

# The impact of Downstream Oil Deregulation Nexus Petroleum Gross Domestic Product: The Nigerian Experience

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**Abstract-** This paper examines the “impact of Downstream Oil Deregulation Nexus Petroleum GDP and the causal relationship between downstream deregulation. Petroleum GDP. ARDL technique was used in analyzing the regression estimates. Based on the findings, the study found a Two-way causation to have existed between PPMS and petroleum GDP and between PPMS and PMSP. The regression estimate has indicated a positive significant impact between PMSP and economic growth (proxy petroleum GDP). The study also revealed a negative but significant impact between, PMSC, IPMS and PPMS with economic growth. The coefficient of the ECM (-0.5785) which is highly statistically significant (0.000) implies that the disequilibrium occurring due to a shock is totally corrected at a rate of about 57 percent. The study recommends that Importation of refined premium motor spirit (IPMS) grossly affects the petroleum GDP of the economy negatively; therefore total deregulation of the downstream sector must be gradually and consistently pursued to revive maximum result to all stakeholders and the nation. While that is being pursued, adequate infrastructure, especially refineries should be put in place. The four refineries already established shall be maintained and made to operate at full capacity. Hence, while “deregulation” is needed to allow space for private initiative and competition, “re-regulation” is needed to establish a set of rules that allow the market to function properly by correcting the imperfections and by accounting for the social costs of the petroleum sector.

**Index Terms-** Downstream, Deregulation, Petroleum Gross Domestic Product

## I. INTRODUCTION

The petroleum industry remains central to the Nigerian economy and accounts for about 95% of the country's exports. The country's proven oil reserves stands at about 37.2 billion barrels; this was in addition to over 187 trillion cubic feet of proven natural gas reserves. The petroleum industry is thus the mainstay of the Nigerian economy. Official records from the budget office of the Federal Republic of Nigeria showed that the petroleum industry accounted for about 29.1% of Gross Domestic

Product (GDP) and 78% of total government revenues in the fiscal year 2015<sup>11</sup>.

The Nigeria National Petroleum Co-operation (NNPC) formerly known as Nigeria National Oil Co-operation (NNOC) was established in 1971 by act No. 18. The NNPC was charged with the responsibility of exploring and producing oil and gases, transporting as well as marketing and distribution of petroleum products. With the activities going on in this sector, four (4) refineries were installed by the Government which were located at Port Harcourt, Warri and Kaduna. These refineries were commissioned between 1965 and 1989 with combined installed capacity to refine over four hundred and forty-five thousand barrels of crude oil per day (445,000) bpd. Gradually and steadily, the importance of crude oil has become more noticeable in terms of its massive revenue generation for national development as well as its spin off effects of its downstream activities. Revenue from crude oil has been used to finance major core industrial projects like the steel complexes, fertilizer plants, as well as social infrastructure. With this ever growing contribution to the GDP, the Nigerian economy became highly dependent on the sector (the oil industry).

Since the discovery of crude oil in commercial quantity, the economic trajectory of Nigeria has changed, which to some extent led to change in policy focus of the government, it has either positively or/adversely affected other sectors of the economy. On the negative side, this was considered with respect to some activities taking place in the downstream oil subsector which has direct link with the local consumers. These activities were seen from under utilisation of the refineries which brought about the scarcity of petroleum product to meet the domestic demand, pipe line vandalism, smuggling, corruption and hikes in prices among others. It was as a result of this, government decided to deregulate the sector with a view to enhance the performance of the oil industry on the economic growth, this means allowing other interest groups to participate in the economic activities.

The Nigerian petroleum industry comprises of upstream and downstream subsector. The upstream is basically concerned with technicalities involved in exploration and exploitation of crude oil. On the other hand, the downstream subsector includes but not limited to; refining, processing, exporting/re-importing and inter-linkage between refineries and depots. The downstream subsector

is so categorised largely due to its functions in production/distribution chain of refined petroleum product where large proceeds were obtained from the domestic sales and export of petroleum products, the main actors in this chain constitute majorly of government agencies and multinational oil companies. This had run contrary to the spirit of capitalism (free market) which posit that government role in business activities if at all necessary should be minimal. Thus, thorough regulation of the petroleum industry by the government had adverse consequences on the economy. This was because the policy will deteriorate the economic condition in the state thereby amounting to hikes in transport fare, prices of food and services, closure of local industries and job losses and unemployment, resulting into increase in poverty level and reduced standard of living of many citizens. Therefore, these posed major impediments that affect the economic growth negatively<sup>1</sup>.

In spite of the Nigerian's position in the Organisation of Petroleum Exporting Countries (OPEC), as the major exporter of crude oil in Africa and six (6) exporter of oil in OPEC. The supply of petroleum product (PMS) has been the major concern of its citizens, because over the years, hardly would Nigerians live-out full calendar year without one form of fuel crisis or the other, these were attributed to the regulation activities in the downstream oil subsector. It was an irony that domestic supplies of petroleum product particularly (premium motor spirit) in the country have been erratic while its prices have been on the increase. These unending erratic supply of PMS and price hikes brought untold hardship to the citizenry and economic growth.

