (Price dropped)	22-Nov-93	N5 to N3.25k
Gen. Sani Abacha	2-Oct-94	N3.25k to N15
Gen. Sani Abacha (Price dropped)	4-Oct-94	N15 to N11
Gen. Abdusalam Abubakar	20-Dec-98	N11 to N25
Gen. Abdusalam Abubakar (Price dropped)	Jan 6,1999	N25 to N20
Chief Olusegun Obasanjo	1-Jun-00	N20 to N30
Chief Olusegun Obasanjo (Price drops)	8-Jun-00	N30 to N22
Chief Olusegun Obasanjo	1-Jan-02	N22 to N26
Chief Olusegun Obasanjo	June, 2003	N26 to N42
Chief Olusegun Obasanjo	29-May-04	N42 to N50
Chief Olusegun Obasanjo	25-Aug-04	N50 to N65
Chief Olusegun Obasanjo	May 27, 2007:	N65 to N75
Alhaji Umaru Musa Yar' Adua- (price drops)	June, 2007:	back to N65
Dr. Goodluck Ebele Jonathan (New year present)-:	1-Jan-12	N141
Dr. Goodluck Ebele Jonathan (forced by Labour strike)	17-Jan-12	N97
Muhamadu Buhari	2016-2017 Dec	N97 to N145
Muhamadu Buhari (Price not stable)	2017 Nov-till Feb. 2018	N145 to N350 and above
Muhamadu Buhari (Relatively stable price)	2018 March till Date	N145 and above

Note: N = Naira, k = kobo.

2. LITERATURE REVIEW

There are researchers whose arguments have been in support of pump price of petroleum products impacting on economic growth (Eregha et al., 2015; Nwaoha, Onwuka, Obisike, Yahaya, & Nwambe, 2018; Orlu, 2018). While Orlu (2018) using ECM found that premium motor spirit prices impact negatively on economic growth, he argued that the increase in the price of premium motor spirit will negatively affect production by firms thus reducing gross domestic product (GDP) growth. Furthermore, there are researches supporting that fuel price changes does not positively impact the Nigerian economy even though these prices are fallout of exchange rate fluctuations (Arinze, 2011; A Iwayemi & Fowowe, 2011; Nkomo, 2009). Arinze (2011) in studying the effect of petroleum product prices on inflation in Nigeria, found that petroleum product prices impacted positively and significantly on inflation in Nigeria. They advised the Nigerian government to diversify its economy away from oil. Ozo-Eson and Muttaqa (2016) in studying the pricing of petroleum products in Nigeria, argued that reviving the refineries will promote competition and become beneficial to Nigeria. He wondered why the pricing of premium motor spirit (PMS), dual purpose kerosene (DPK) and automotive gas oil (AGO) take center stages in Nigeria's fuel pricing debates, with liquefied petroleum gas (LPG) pricing getting less mention in the discussions. He advised on the importance of LPG regarding its environmental benefits of weaning consumers from fuel wood to gas for domestic uses.

Wale-Awe and Sulaiman (2020) examined the effect of PMS pricing on inflationary dynamics in Nigeria for the period 1980-2018. Their result showed the existence of inflationary tendencies occasioned by PMS price increase and absence of causality between PMS pricing and inflation in Nigeria. They hence called for the aligning of wage rate and pricing of PMS for economic stabilization. Also Ocheni (2015) studied the impact of fuel price increase on the Nigerian economy using survey method. The study found that a significant relationship between increases in fuel prices and economic growth. Accordingly, food security is hampered by this. He therefore recommended for the speedy reinvigoration of the refineries, and removal of subsidy once this is done.

Hassan and Meyer (2020) in analysing the non-linear effect of petrol price changes on inflation in South Africa, argued that short run price increase does not impact significantly on economic growth and inflation, meaning that the continued increases in the price of petrol have had negative but significant impact on economic growth and inflation. Petrol price can impact on GDP negatively (Cavalcanti & Jalles, 2013). In addition, some researches argue that if petrol price is caused by global scale economic growth, it can cause a decline in GDP while increasing inflation (Cologni & Manera, 2008; Peersman & Van Robays, 2012).

