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ESTIMATING CAUSALITY BETWEEN PETROLEUM AND GAS SECTOR AND CONSTRUCTION SECTOR DEVELOPMENT: AN ECONOMETRIC APPROACH

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Abstract

Despite the fact that the construction industry contributes to the global economy, the majority of developing nations rely primarily on oil and gas resources. Consequently, this study examined the causa relationship existing between the construction industry and the petroleum and gas sector (PGS) in Nigeria. Time series data over 37-year period (1981–2017) was obtained from the Central Bank of Nigeria's statistical bulletin and estimated using econometric approach including causality, endogeneity, etc. The weak and strong exogeneity tests revealed that PGS has significant impact on construction industry while the short run causality test showed an insignificant impact. The study concludes that the PGS remain an enclave with little forward and backward linkages to the Nigerian economy and thus made non-commensurate contributions to the construction industry. The study therefore suggests that Nigerian government should embark on massive local content development to create extensive links between the PGS and all economic sectors.

Keywords - Construction sector, econometrics, economy, gross domestic product, Nigeria, oil and gas sector

Introduction

The resources of oil and gas have the potential to accelerate and transform any nation's economic and social development. Globally, the product of oil and gas is essential to the international community both in developed and developing countries (Wang, 2021; Khan et al, 2013). Besides, the activities of Petroleum/oil and Gas Sector (PGS) contributes to employment, gross domestic product, internationally traded commodity, innovation and so on (Cameron & Stanley, 2017). Hence, the oil and gas sector is vital and plays dominant role in the global economy (Akashraj and Mourwel, 2020) accounting for more than 70% world's energy consumption. Oil exports represent over 95% of the share of exports, about 41% of the GDP and about 86% of government revenue in 2005. With more than 37 billion barrels of proved reserves and daily output in excess of 2.4 million barrels, the petroleum and gas sector (PGS) has emerged as one of the greatest in the world. In Nigeria specifically, the petroleum and gas industry serves as the country's economic hub and has developed over time to become its single largest source of income and foreign exchange. As a result, Nigeria rises to the sixth-biggest member of OPEC and the eleventh-largest oil production in the world (Adeogun, 2021), becoming the largest country in sub-Saharan Africa (Orji et al., 2021; Terwase et al., 2014). However, the displacement of agriculture by the PGS in Nigeria created structural imbalances that impact long run economic growth and development. Firstly, despite the visible effect of oil production in terms of little real economy growth and increasing quality of life globally, Elwerfelli and Benhin (2018) submitted that most Nigerians still live in abject poverty. Secondly, the absolute reliance on oil made Nigeria the world's most oil-dependent economy but the most vulnerable to oil price shocks (Akinyetun et al, 2021; Olanipekun and Saka, 2019).

Although the construction industry is viewed as the main axis of infrastructural development and the sector that significantly contributes to the economic development, the petroleum and gas sector serves as the hub for other economic sectors (Godfrey & Oritsematosan, 2015). The construction industry as an economic sector makes a significant contribution to the economy's product, infrastructure development, and so on. Also, the construction industry contributes an average of over 3% annually to the GDP and instrumental in creating facilitates infrastructure development and fosters industrialization (Faminu, 2021). However, the construction industry is faced with some challenges such as operating environment, poor local content, volatile and/or declining gross domestic product contribution and, project cost and time overruns, etc. (Ojo et al, 2020; Abubakar et al, 2018). In addition,

the persistent oil price shocks have negatively affected investment particularly construction and growth (see Detail Commercial Solicitors, 2018; Malden, 2017; Alawode and Omisakin, 2011).

In the effort to create an efficient Construction Sector (CNS) and address these challenges in Nigeria, studies have explored the linkage between the construction industry and other sectors. Saka and Lowe (2010) examined the connections between the construction industry and other economic sectors in Nigerian using econometric method and discovered that the construction industry is crucial since it greatly outperforms other economic sectors. Also, Anyanwu et al. (2013) and Yusuf (2016) investigated the relationship existing between the construction industry and the economy, and revealed that the construction industry is a contributor to the Nigerian economy though the contribution is minimal. This is affirmed by Ruddock et al. (2019) that the construction industry is one of the least productive sectors in the economy. However, all these studies do not demonstrate how the oil and gas sector affect the construction industry. Notwithstanding, it is noteworthy that the construction industry contributes significantly to the economy (Murillo et al., 2019) despite the fact that Nigeria's Petroleum and Gas Sector (PGS) is the main driver of the country's economy. In addition, given that the PGS is a hub for all other industries, it may have the potential to support the construction industry's rapid expansion and development. As such, it is critical to ascertain how the PGS and the expansion of Nigeria's construction industry are related. Hence, as oppose to the existing studies which concentrated on how the petroleum sector affects the economy and macro-economy, this current study examined the causal effect of the PGS on the growth of the CNS.