Needless to say, subsidy has been the major economic issue in Nigeria, with different opinion leaders offering divergent views on it. In view of this, this paper examined the impact of Downstream Oil Deregulation Nexus Petroleum Gross Domestic Product.

### Statement of the Problem

Nigeria has witnessed considerable ups and downs in its quest to economic growth and development. The odds against the country's economic development efforts became higher due to over dependence on crude-oil for foreign exchange. Any slightest disequilibrium in the production/distribution chain in petroleum industry affects all facets of economic activities. For instance, commuters all over Nigeria have had to contend with numerous hikes in price of commuting; delays on transit due to fewer vehicular services. It thus meant that traders, farmers, producers had to factor in cost of transporting farm produce and other related output cost multipliers in their daily commercial activities; all these are consequences of petroleum products induced problems and is attributed to the regulation activities in the downstream subsector.

The nation's downstream subsector of the oil industry comprises activities relating to the distribution and marketing of petroleum products and derivatives throughout the country. The subsector is particularly volatile in recent times due to government policy on deregulation of the industry, which has removed price control mechanisms that have undermined the growth of the industry in previous years<sup>15</sup>. The subsector has also been constrained by the unenviable state of the nation's refineries, which have been producing at minimal capacities in the past few years, despite huge expenses incurred on turnaround-maintenance

of the crisis-ridden refineries. This development has led to massive importation of petroleum products to fill demand gaps that exist in domestic consumption.

However, the huge cost associated with importation of petroleum products was the major reason for government emergent deregulation and the hike in prices of petroleum products from 36% to 90% at the end of 2015.

It is against this backdrop that this paper assesses the impact of Downstream Oil Deregulation Nexus Petroleum Gross Domestic Product and also to analyse the causal relationship between petroleum GDP and deregulation.

## II. LITERATURE REVIEW

### Conceptual Issues

This section of the literature review will focus extensively on reviewing literatures that will provide a conceptual clarification of issues related to deregulation with focus on "downstream petroleum subsector and the Nigerian Economy.

To fully understand the concept of deregulation, it will be of great importance to define the term deregulation in a simple parlance. Deregulation literary means removal of regulation or control. This includes removal of monopoly rights over certain issues. In the case of petroleum industry, deregulation could be the removal of monopoly right over production, distribution and pricing of refined petroleum product with sole aim of allowing interest group to participate in the economic activities. This implies the gradual withdrawal or removal of regulation in the way of liberating the economy. The concept also refers to a restrictive use of the state's legal power to direct the conduct of private actors<sup>39</sup> <sup>14</sup>It was asserted that deregulation and privatization are elements of economic reform programs charged with the goal of improving the overall economy in a structured process.

<sup>20</sup>Contributing to the concept of deregulation, it was viewed from an economic perspective which implies freedom from government control. <sup>3</sup>Meanwhile some assert that deregulation is the removal of government interference in running a system. This implies that the normal regulatory rules and enforcement in managing the operation of a system is replaced by the market forces of demand and supply as a determinant of price<sup>2</sup>.

### Prospects of the Deregulation on the Downstream oil Subsector

Since 1999, the Nigeria government decided to emulate oil producing nations by deregulating the downstream sector of her petroleum industry which, hitherto, was monopolized by the Nigerian National Petroleum Corporation (NNPC) like every policy measure; deregulation will not be without costs. A cost – benefit analysis always forms sound basis for adopting a particular policy, and it was believed in this case, that the benefits of deregulation outweigh the cost<sup>24</sup>. He noted that the most obvious cost of deregulation is potential to have a shape price increases from transportation of food, to a lot of other items and services. He maintained that this chain of price increases is inevitable since, in economics everything affect everything else, however remotely and oil of course, a unique commodity and its effect are expected to cause a onetime jump in overall inflation, which needs not become perpetuating if it not accommodating, say through monetization of budget deficits and large wage awards.

In other words, once fiscal and monetary discipline and associated exchange rates stability remain in place, inflation should return to the original declining path quickly<sup>24</sup>.<sup>16</sup>It is true from the consumer's perspective that the benefits of deregulation may not be intuitively obvious, especially with the hassle factor of making sense of various offers and the confusion of meeting the challenges of price increases on commodities and services in the immediate term.<sup>35</sup>Meanwhile others believed in the long – term advantages of deregulation and it is worth the attendant short – term disruptions and consumer confusion.

The negative perceptions of Nigerian public that arose from the sensitization campaigns to deregulate the downstream subsector which were registered through protest and strike by labour unions were resisted by the government. The government on the other hand, defended her position by pointing to the successes of other countries as USA, Germany, Mexico, etc. who run a deregulated downstream subsector as her models an adhering to the policy.<sup>7</sup>It was stated that the benefits of deregulation are enormous, apart from its essence to eradicate huge revenue spent as subsidy, the following benefits among others are being enjoyed from the deregulation policy in Nigeria;

- i. Products are now available all over the country and no one needs to queue for days at filling stations waiting for non – existent products.
- ii. Motorists no longer hoard fuel in their homes or jerry cans of fuel when travelling; this has eliminated the fuel – induced accidents and fire that claimed thousands of lives in the regulated economy.
- iii. Marketers are now investing in new facilities such as storage tanks, retail outlets, trucks, the railway rolling stock, etc.
- iv. There is now competition among the marketers who now treat the consumer as king.
- v. The marketers, who in the past depended on NNPC for all products, now import their own; some are planning to build refineries in Nigeria.
- vi. Jobs have been created in the sector, for example, NNPC is now confident enough to build its own retail outlets (Mega Stations) and has already built and is operating in each states of the federation.
- vii. Apart from new investment in new facilities, old ones are being expanded because of increase in activities.
- viii. Investment in the downstream sector is now more attractive to the international and local business communities as evidences by the interests express in the refineries privatization programme.