Various government regimes in Nigeria always point at the international price of crude as the reason for the incessant domestic price changes of petroleum products. Hence, some literatures abound that x-rays the effects of oil prices on growth of the economy. Akinleye and Ekpo (2013) is of the opinion that oil revenue shocks marginally raises price levels in the short run and in the long run impedes growth of the economy. Tang, Wu, and Zhang (2010) with data from 1998–2008, found that petrol increases negatively impacts on economic growth while having a positive relationship with inflation in Chinese economy. However, it was found by the researchers that there is a negative effect on output occasioned by petrol price increases and inflation. Chang, Jha, Fernandez, and Jam'an (2011) studied oil price fluctuations and macroeconomic performances in 17 Asian and Oceanic economies using GDP, inflation and unemployment. They found the existence of a negative impact only in the short run. Popp, Oláh, Farkas, Lakner, and Máté (2018) in their study titled the effect of bioenergy expansion: food, energy, and environment found that economic growth and inflation have a non-linear relationship with petrol price changes while causality runs from petrol price to economic growth.

Ghalayini (2011) agreed to the fact that there is usually a positive effect of increase in oil prices on oil exporting nations with an opposite effect in nations that import oil. In trying to confirm the results of Papapetrou (2001) in Greece, Lardic and Mignon (2006) and Roeger (2005) using a number of European countries as case study, analysed the impact of changes of petrol prices on the economic performance of developed countries from 1980 to 2011, Katircioglu, Sertoglu, Candemir, and Mercan (2015) using samples from 26 OECD countries confirmed the existence of a relationship between GDP, inflation and employment with petrol prices negatively impacting on GDP.

3. METHODOLOGY AND EMPIRICAL MODELLING

3.1. Data Sources and Description

Time series secondary data from 1981 to 2019 was used in this analysis. All the variables used in this study are sourced from various editions of the Central Bank of Nigeria (CBN) and National Bureau of Statistics (NBS) publications. The rate of growth of gross domestic product was estimated using simple production function transformed into the Cobb Douglas production function. Descriptive statistics, Augmented Dickney-Fullller (ADF), Johansen's cointegration, Error correction (ECM) mechanism and the Granger causality were employed in analysing the data. Using ADF, stationarity of the time series was determined, as it is a more expedient procedure in examining time series data. To prevent loss of observation as against ADF test because of its non-parametric method, 1988 Phillips-Perron unit root test was also applied. This method recognizes the lagged difference terms in the dependent variables by allowing heteroskedasticity error terms possibility, hence maintaining a correlation of higher order (Awunyo-Vitor et al., 2018; Hamilton, 2009). We therefore specify a lag model. The model will show how the changes in fuel price affect GDP. The three products PMS, AGO and DPK were adopted because they are the most commonly used directly or indirectly by every household in Nigeria. Exchange rate became the control variable. Economic growth is proxied by growth rate of gross domestic product.

3.2. Theoretical Framework

The endogenous growth theory forms the theoretical underpinning of this study. Van Zon and Yetkiner (2003) employed energy as input in the intermediate goods sector. As modified by Rebelo (1991) and Barry (1996) the

endogenous growth model in this case consumables segment of the economy uses energy as an input capital. The simple production function is thus:

$$Q = f(K, L) \tag{1}$$

From (1)

$Q = Output$

$K = Capital$

$K = Labour$

Assuming Q to be real output (Economic growth or GDP), K is total capital - capital here includes the prices of the petroleum products (PMS, DPK and AGO), and L is index of labour input. Thus, if Labour productivity is a dynamic measure of economic growth, competitiveness, and living standards within an economy, hence it is a revealing indicator of several economic indicators. If we mathematically derive it as.

$$LP = \frac{OV}{LIU} \tag{2}$$

From (2)

$LP = Labour\ Productivity$

$OV = Output\ Volume$

$LIU = Labout\ Input\ Use$

Therefore, Output measure = Net output, which is the value added by the process, i.e. value of outputs – (less) value of intermediate inputs, all valued in monetary terms. Therefore, L is index of labour input, here represented by (EXR).