Literature Review

The Operation of Petroleum/Oil and Gas Sector (PGS)

In the global community, the petroleum/oil and gas resources are important products that are beneficial to the globe (Lalude, 2015). The Petroleum and Gas Sector (PGS) involves all activities within the petroleum and gas sector including mining (upstream) manufacturing, transport as well as wholesale and retail trade (downstream) (Adeogun, 2021; Oyebode, 2021). The PGS grew rapidly and subsequently replaced agriculture as Nigerian largest revenue and foreign exchange earner in the mid-1970s following the Yom Kippur war in 1973. The expansion in PGS brought huge earnings to Nigeria that are used to ease foreign exchange constraints and development.

The operations of the PGS are classified into downstream (refining, marketing, and servicing) and upstream (exploration and production, or E&P) sub-sectors (Oyebode, 2021; Yakubu, 2017). Since the 1970s, activities in the upstream sub-sector have been impacted by market trends, restiveness in the Niger Delta and funding (UNDP, 2001). Recently, oil production is rapidly rising due to the development of deep-water offshore fields under the production sharing contracts. Also, Nigeria is developing capacity to liquefy and export gas, which further raises PGS revenues (Sweetcrudereport (SCR) 2018; Aigbedion and Iyayi, 2007).

The Construction Sector

The economy's expansion and growth are considerably aided by the construction industry. In developing countries, the construction industry is a strategic and dynamic industry due to the variety of activities contributed to the economy. The contribution is reflected in basic development objectives such as the creation of employment, gross domestic product, income generation and so on. In sub-Sahara Africa, there is short and long-term positive relationship between the growth of the economic and construction expenditure (Osei et al, 2017). Studies have investigated the connection between the economy and the building sector, particularly in emerging nations. According to Dakhil (2013), there is symbiotic relationship existing between the economy and Libya's construction industry though the influence of GDP on construction industry is short-term while the impact of the construction industry on the GDP is long-term. Ramachandra et al (2014) submitted that the construction sector in Sri Lanka contributes about 60% of the GDP in the economy and using causality test, it was discovered that construction activities determines economic activities. Erol and Unal (2015) stated that the construction is the sixth largest sector of the Turkey economy but discovered that the relationship existing between the GDP of the economy and the construction sector time-based. On the contrary, Dlamini (2018) established that there exists no linkage between the economy and the construction investment in South Africa.

Due to extensive reconstruction after the civil war (1967–1970) and rising oil earnings after the oil boom of 1973–1974, Nigeria's construction industry experienced tremendous growth in the 1970s. Recently, the construction sector has increased its GDP and domestic fixed capital contributions by up to 10% and 60%, respectively (Saka and Olanipekun, 2020). The significant annual spending on the provision of infrastructure to support socioeconomic development makes the significance of the construction sector in national life clear (Okoye et

al, 2016). The relationship between the construction sector and the economy in Nigeria have been extensively investigated.

Methodology

The study adopted econometric methodology to ascertain the influence of the Petroleum/oil and Gas Sector (PGS) on the development of the Construction Sector (CNS) in Nigeria. Specifically, the study tested time series data on the impact of PGS revenues on construction industry outputs using Vector Autoregression (VAR). The time series data of the construction industry, GDP, and PGS used in this analysis were extracted from the statistical bulletin of the Central Bank of Nigeria, volume 28 published in 2017. The data was centred on 2010 constant Nigerian Naira and covers a thirty-seven (37) year period from 1981 through 2017. The Vector Autoregression (VAR) techniques involve sequential tests and procedures such as unit root, cointegration, causality and exogeneity tests, Forecast Error Variance Decomposition (FEVD) and Impulse Response Function (IRFs). When using the Vector Autoregression (VAR) approaches, unit root, cointegration, causality, and exogeneity tests, forecast error variance decomposition, and impulse response function are the sequential tests and procedures that are adopted.