However, the above benefits appear to be experienced in the short and mid – term. It was pointed out to the long term advantages<sup>24</sup>.<sup>35</sup>The following benefits were indicated as the flip side of the costs of subsidization in regulated downstream;

- i. Deregulation free resources for government to spend on productive ventures and social sectors, in education and health.
- ii. A market price will encourage efficiency in the use of petroleum products, which would reduce traffic congestion, and loss of productive time, this will

save the country money in terms of reducing oil import.

- iii. Removing the subsidy will reduce the incentive to smuggle as the domestic price approaches those in neighbouring countries. This will save the country foreign exchange, which would have been used to replace the smuggled portion, and also allow government to realize the full complement output would have been lost to smugglers.
- iv. Fundamentally, deregulation will depoliticize petroleum pricing and eliminate the speculation, rent seeking and other practices usually associated with government announced price increases.
- v. Automatic pricing would allow the benefits of cost reductions, through world oil price fall passed on to consumers.

However, other acknowledged the benefits of deregulation from different perspectives that; the deregulation of the energy sector in the United State was forth with hindsight as the policy makers, by their rulers suggest that they lost the fundamental purpose of deregulation. As a result a few big companies that figured out how to gain the rules profited enormously, while everyone else suffers. This view appears to be the case with the Nigerian downstream because the major marketers who have capacity and a good network of marketing outlets are benefiting from the policy far above their counter parts, the independent marketers. Deregulation would also remove the current incentive which exists for people smuggling our oil elsewhere. Removal of the smuggling incentive would greatly improve local product availability and this would in turn, exerts a downwards pressure on product prices within the economy<sup>29</sup>.

### **Deregulation Policy of Petroleum Industry**

The policy framework for the deregulation of downstream oil industry evolved with the inauguration of a 34 member Special Committee by the government on 14 August 2000. The Special Committee to Review Petroleum Products Supply and Distribution (SCRPPSD) members constituted from various stakeholders and other interest groups were charged to review the petroleum products supply and distribution and also other problems of the downstream petroleum subsector. On October 2000, the Committee's reports and recommendations were published in the government white paper<sup>29</sup>. Some of the decisions were;

- i. Deregulation and liberalization of the importation of petroleum products by oil marketers and basing prices of products on import parity to encourage the participation of other players other than the NNPC.
- ii. The privatization of all four government refineries and encouraging private sector participation in the establishment of private refineries.
- iii. The establishment of a pipeline management authority for the pipelines, jetties and depots, which will charge private and public users a tariff per throughput litre of products.
- iv. The immediate setting up of a Petroleum Products Pricing Regulatory Agency (PPPRA) with sufficient autonomy to superintend the various phases of the

proposal embodied in the report of (SCRPPSD) especially the deregulation and liberalization of the downstream sector of the petroleum industry.

The decision led to the establishment of PPPRA by an Act of the National Assembly in May, 2003 as an agency to monitor deregulation implementation. The PPPRA is an agency of the [government of Nigeria](#) established in 2003 to, among other responsibilities, monitor and regulate the supply and distribution, and determine the prices of [petroleum](#) products in [Nigeria](#). Below are its major functions;

- i. To determine the pricing policy of petroleum products;
- ii. To regulate the supply and distribution of petroleum products;
- iii. To create an information databank through liaison with all relevant agencies to facilitate the making of informed and realistic decisions on pricing policies;
- iv. To oversee the implementation of the relevant recommendations and programmes of the Federal Government as contained in the Report of the Special Committee on the review of the Petroleum Products Supply and Distribution;
- v. To moderate volatility in petroleum products prices, while ensuring reasonable returns to operators.
- vi. To establish parameters and codes of conduct for all operators in the downstream petroleum sector.

#### Domestic Price of PMS

Petroleum prices in the domestic market have been under government control since 1973 when the government took it over from the private oil companies<sup>21</sup>. The prices of various grades of petroleum products have been adjusted upward more than 20 times since the introduction of uniform pricing on October 1973. The prices of petroleum products in Nigeria should theoretically be derived from International Crude oil prices since the marginal supply (litres) comes from import, it should therefore reflect import price. In other words, when the marginal unit of consumption is imported the economic price should be import parity price. However, this has not always been the case for a number of reasons particularly socio-political ones. <sup>22</sup>Three factors that have influenced government position were identified; First, was the desire to protect the interest of the poor that were affected with higher prices. The second was the need to reduce industrial cost as energy products are seen as critical inputs in production processes. The third factor relates to the potential inflationary impact of higher energy prices.