We transform it into a linear function in (3) as,

$$GDP = f(PMS, DPK, AGO, EXR) \tag{3}$$

But from (3), GDP is proxied by Ygt, hence, we specify the model as:

$$Yg_t = f(PMS, DPK, AGO, EXR) \tag{4}$$

Where from (4),

$Yg_t = growth\ rate\ of\ real\ gross\ domestic\ product\ defined\ by$:

$$Ygt = \frac{RGDPc - RGDPp}{RGDPp}$$

Where

$Ygt = Growth\ Rate$

$RGDPc = RGDP current\ year$

$$RGDPp = RGDPprevious\ year$$

PMS is the domestic price of premium motor spirit; DPK is the domestic price of dual purpose kerosene; AGO is the domestic price of automotive gas oil, EXR is the rate of exchange of Naira to the US dollar while, *'ect'* represents the residual adjustment and *'u'* is the stochastic error term.

Transforming this (4) into lag model, then we have (5) thus;

$$\Delta \log_{Yg_t} = \beta_0 + \beta_1 \Delta \log PMS_{t-1} + \beta_2 \Delta \log DPK_{t-1} + \beta_3 \Delta \log AGO_{t-1} + \beta_4 \Delta \log EXR_{t-1} + \beta_5 ect + \mu_t \quad (5)$$

Where in (5), all the variables remain as explained in (4), while log is the logarithm value of the variables, β_0 is the constant of the model, β_1 - β_5 are all slopes of the estimates, t is the time (yearly trend) and t-1 is the yearly lag period (one yearl0.

$$Apriori\ \beta_0 > 0, \beta_1 > 0, \beta_2 > 0, \beta_3 > 0, \beta_4 > 0\ where\ \beta_1, \beta_2, \beta_3, \beta_4, are\ parameters\ in\ the\ model$$

3.3. Model Specification and Justification

This study is about the relationship or impact of domestic fuel price and growth of Nigerian economy using PMS popularly known as fuel, DPK popularly known as kerosene and AGO popularly known as diesel as major variables since they are the most commonly used in Nigeria. Exchange rate is used as a control variable of labour. These will be used in testing the hypothesis of the model.

4. ESTIMATION AND RESULTS

Descriptively, the statistics of the model variables is presented in Table 2. Our data being an annual series data, with 39 observations representing from 1981-2019 year period, the highest and lowest values of Ygt (economic growth) were 15.33 and -13.13. The price of automotive gas oil (AGO) and dual purpose kerosene (DPK) peaked at Naira 245.00 and Naira 200.00 per liter respectively in the year 2017. A close look at the price adjustments of the products – PMS, AGO and DPK, shows that the prices have been on a steady increase. For example, while PMS grew from Naira 0.15 to Naira 145 per liter within the period, AGO grew from Naira 0.11 to Naira 245 per liter within same period. The exchange rate of the Naira to the United States dollar is not left out. The weakening strength of the Naira when compared to other currencies, especially the US dollar can be attributed to the import dependent nature of Nigeria. The substantial values of the difference between the maximum and minimum values of the variables indicate how the variables spread out from the mean.

Table-2. Descriptive statistic.

Variable	Ygt	PMS	AGO	DPK	EXR
Mean	3.150	45.271	60.158	47.166	86.769
Median	4.196	22.400	21.000	17.500	22.051
Maximum	15.329	145.000	245.000	200.000	320.235
Minimum	-13.128	0.150	0.110	0.110	0.610
Std. Dev.	5.467	48.656	79.035	64.524	95.110
Skewness	-0.866	0.810	1.294	1.463	1.010
Kurtosis	4.635	2.426	3.399	3.839	3.176
Jarque-Bera	9.224	4.795	11.139	15.059	6.682
Probability	0.010	0.091	0.004	0.001	0.035
Sum	122.841	1765.574	2346.160	1839.460	3384.005
Sum Sq.Dev.	1135.921	89960.190	237366.3	158209.3	343744.6
Observation	39	39	39	39	39

The standard deviation from the mean value is moderately good. The values of PMS (premium motor spirit), AGO (automotive gas oil), DPK (dual purpose kerosene) and EXR (exchange rate) are all positively skewed. While

AGO and EXR can be said to be *mesokurtic* (values approximately 3), PMS is *platykurtic* (2.4<3), DPK is *Leptokurtic* (3.8>3) *cetirus paribus*. The probability values of all the variables are less than 0.05 with exception of PMS which is 0.091. This means that the probability that Jarque-Bera statistic exceeds in absolute terms the observed value under the null hypothesis is rejected for normal distribution of the variables Ygt, AGO, DPK and EXR, and the reverse for PMS. However, the kurtosis values of all the variables are not so much peaked, indicating the absence of an outlier, *cetirus paribus*.