The univariate Autoregression (AR) model is extended to multivariate time series data using vector autoregression. The ability of the VAR model has been confirmed over time to forecast, policy analysis and structural inferencing of time series data in economic situations (Patterson, 2000; Hall, 1994). Hence, the Vector AutoRegression model becomes the basic technique for this study's analysis of multivariate time series data. Here, in order for the short run analysis of time series data in I to 3 that are co-integrated to modify the divergence from its long run equilibrium, the Vector AutoRegression was adopted by adding the error correction term Ɛ. This led to vector error correction model, which involves adjusting estimates of short-run dynamics and the long-run equilibrium (Engle and Granger, 1987). Equations 1 through 3 describe the model with vector error correction;

$$\Delta LCNS_t = \phi_1 + \sum_{i=1}^{p-1} \beta_{11i} \Delta LCNS_{t-i} + \sum_{i=1}^{p-1} \beta_{12i} \Delta LPGS_{t-i} + \sum_{i=1}^{p-1} \beta_{13} \Delta LGDP_{t-i} + \alpha_{11} ECT_{t-i} + \varepsilon_{1t} \quad (1)$$

$$\Delta LPGS_t = \phi_2 + \sum_{i=1}^{p-1} \beta_{21i} \Delta LCNS_{t-i} + \sum_{i=1}^{p-1} \beta_{22i} \Delta LPGS_{t-i} + \sum_{i=1}^{p-1} \beta_{23} \Delta LGDP_{t-i} + \alpha_{21} ECT_{t-i} + \varepsilon_{2t} \quad (2)$$

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$$\Delta LGDP_t = \phi_3 + \sum_{i=1}^{p-1} \beta_{31i} \Delta LCNS_{t-i} + \sum_{i=1}^{p-1} \beta_{32i} \Delta LPGS_{t-i} + \sum_{i=1}^{p-1} \beta_{33} \Delta LGDP_{t-i} + \alpha_{31} ECT_{t-i} + \varepsilon_{3t} \quad (3)$$

Where i=1…N to lag, t=1….T represents the time; is the uncorrelated error term while ECT denotes the lagged error term from long-run relationship.

Where i=1...N corresponds to lag, ECT stands for the lagged-error term, t=1,...T stands for the time and ε_t is the nonstationary error term.

Co-integration Analysis

Granger (1981) proposed the idea of co-integration to address the problems associated with spurious regression, which are a common difficulty when modelling time series data (Yule, 1926). When two or more non-stationary time series data are combined linearly to create a stationary time series, co-integration is utilized. Engle and Granger (1987) tested the stationarity or unit root of the residual of the co-integration equation to create the first co-integration test. In this study, the VAR-based co-integration tests developed by Johansen and Juselius (1992) and Johansen (1995) are used to assess the co-integration limits on the unrestricted VAR. The co-integration tests, which demand that the co-integrating time series data be integrated of the same order, are preceded by the test for unit root or stationarity (Ghirmay, 2004). The idea that time series data are stationary serves as the foundation for time series models. Thus, the unit root test is the common method for determining if a series is stationary.The two tests of unit root used in this study are the Phillips-Perron (PP) and augmented Dickey-Fuller (ADF) as suggested by previous studies (Leitner, and Fischer, 2000; Phillips and Perron, 1988; Dickey and Fuller, 1979, etc.).

Causality and Exogeneity

Exogeneity is the quality of being "determined" outside the model under investigation, whereas causation explains the relationship between economic factors. The short run Granger causality, long run weak exogeneity test, and long run strong exogeneity test are computed using the vector error correction model. The Granger causality test, on the other hand, is a statistical test for assessing if time series data can predict another in the short term (Granger, 1969). Conversely, the ideas of weak, strong, and super exogeneity relate current variables to relevant parameters, conditional inferences, and forecasting, respectively (Hendry, 1980). In this study,

the three causality test were adopted to estimate possible causal effect of the revenues of petroleum/oil and gas sector on construction industry outputs.

Results

Line graph

The line diagram showed that the time series data from 1981 to 2017 displayed a parallel and oblique trend. Between 1981 and 2003 both the GDP and PGS almost follows the same pattern of growth. However, between 2004 and 2015 the GDP moved positively while the PGS grew negatively. The CNS remains almost flat on the horizon until 1998 when growth began to increase through to 2017(see, Fig. 1).