Government of both oil producing and consuming countries invariably intervene in the market to influence product price. The extent of such intervention depends on the specific needs of the country and importance of the product in question. It has also been noted that crude oil cost was not the only cost incurred in the supply and distribution of petroleum products as other costs such as refining costs, transportation and distribution costs were involved. The trends in petroleum products pricing in Nigeria has a long history.

The Military Head of State of General Gowon increased fuel price from 6 kobo to 8.45 kobo. It was raised to 9kobo in 1976 by Late General Murtala Administration. On October 1, 1978, the then military government of Obasanjo increased the pump price of

petrol from 9 kobo to 15.37kobo. There was another hike on April 20, 1982, when price was marked to 20 kobo. On March 31, 1986, General Ibrahim Babangida increased pump price of fuel to 39.5 kobo. On April 10, 1988, it was increased to 42 kobo per litre. On January 1, 1989, it was announced another increase whereby private car were to pay 60 kobo per litre while commercial cars continue paying 42 kobo.

#### Subsidy Payment

<sup>23</sup>The Federal Government of Nigeria has made a savings in excess of N1.4 trillion since removal of subsidy on petrol earlier this year (2016). Deregulation by his estimation has thrown up unexpected gains, as we now experience reduced consumption in petrol from about 1,600 trucks being delivered daily to 850 trucks per day. Also, this has reduced daily consumption at the pumps from 45 million litres per day to less than 30 million litres daily. The estimated daily consumption of PMS is 45 Million Litres per Day (MLPD) but there had been no accurate records of the actual quantity of imported PMS. Hence, there existed varied subsidy repayment values in the records of the various government agents.

### III. THEORETICAL FRAME WORK

#### Public Interest Theory

The first group of regulation theories proceeds from the assumptions of full information, perfect enforcement and benevolent regulators. According to these theories, the regulation of firms or other economic actors contributes to the promotion of the public interest. This public interest can further be described as the best possible allocation of scarce resources like petroleum product for individual and collective goods like provision of national defence and services in society. In western economies, the allocation of scarce resources is to a significant extent coordinated by the market mechanism. In theory, it can even be demonstrated that, under certain circumstances, the allocation of resources by means of the market mechanism was optimal<sup>4</sup>. Because these conditions do frequently not apply in practice more so in the Nigerian context, the allocation of resources is not optimal from a theoretical perspective and a quest for methods of improving the resource allocation arises<sup>8</sup>. This situation was described as a market failure. A market failure is a situation where scarce resources are not put to their highest valued uses. In a market setting, these values are reflected in the prices of goods and services. A market failure thus implies a discrepancy between the price or value of an additional unit of a particular good or service and its marginal cost or resource cost. Ideally in a market, the production by a firm should expand until a situation arises where the marginal resource cost of an additional unit equals its marginal benefit or price. Equalization of prices and marginal costs characterizes equilibrium in a competitive market which deregulation aims to achieve. If costs are lower than the given market price, a firm will profit from a further expansion of production. If costs are higher than price, a firm will increase its profits by curtailing production until price again equals marginal cost. Market equilibrium, and more generally equilibrium of all markets is thus a situation of an optimal allocation of scarce resources. In this situation supply equals demand and under the given circumstances can market players do no better. A great

number of conditions have to be satisfied for an optimal allocation in a competitive market economy to exist<sup>10</sup>.

One of the methods of achieving efficiency in the allocation of resources when a market failure is identified is government regulation<sup>4,5</sup>. In the earlier development of the public interest theories of regulation, it was assumed that a market failure was a sufficient condition to explain government regulation<sup>9</sup>. But soon the theory was criticized for its Nirwana approach, implying that it assumed that theoretically efficient institutions is seen to efficiently replace or correct inefficient real world institutions<sup>12</sup>. This criticism has led to the development of a more serious public interest theory of regulation by what has been variously referred to as the "New Haven" or "Progressive School" of Law and Economics<sup>28</sup>. In the original theory, the transaction costs and information costs of regulation were assumed to be zero. By taking account of these costs, more comprehensive public interest theories developed. It is argued that government regulation is comparatively the more efficient institution to deal with a number of market failures<sup>40</sup>. For example, with respect to the public utilities it was argued that the transaction cost of government regulation to establish fair prices and a fair rate of return are lower than the costs of unrestricted competition<sup>17</sup>. These more serious versions of the public interest theories do not assume that regulation was perfect. They do assume the presence of a market failure that regulation was comparatively the more efficient institution and that for example deregulation takes place when more efficient institutions develop. These theories also assume that politicians act in the public interest or that the political process is efficient and that information on the costs and benefits of regulation is widely distributed and available<sup>27</sup>.