Table 3 gives unit root tests output conducted under the variables using Akaike Information Criterion (AIC) automatic lag selection on the differenced value of the variables at both the level and first differences of the lagged series. Both the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) methods of unit root test unanimously agreed to all the variables being I(1) stationary.

Table-3. Stationarity test.

Variable	Unit root test statistic		5% Critical value		Integration order	
	ADF	PP	ADF	PP	ADF	PP
EXR	-4.194	-4.201	-2.943	-2.943	I(1)	I(1)
PMS	-6.198	-14.387	-2.946	-2.943	I(1)	I(1)
AGO	-5.229	-5.230	-2.943	-2.943	I(1)	I(1)
DPK	-5.507	-6.231	-2.946	-2.943	I(1)	I(1)
Ygt	-10.077	-10.407	-2.943	-2.943	I(1)	I(1)

The Akaike information criterion (AIC) as shown in Table 4 recommends optimal lag length selection of lag 1, therefore, we adopt it for our estimations.

Table-4. Lag selection.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-792.327	NA	1.190	44.296	44.516	44.373
1	-702.990	148.894*	3.390*	40.722*	42.041*	41.182*
2	-688.046	20.756	6.440	41.280	43.700	42.125
3	-661.877	29.077	7.620	41.215	44.734	42.444

The Johansen cointegration result output is presented below in Table 5. The results indicates that both the trace statistic and Max-Eigen statistic confirms the existence of three cointegrating equations among the variables. This is at the point in which the 5% critical values is less than both the Trace and Max-Eigen statistics. The critical values is less than the trace statistic in the following values: 69.819, 47.856 and 29.797 respectively. Also, the Max-Eigen Statistic is greater than the critical value at points 33.877, 27.584 and 21.132 respectively. This confirming a cointegrating relationship between the variables being similar results as observed by Papapetrou (2001); Hassan and Meyer (2020). Also from the normalized cointegration coefficients, it is obvious that in the long run the price of premium motor spirit (PMS) and automotive gas oil (AGO) will positively affect the growth of the economy, while the prices of dual purpose kerosene and exchange rate will negatively affect the growth of the Nigerian economy, *cetirus paribus*. Hence we reject the null hypothesis of no cointegration as against the alternative of a cointegrating relationship in the model.

From Table 6, ECT is negative, meaning it is rightly signed and non-explosive. That is to say that the previous year's deviation from long-run equilibrium is corrected in the current period at an adjustment speed of 53%. However, a percentage change in the price of premium motor spirit, (PMS), dual purpose kerosene, (DPK) and exchange rate, (EXR) is associated with a 0.011%; 0.038% and 0.018% increase in economic growth respectively, *cetirus paribus*. Also a percentage change in the price of automotive gas oil, (AGO) is associated with a 0.002% decrease in economic growth, all things being equal. This means that for every unit (1%) increase in the price of automotive gas oil, (AGO) there will be a reduction of 0.002% in economic growth while a unit increase in the price of premium motor spirit (PMS), dual purpose kerosene (DPK), and exchange rate (EXR) causes the economy to

grow by 0.011%, 0.038% and 0.018% respectively. The value of R^2 (R squared) which is 0.574 is an indication that about 57.4% of the changes in the level of economic growth in the country are explained by the pump price of petroleum products and exchange rate within this study timeframe. This result supports the findings of Hassan and Meyer (2020) and Du, Yanan, and Wei (2010) who claims that petroleum prices impact on economic growth, though in the latter's case it significantly affects economic growth.

Table-5. Cointegration test output.

Hypothesized No of CE(s)	Trace Statistic	0.05 Critical Value	Max-Eigen Statistics	0.05 Critical Value
None *	108.922	69.819	41.299	33.877
At most 1 *	67.622	47.856	34.412	27.584
At most 2 *	33.210	29.797	21.849	21.132
At most 3 *	11.361	15.495	8.237	14.265
At most 4 *	3.125	3.841	3.125	3.841
Normalized cointegrating coefficients (standard error in parentheses)				
YGT	LOG(PMS)	LOG(DPK)	LOG(AGO)	EXR
1.000	-1.888	8.688	-8.445	0.065
	(2.842)	(3.705)	(3.154)	(0.027)

Table-6. VECM dynamics (Ygt as dependent variable).

Variables	Coefficient	T-Statistics	Probability
D(PMS(-1))	0.014	0.036	0.319
D(DPK(-1))	0.038	0.065	0.587
D(AGO(-1))	-0.002	0.038	-0.065
D(EXR(-1))	0.018	0.024	0.745
ECT_{t-1}	-0.535	0.146	-3.665
C	0.516	1.084	0.476
R^2=0.574 ;Adj R^2=0.323 ;F-Statistic =2.282			

Table 7 presents the causal relationship and direction of causality among the variables. The study employed F-Statistics constructed under no causality null hypothesis. This enabled us to measure the causality direction among the variables for which probabilities are less than 5%. At probabilities of less than 5%, we accept the null hypothesis and reject the alternative hypothesis. At this point, the null hypothesis is significant. From the Table 7 below, DPK granger causes PMS, AGO and EXR, while AGO granger causes PMS. In all these cases, the probability value is less than 5%. Literarily, this means that the price of DPK will help in predicting the prices of AGO and EXR. This is same for AGO and PMS. Therefore increase in the pump price of DPK will cause the pump price of PMS, AGO and EXR to increase too. This is also obtainable when the pump price of AGO increase as it pushes up the pump price of PMS. This result lays credence to the study by Peersman and Van Robays (2012).

Table-7. Granger causality.

Null Hypothesis	F-Statistic	Prob %	Decision
DPK Granger Causes PMS	13.690	0.001	Accept
AGO Granger Causes PMS	18.274	0.000	Accept
DPK Granger Causes AGO	5.987	0.020	Accept
DPK Granger Causes EXR	4.353	0.044	Accept

Table 8 provides result of the diagnostic tests and from it we conclude that the model does not exhibit serial correlation since the value of its probability 0.077 > 0.05. However, the probability value of the Normality test showed that it is significant at 0.000, hence we carried out the test for Heteroskedasticity. The test indicated that all the variables exhibit normal distribution as shown by the normality test thus making us not to reject the null hypothesis. The chi-square coefficient of the heteroskedasticity test is insignificant meaning that our model is heteroskedased.

Table-8. Diagnostic tests.

Type of test	Prob.
Serial correlation LM test	0.076
Normality test	0.000
Residual heteroskedasticity test	0.603

5. CONCLUDING REMARKS AND POLICY IMPLICATIONS

In this study, we have empirically investigated the impact of petroleum pump price adjustments on economic growth in Nigeria for the period 1981-2019. In the course of our study, we find that pressure on government expenditures and balance of payment makes each government regime to tarry with the pump pricing of petroleum products, to enable it make available more money to cover its expenditure profile. However, Nigeria, despite being a crude exporter, is daily becoming a net importer of refined fossil fuel for its domestic use.

The empirical results show that a percentage increase in economic growth causes the price of premium motor spirit (PMS), dual purpose kerosene (DPK) and exchange rate (EXR) to increase by 0.011%, 0.038% and 0.018% respectively. Also a percentage change in the price of automated gas oil (AGO) is associated with a 0.002% decrease in economic growth. Also about 57.4% of the changes in the level of economic growth in the country are explained by the pump price of petroleum products and exchange rate within this study timeframe. The previous year's deviation from long-run equilibrium is corrected in the current period at an adjustment speed of 53%.

However, the prices of PMS, AGO and DPK does not granger cause economic growth in Nigeria within the period under this study. This is same for exchange rate. Instead DPK granger causes PMS, AGO and EXR while AGO granger causes PMS. Given these results, it is advisable for government to pursue its growth policies independent of petroleum pump prices. Obviously using fuel pump price as a policy to influence economic growth is ineffective. To forestall this, efforts should be made to stop the importation of refined fossil fuel. This should be by way of building new refineries and revamping existing ones. This will in turn save the country huge foreign exchange while also creating jobs.

Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no competing interests.
Acknowledgement: All authors contributed equally to the conception and design of the study.