### The Chicago Theory

'The Theory of Economic Regulation' by George Stigler appeared and was the start of what some called 'the economic theory of regulation' and others 'the Chicago theory of government'<sup>27,34</sup>. Stigler's central proposition was that 'as a rule, regulation is acquired by the industry and is designed and operated primarily for its benefit'. Government can grant subsidies or ban the entry of competitors directly so that the level of prices rises. The government can maintain minimum prices and restrict entry more easily than a cartel. The government can suppress the use of substitutes and support complements. An example of each is the suppression of transport by trucking to protect the railroads and the subsidization of airports for the benefit of airlines. On the one hand, therefore a demand will arise for government regulation. The political decision-making process on the other hand makes it possible for industries to exploit politics for its own ends. For this proposition<sup>13,30</sup>. In the political process, primarily interest groups will exercise political influence, as opposed to individuals. Individuals will not participate because forming an opinion about political questions is expensive in terms of time, energy and money, while the benefits in terms of political influence will be negligible. Individuals will only be informed on particular interests as member of an interest group. Democracies will thus mostly be a platform for interest groups. Some groups can organize themselves less expensively than others. Small groups have the advantage because the transaction costs are lower and the 'free-rider' problem is smaller than is the case with large groups. Furthermore, in small groups the preferences will be more

homogeneous than in large groups. Small groups also have the advantage in that for the same expected total revenue, the revenue per member of the group is greater. The fact that apparently large groups can still be well organized is explained by Stigler through concentration and asymmetry<sup>39</sup>. The large companies in a concentrated branch will see themselves as a small group. In the case of asymmetry in the industry, for example as a result of product diversity or widely varying production techniques, separate companies will wish to prevent unfavourable regulation and will participate in the organization.

### Explanations of deregulation

Once the Chicago theory of regulation had been developed, social developments seemed to refute it. While this theory explained regulation as aiming for transfers of income, at the end of the 1970s and the beginning of the 1980s, many complexes of rules were dispensed with in a process of deregulation and privatization. This process of deregulation and privatization was mainly concerned with economic regulation of sectors such as transport (airlines and freight), telecommunications, energy and the financial sector. In the US, where these sectors were regulated, deregulation took place and in Europe, public enterprises were privatized. From the public interest theories of regulation two general explanations of deregulation can be derived. In the first place, it is possible that the cause of market failure is removed by technological or demand factors. Through increasing demand for, for example, transport facilities, a former natural monopoly may change into a competitive market. Furthermore, technological developments such as communication via satellite or through wireless facilities instead of by cable can undermine natural monopolies. A second explanation for deregulation may be the presence of more efficient alternatives to regulation to solve the market failure.

## IV. METHODOLOGY

### Sources of Data

The sources of data for this study were mainly from secondary source, the data were obtained from Central Bank of Nigeria (CBN) Statistical Bulletin, National Bureau of Statistics (NBS), Nigerian National Petroleum Corporation (NNPC) statistical bulletin, Organization of Petroleum Exporting Countries (OPEC) statistical bulletin and World Bank data bases.

### Method of Data Analysis

Auto-regressive Distributed Lagged Estimates (ARDL) was used to analyse the objectives because the technique possessed the following advantages; it does not formally require pretesting of unit root, more so, using ARDL, both short run and long run coefficient can be obtained simultaneously, and it can be applied to variables irrespective of their order of integration whether they are purely I(0) and I(1) or mixed, it is efficient for limited sample data and large sample<sup>32</sup>.

### ARDL Modelling Approach to Cointegration Analysis

Several methods are available for conducting the cointegration test. The most commonly used methods include the residual based test, and the maximum likelihood based tests<sup>18</sup>. Due to the low power and inconsistency associated with these methods,

the OLS based autoregressive distributed lag (ARDL) approach to co integration has become popular in recent years. Moreover, a dynamic error correction model (ECM) can be derived from ARDL through a simple linear transformation<sup>6</sup>. The ECM integrates the short-run dynamics with the long-run equilibrium without losing long-run information. It is also argued that using ARDL approach avoids problems resulting from non-stationary time series data<sup>25</sup>. Therefore, these methods of cointegration (OLS based) are not appropriate and cannot be employed. Hence, this makes ARDL more appropriate and suitable as a method choosing for analysis in this study because it provides unbiased estimates of the long run model and valid t-statistics even when some of the regressors are endogenous. The model for the error correction is shown below. Model

$$\begin{aligned} \Delta \ln GDP_t &= \vartheta_0 + \sum_{j=1}^q \gamma_j \Delta \ln GDP_{t-j} + \sum_{m=0}^q \delta_m \Delta \ln PMSP_{t-m} \\ &+ \sum_{p=0}^q \theta_p \Delta \ln PMSC_{t-p} + \sum_{v=0}^q \sigma_v \Delta \ln IPMS_{t-v} \\ &+ \sum_{z=0}^q \varepsilon_z \Delta \ln PPMS_{t-z} + \pi \text{ecm}_{t-1} \\ &+ \mu_t \dots \dots \dots 3.9 \end{aligned}$$

### Granger Causality Test

Although regression analysis deals with the dependence of one variable on the other, it does not necessarily imply causation. In other words; the existence of a relationship between variables does not prove causality or the direction of influence<sup>19</sup>.