REFERENCES

Adelabu, N. S. (2012). The political economy of oil deregulation in Nigeria's fourth republic: Prospects and challenges. *Journal of Emerging Trends in Educational Research and Policy Studies*, *3*(3), 193-198.

Akinleye, S. O., & Ekpo, S. (2013). Oil price shocks and macroeconomic performance in Nigeria. *New Epoch Mexican Economy*, *2*, 565-624.

Amagoh, M. N., Odoh, C. M., & Okuh, B. A. (2014). Modelling petroleum product prices and the Nigerian economy. *IOSR Journal of Mathematics*, *10*(1), 72-79. Available at: https://doi.org/10.9790/5728-10147279.

Arinze, P. E. (2011). The impact of oil price on the Nigerian economy. *Journal of Research in National Development*, *9*(1), 211-215.

Awunyo-Vitor, D., Samanhyia, S., & Addo Bonney, E. (2018). Do oil prices influence economic growth in Ghana? An empirical analysis. *Cogent Economics & Finance*, *6*(1), 1496551. Available at: https://doi.org/10.1080/23322039.2018.1496551.

Balouga, J. (2012). The political economy of oil subsidy in Nigeria. *International Association for Energy Economics Second Quarter*, *2*, 31-35.

Barry, W. I. (1996). Endogenous growth models (pp. 8-11). USA: Department of Economics Penn State University Park, PA 16302.

Cavalcanti, T., & Jalles, J. T. (2013). Macroeconomic effects of oil price shocks in Brazil and in the United States. *Applied Energy*, *104*, 475-486. Available at: https://doi.org/10.1016/j.apenergy.2012.10.039.

Chang, Y., Jha, K., Fernandez, K., & Jam'an, F. (2011). *Oil price fluctuations and macro-economic performances in Asian and oceanic economies*. Paper presented at the 30th USAEE/IAEE North American Conference, Washignton, DC, 9-12 October.

Cologni, A., & Manera, M. (2008). Oil prices, inflation and interest rates in a structural cointegrated VAR model for the G-7 countries. *Energy Economics, 30*(3), 856-888. Available at: https://doi.org/10.1016/j.eneco.2006.11.001.

Du, L., Yanan, H., & Wei, C. (2010). The relationship between oil price shocks and China's macro-economy: An empirical analysis. *Energy Policy, 38*(8), 4142-4151. Available at: https://doi.org/10.1016/j.enpol.2010.03.042.

Eregha, B., Mesagan, E., & Ayoola, O. (2015). Petroleum products prices and inflationary dynamics in Nigeria. *The Empirical Econometrics and Quantitative Economics Letters, 4*(4), 108–122.

Ghalayini, L. (2011). The interaction between oil price and economic growth. *Middle Eastern Finance and Economics, 13*(21), 127-141.

Hamilton, J. (2009). *Causes and consequences of the oil shock of 2007-08*. Cambridge, MA: National Bureau of Economic Research.

Hassan, A., & Meyer, D. (2020). Analysis of the non-linear effect of petrol price changes on inflation in South Africa. *International Journal of Social Sciences and Humanity Studies, 12*(1), 34-49.

Ifediora, J. O. (2020). Solving the energy problem in Sub-Saharan Africa. Council on African security and development (CASADE). Retrieved from Https://Casade.Org/Development-Security/Solving-the-Energy-Poverty-Problem-in-Sub-Saharan-Africa.

International Institute for Sustainable Development. (2012). *A citizens guide to energy subsidies in Nigeria*. Geneva, Switzerland: International Institute for Sustainable Development.

Iwayemi, A., & Adenikinju, A. (2001). *Energy-environment-economy linkages in Nigeria: A general equilibrium assessment*. Paper presented at the Natural Resource Control in Nigeria. Selected Papers for the 2001 Annual Conference.

Iwayemi, A., & Fowowe, B. (2011). Impact of oil price shocks on selected macroeconomic variables in Nigeria. *Energy Policy, 39*(2), 603-612. Available at: https://doi.org/10.1016/j.enpol.2010.10.033.

Jiménez-Rodríguez*, R., & Sánchez, M. (2005). Oil price shocks and real GDP growth: Empirical evidence for some OECD countries. *Applied Economics, 37*(2), 201-228. Available at: https://doi.org/10.1080/0003684042000281561.