Granger causality tests will be conducted in order to know whether lagged values of one variable predict changes in another, or whether one variable in the system explains the time path of the other variables. Hence, a variable x is said to Granger cause another variable y ( $x \rightarrow y$ ) if past values of x can predict present values of y. Granger posits two cardinal principles namely the cause precedes the effect and; ‘the causal series contains special information about the series being caused that is not available in the other available series’<sup>18</sup>. Similarly, there is an instantaneous causality from x to y ( $x \Rightarrow y$ ) if present and past values of x predict present value of y. If causality is in one direction e.g. from x to y, we have uni-directional causality while if x Granger causes y and y Granger causes x, we have bi-directional or feedback causality ( $y \leftrightarrow x$ ). There are two commonly used causality tests. However, one is more widely used in applied econometrics, partly because of its simplicity and also because it is less costly in terms of degrees of freedom. The granger causality equation is given below:

$$Y_t = a + \sum_{i=1}^{\infty} \alpha_i X_{t-i} + \sum_{j=1}^{\infty} \beta_j Y_{t-j} + U_t \text{ equation } \dots \dots \dots 3.7$$

$$X_t = b + \sum_{i=1}^{\infty} \phi_i X_{t-i} + \sum_{j=1}^{\infty} \delta_j Y_{t-j} + U_{2t} \text{ equation } \dots \dots \dots 3.8$$

Where Y and X in the above equations represent dependant and independent variables respectively. It is assumed that the

disturbances  $\mu_{1t}$  and  $\mu_{2t}$  are uncorrelated. The F statistic will be used for joint test of the hypotheses that in equation (3)  $\alpha_1 = \alpha_2 = \dots = \alpha_n = 0$ ; and in equation (4)  $\delta_1 = \delta_2 = \dots = \delta_n = 0$ . The null hypothesis in equation (4) is that ‘‘X does not granger – cause Y’’ and in (3) that ‘‘Y does not granger – cause X’’

### Model Specification

#### ARDL Approach to Regression

The variables operationalization of the model estimating the impact of deregulating petroleum downstream subsector and Nigeria’s economic growth was obtained from the public interest theory as postulated in the theoretical framework. The theory portrays regulation policy, PMS scarcity, hikes in price and subsidy payment have increased Nigeria’s external debt profile, decreased foreign reserve, increased fiscal burden have adversely affects economic growth.

The study employed the following indicators; quantity of premium motor spirit produced per litre (PMSP), quantity of premium motor spirit consumed per litre (PMSC), quantity of premium motor spirit imported per litre (IPMS), and price of premium motor spirit per litre (PPMS) as the independent (explanatory) variables to measure the impact of downstream oil deregulation while petroleum Gross Domestic Product (PGDP) as dependent (explained) variable to measure the performance of the economic growth. Here, petroleum Gross Domestic Product (PGDP) was proxy for the level of economic activities.

The functional form of the model for the study is specified as follows:

$$PGDP = F(\text{PMSP, PMSC, IPMS and PPMS}) \dots \dots \dots 3.10$$

Adopting a log-linear specification and assuming linearity among variables in order to removed serial correlation from the model and to reduce the variance, skewness and kurtosis statistics, thus, the multivariate specification of the model evolves as;

$$\begin{aligned} \Delta \ln GDP_t &= \alpha_0 + \varphi_1 \ln GDP_{t-1} + \varphi_2 \ln PMSP_{t-1} + \varphi_3 \ln PMSC_{t-1} \\ &+ \varphi_4 \ln IPMS_{t-1} + \varphi_5 \ln PPMS_{t-1} \\ &+ \sum_{i=1}^{k1} \sigma_{1i} \Delta \ln GDP_{t-1} \\ &+ \sum_{i=0}^{k2} \gamma_{2i} \Delta \ln PMSP_{1t-i} + \sum_{i=0}^{k3} \varepsilon_{3i} \Delta \ln PMSC_{2t-i} \\ &+ \sum_{i=0}^{k4} \vartheta \Delta \ln IPMS_{3t-i} + \sum_{i=0}^{k5} \vartheta_5 \Delta \ln PPMS_{4t-i} \\ &+ \mu_t \dots \dots \dots 3.11 \end{aligned}$$

#### Where:

$\alpha$  = is the intercept,  $U_t$  = error term.  $\gamma \varepsilon \Theta \sum$  are coefficients of short run dynamics,  $\Pi$  is the speed of adjustment.

**PGDP**= Petroleum Gross Domestic Product

**PMSP**= Quantity of PMS produced per litre

**PMSC**= Quantity of PMS consumed per litre

**IPMS**= Quantity of PMS imported per litre

**PPMS**= Price of PMS per litre

$\mu_i$  = Stochastic error term

$\theta_1, \theta_2, \theta_3$  and  $\theta_4$  are parameters of the variables

V. RESULTS

**Error correction Estimate for the Selected ARDL Model**

The result in table 1 shows the error correction specification restricts the long-run behaviour of the endogenous variables to converge to their cointegrating relationship while allowing a wide range of short-run dynamics. The size of the error correction term indicates the speed of adjustment of any equilibrium towards a long-run state since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustment. Moreover, the error correction Model parameter is (ECM), is negative, less than one and significant at 1% level. The coefficient of the ECM (-0.5785) measures the speed at which the level of economic growth adjusts to change in the explanatory variables in order to attain long run equilibrium and it can be said that it will take about 57% for the short run deviation to converge to the long run. This implies that the disequilibrium occurring due to a shock in petroleum subsector is totally corrected a rate of about 57 percent. Therefore it can be said that the speed of adjustment is low and this reflects the inefficiency in the downstream petroleum subsector over the years.