Katircioglu, S. T., Sertoglu, K., Candemir, M., & Mercan, M. (2015). Oil price movements and macroeconomic performance: Evidence from twenty-six OECD countries. *In Renewable and Sustainable Energy Reviews, 44*, 257-270. Available at: https://doi.org/10.1016/j.rser.2014.12.016.

Lardic, S., & Mignon, V. (2006). The impact of oil prices on GDP in European countries: An empirical investigation based on asymmetric cointegration. *Energy Policy, 34*(18), 3910-3915. Available at: https://doi.org/10.1016/j.enpol.2005.09.019.

Majekodunmi, A. (2013). The political economy of fuel subsidy removal in Nigeria. *International Journal of Management and Social Sciences Research, 2*(7), 76-81.

Njiru, C. W., & Letema, S. C. (2018). Energy poverty and its implication on standard of living in Kirinyaga, Kenya. *Journal of Energy*, 1-12. Available at: https://doi.org/10.1155/2018/3196567.

Nkomo, J. C. (2009). Energy security and liquid fuels in South Africa. *Journal of Energy in Southern Africa, 20*(1), 20-24. Available at: https://doi.org/10.17159/2413-3051/2009/v20i1a3298.

Nwaoha, W. C., Onwuka, O. O., Obisike, N. E., Yahaya, A., & Nwambe, C. O. (2018). Minus effect of petroleum products pump prices on macroeconomic indicator in Nigeria: A unit root approach. *International Journal of Social Sciences and Management Research, 4*(6), 8–23.

Ocheni, S. I. (2015). Impact of fuel price increaseon the Nigerian economy. *Mediterranean Journal of Social Sciences, 6*(1 S1), 560-560. Available at: https://doi.org/10.5901/mjss.2015.v6n1s1p560.

Onyeizugbe, C., & Onwuka, E. (2012). Fuel subsidy removal as an imperative for enhancing business development in Nigeria. *VSRD International Journal of Business & Management Research, 2*(9), 454-461.

Orlu, R. N. (2018). The impact of domestic pricing of petrol on economic growth of Nigeria (1970– 2013). *Global Journal of Social Sciences, 16*(1), 1. Available at: https://doi.org/10.4314/gjss.v16i1.1.

Ozo-Eson, P. I., & Muttaqa, Y. (2016). Pricing of petroleum products in Nigeria. Research Report by African Centre for Leadership Strategy and Development, with Support from Open Society Initiative OSIWA West Africa.

Papapetrou, E. (2001). Oil price shocks, stock market, economic activity and employment in Greece. *Energy Economics*, *23*(5), 511-532. Available at: https://doi.org/10.1016/S0140-9883(01)00078-0.

Peersman, G., & Van Robays, I. (2012). Cross-country differences in the effects of oil shocks. *Energy Economics*, *34*(5), 1532-1547. Available at: https://doi.org/10.1016/j.eneco.2011.11.010.

Popp, J., Oláh, J., Farkas, F. M., Lakner, Z., & Máté, D. (2018). The relationship between prices of various metals, oil and scarcity. *Energies*, *11*(9), 2392. Available at: https://doi.org/10.3390/en11092392.

Rebelo, S. (1991). Long-run policy analysis and long-run growth. *Journal of Political Economy*, *99*(3), 500-521. Available at: https://doi.org/10.1086/261764.

Roeger, W. (2005). International oil price changes: Impact of oil prices on growth and inflation in the EU/OECD. *International Economics and Economic Policy*, *21*(1), 15-32. Available at: https://doi.org/10.1007/s10368-005-0027-z.

Tang, W., Wu, L., & Zhang, Z. X. (2010). Oil price shocks and their short- and long-term effects on the Chinese economy. *Energy Economics*, *32*, S3-S14. Available at: https://doi.org/10.1016/j.eneco.2010.01.002.

Van Zon, A., & Yetkiner, I. H. (2003). An endogenous growth model with embodied energy-saving technical change. *Resource and Energy Economics*, *25*(1), 81-103. Available at: https://doi.org/10.1016/S0928-7655(02)00018-0.

Wale-Awe, O. I., & Sulaiman, L. A. (2020). Premium motor spirit (PMS) pricing and inflationary dynamics in Nigeria. *Forum Scientiae Oeconomia*, *8*(3), 49-60.