The ECM result indicates that the intercept of the equation is 6.0073; it represents the autonomous growth rate of the economy assuming all the independent variables are held constant. The coefficient value of PMSP which is 0.180 indicated that a positive and significant relationship at 5% exists between PMSP and PGDP. It shows that PGDP increases by 0.434 units as a result of a unit increase in domestic production of refined PMS, keeping all the other independent variables constant. The coefficient of PMSC shows that there is negative but significant relationship between PMSC and PGDP at 1% level. This implies that PGDP decreases by -0.758 units as a result of a unit increase in PMSC, keeping all the other independent variables constant. More so, the coefficient of IPMS revealed a negative association with PGDP, which means that a unit increase in IPMS will result to a decrease in PGDP by -0.208 when all other independent variables are held constant.

The value of the PPMS which is Price of Premium Motor Spirit reveals that the coefficient is -0.669, indicating that a negative and significant relationship at 5% level exist between PGDP and PPM. The result suggests that if all the independent variables are kept constant, there will be a decrease in petroleum GDP by -0.669 units as a result of a unit appreciation in the price premium motor spirit. This result contradicts a priori expectation, but it is not surprising; considering the fact that the Nigeria's petroleum refineries operate below capacity and hardly could they supply the product adequately to meet the domestic demand hence embark upon massive importation of the product that is based on import price parity.

The coefficient of determination  $R^2 = 0.97$  shows a 97% contribution of PMSP, PMSC, IPMS and PPMS. This implies that there is a strong linear dependency existing between deregulation variables and economic growth. The result also indicates that there is absent of first order auto-correlation since the Durbin-Watson value (2.1)

Table 1: Error correction Estimate for the Selected ARDL Model

[1] Regres	[2] Coeffici	[3] Stand	[4] T-	[5] Pro
sor	ent	ard	Rati	b.
		Error	o	
[6] dPGD P1	[7] 0.43444 ***	[8] 0.119 84	[9] 3.62 52	[10] 0.0 03
[11] dPMS P	[12] 0.18003	[13] 0.086 49	[14] 2.08 13	[15] 0.0 59
[16] dPMS P1	[17] - 0.36461 ***	[18] 0.083 84	[19] - 4.34 88	[20] 0.0 01
[21] dPMS C	[22] - 0.75844 ***	[23] 0.151 96	[24] - 4.99 11	[25] 0.0 00
[26] dPMS C1	[27] 1.0111* **	[28] 0.183 02	[29] 5.52 46	[30] 0.0 00
[31] dIPM S	[32] - 0.20835	[33] 0.126 80	[34] - 1.64 32	[35] 0.1 26
[36] dPPM S	[37] - 0.66917 ***	[38] 0.192 20	[39] - 3.48 17	[40] 0.0 05
[41] Dc	[42] 6.0073	[43] 6.712 3	[44] 0.89 49	[45] 0.3 88
[46] dTRE ND	[47] - 0.66917 ***	[48] 0.032 77	[49] 7.72 93	[50] 0.0 00
[51] ecm(- 1)	[52] - 0.5785* **	[53] 0.150 80	[54] - 9.14 14	[55] 0.0 00
[56] R- Square	[57] 0.97173	[58]	[59]	[60]
[61] DW- statisti c	[62] 2.1619	[63]	[64]	[65]

**Note:** \*\*\*, \*\* denotes significant at 1%, 5% level respectively

**Discussion of Results for Pairwise Granger Causality Test**

The granger causality test is presented in Table 5. The test was applied to determine the direction among PGDP, PMSP, PMSC, IPMS and PPMS. The result revealed that no causation was found to exist between PMSP and petroleum PGDP, no causation was found to exist between PMSC and petroleum PGDP and no causation existed between IPMS and petroleum GDP. Moreover, one-way causation was found to exist between PPMS and petroleum GDP and the causation flows from PPMS to petroleum GDP. This indicates unidirectional causality running from PPMS to PGDP which means that, it is price that granger cause petroleum GDP and not the other way round. This implies that the value of PPMS is useful in predicting the future value of PGDP.

More so, no causation was found to exist between PMSC and PMSP, no causation was found to exist between IPMS and PMSP. One-way causation was found to exist between PPMS and PMSP and the causation flows from PPMS to PMSP implying that the value of PPMS is useful in predicting the future value of PMSP.

**Table 2: Pairwise Granger Causality Test Results**

[66] Pairwise Granger Causality Tests	[67]	[68]	[69]
[70] Date: 02/09/17 Time: 11:38	[71]	[72]	[73]
[74] Sample: 1991 2014	[75]	[76]	[77]
[78] Lags: 2	[79]	[80]	[81]
[82] Null Hypothesis: PMSP does not Granger Cause GDP	[83] Obs	[84] F-Statistic	[85] Prob.
[86] PMSP does not Granger Cause GDP	[87] 22	[88] 0.67476	[89] 0.5224
[90] GDP does not Granger Cause PMSP	[91]	[92] 3.16088	[93] 0.0681
[94] PMSC does not Granger Cause GDP	[95] 22	[96] 0.73220	[97] 0.4954
[98] GDP does not Granger Cause PMSC	[99]	[100] 0.53316	[101]0.5962
[102] IPMS does not Granger Cause GDP	[103] 22	[104] 0.84377	[105]0.4473
[106]GDP does not Granger Cause IPMS	[107]	[108] 0.96853	[109]0.3996
[110] PPMS does not Granger Cause GDP	[111] 22	[112] 8.33284	[113]0.0030
[114]GDP does not Granger Cause PPMS	[115]	[116] 3.44586	[117]0.0554
[118] PMSC does not Granger Cause PMSP	[119] 22	[120] 1.61515	[121]0.2279
[122]PMSP does not Granger Cause PMSC	[123]	[124] 0.18893	[125]0.8296
[126]IPMS does not Granger Cause PMSP	[127] 22	[128] 0.67967	[129]0.5200
[130]PMSP does not Granger Cause IPMS	[131]	[132] 1.02997	[133]0.3783
[134] PPMS does not Granger Cause PMSP	[135] 22	[136] 3.47556	[137]0.0543

[138]PMSP does not Granger Cause PPMS	[139]	[140] 0.02538	[141]0.9750
[142] IPMS does not Granger Cause PMSC	[143] 22	[144] 0.02699	[145]0.9734
[146]PMSC does not Granger Cause IPMS	[147]	[148] 0.14588	[149]0.8653
[150] PPMS does not Granger Cause PMSC	[151] 22	[152] 1.74922	[153]0.2038
[154]PMSC does not Granger Cause PPMS	[155]	[156] 0.69833	[157]0.5111
[158] PPMS does not Granger Cause IPMS	[159] 22	[160] 0.83696	[161]0.4501
[162]IPMS does not Granger Cause PPMS	[163]	[164] 1.99028	[165]0.1673

**Source: Eviews 8**

Source: own computation

The following were deduced from the findings of the study.

- i. The study found a positive significant impact between PMSP and petroleum PGDP.
- ii. The study revealed a negative but significant impact between, PMSC, IPMS and PPMS with petroleum GDP
- iii. The study found a Two-way causation to have existed between PPMS and petroleum GDP and between PPMS and PMSP.
- iv. Finally, the hypothesis of the study tested revealed that PMSP, PMSC, IPMS and PPMS were jointly and statistically significant in impacting on the economic growth (proxy petroleum GDP).

**Summary of the findings and policy implications**

The empirical test results show that deregulation of the downstream petroleum subsector in Nigeria has brought a mixed impact on petroleum GDP in Nigeria.

The study uses the bound testing (ARDL) approach to cointegration to examine the impact of downstream oil deregulation nexus petroleum. The result showed that downstream oil deregulation exercise significantly influences Nigeria's economic growth. Moreover, among the control variables only price of premium motor spirit and domestic production of premium motor spirit are found to have long-run and short-run influence on the Nigeria's economic growth.

The granger technique was adopted to determine the direction of causality between determinants of downstream petroleum deregulation and Nigeria's economic growth. It was found that two-way causation exists between PPMS and petroleum GDP and between PPMS and PMSP, implying a bi-directional causality running from price of premium spirit to petroleum Gross Domestic Product. Also price of premium motor spirit to domestic production of the product.



## VI. CONCLUSION

From the discussion so far, it was clear that the current state of the deregulation of the downstream petroleum Sub-sector is adjudged as inefficient in service delivery and ineffective at promoting national developmental objectives.

One of the main finding emerging from this study indicates that deregulation of the downstream petroleum subsector in Nigeria does not lower price, although it enhanced availability of the product in the short run. Hence, it can be concluded that underutilisation of refineries constitutes major setback in reaping the benefit of deregulation. This is at variance with the hypothesis that deregulation leads to lower or zero benefit.(i.e the null hypothesis that says there is no significant impact between petroleum GDP and downstream petroleum deregulation is rejected).

Deregulation or Subsidy removal is a germane economic policy for sustainable democratic transformation of Nigeria, provided social vices like unethical marketing practices of middlemen in the purchase, and distribution of the petroleum products are removed. The corrupt practices of both officials of NNPC and government must be tackled head-on while the proceeds from the downstream should be used to provide social infrastructure. This will engender and accelerate self-employment, job creation and efficient mass transportation. With deregulation, subsidy, which has been a conduit pipe and source of fraud in Nigeria, will be a forgotten issue.

## VII. RECOMMENDATIONS

Having empirically examined the impact of downstream oil deregulation nexus petroleum, in the light of the major findings above, the following policy recommendations are proposed;

- i. Importation of refined premium motor spirit (IPMS) grossly affects the petroleum sector of the economy negatively; therefore total deregulation of the downstream sector must be gradually and consistently pursued to revive maximum result to all stakeholders and the nation. While that is being pursued, adequate infrastructure, especially refineries should be put in place. The four refineries already established should be maintained and made to operate at full capacity.
- ii. The free market is not everything. Effective as market forces are in optimizing the allocation of resources for short and medium term objectives, the market is to be short-sighted, not to respond spontaneously to long term signals. As the World Bank put it, "liberalising energy markets, however may not be the complete answer". Long-term and social signals should be introduced by government thereby promoting sustainability in the petroleum sector, while using market mechanism to the best of their potentials. Hence, while "deregulation" is needed to allow space for private initiative and competition, "re-regulation" is needed to establish a set of rules that allow the market to function properly by correcting the imperfections and by accounting for the social costs of the petroleum sector.

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