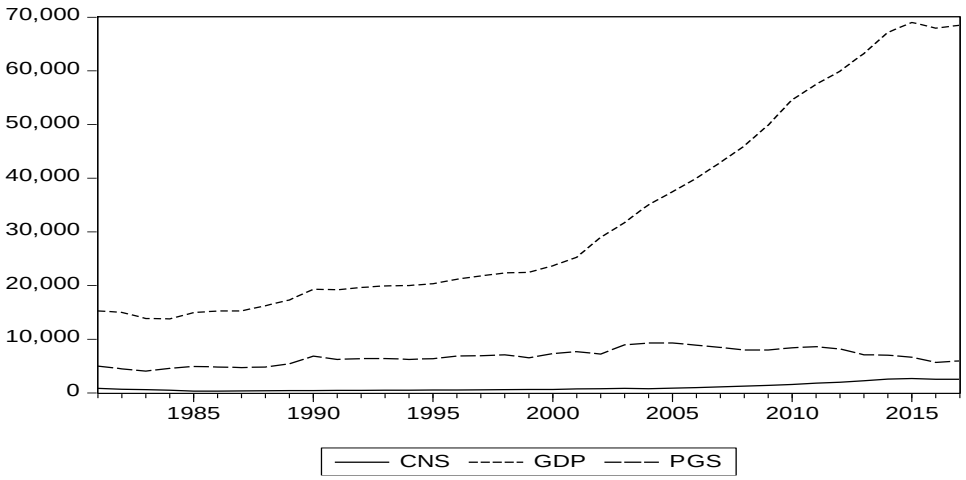

Figure 1: Diagonal Line Graph of CNS, GDP and PGS

Descriptive Statistics

The result in Table 1 showed the descriptive statistics on Petroleum/oil and Gas Sector (PGS), Construction Sector (CNS) and the Gross Domestic Product (GDP) and the. The statistics indicated that the GDP is the largest with a mean and standard deviation of 32749.950 and 18889.200 respectively while the CNS has the lowest mean and standard deviation of 1002.612 and 725.540 respectively.

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Table 1: Statistics of CNS, GDP and PGS

	CNS	GDP	PGS
Mean	1002.612	32749.95	6730.875
Median	679.2004	22449.41	6831.768
Maximum	2680.216	69023.93	9294.051
Minimum	335.7586	13779.26	4052.978
Std. Dev.	725.5399	18889.20	1471.115
Skewness	1.241479	0.801592	-0.009323
Kurtosis	3.145888	2.141006	2.052787
Jarque-Bera	9.537309	5.099938	1.383738
Probability	0.008492	0.078084	0.500640
Sum	37096.65	1211748.	249042.4
Sum Sq. Dev.	18950694	1.28E+10	77910423
Observations	37	37	37

Estimates of Stationarity Test

From the result, only the GDP is non-stationary at 1st difference based on the Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF) tests in difference and level. The ADF and PP tests showed that the CNS and PGS are both stationary at first difference (see Table 2). The time series data were subsequent converted into the natural logarithm, and the stationarity test was then repeated. The result on Table 2 also presented the stationarity test using logged data and indicated that the LCNS and LGDP are stationary at level I (0) with ADF with trend. Whereas at first difference I (1), the LPGS is stationary with or without trend for the PP and ADF tests. In summary the LCNS and LGDP are I (0) while the LPGS is I (1). This implied that the co-integration test is therefore crucial since at level 1, not all time series data are stationary.

Table 2: Result of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) Tests

		ADF Test at level		**ADF Test in 1st difference**		**PP Test in level**		**PP Test in 1st difference**		
S/no.	Series	No trend	With trend	No trend	With trend	No trend	With trend	No trend	With trend	Concl
1	CNS	0.9633	0.7613	0.0476	0.1375	0.9984	0.6539	0.0558	0.1421	I(1)

2	GDP	0.9624	0.2873	0.1650	0.3552	0.9997	0.7765	0.1875	0.3841	I(2)
3	PGS	0.5686	0.9728	0.0001	0.0001	0.5529	0.9728	0.0001	0.0001	I(1)
4	LCNS	0.9317	0.0612	0.0182	0.0634	0.9732	0.0025	0.0221	0.1342	I(0)
5	LGDP	0.9953	0.0273	0.0205	0.0899	0.9937	0.2968	0.0298	0.1235	I(0)
6	LPGS	0.5630	0.9714	0.0001	0.0001	0.5630	0.9750	0.0001	0.0000	I(1)

Estimates of Co-Integration Test

The result on Table 3 showed the co-integration tests with the null hypothesis indicating that there is no co-integrating equation and the alternative hypothesis indicating that there is equation. The results of co-integration tests on Table 3 indicated that there is no co-integrating equation under the null hypothesis but otherwise under the alternative hypothesis. The results showed that the Eigen value and trace statistic both rejected the null hypothesis with zero co-integration equation at less than 5% significant level (p = 0.002). Hence, the presence of co-integration indicates that the time series data and causal relationship defined by the vector error correction model have a long-term equilibrium simultaneous linkage.

Table 3: Co-integration Test for LCNS LGDP LPGS

Hypothesized No. of CE(s)	**Eigen-value**	**Trace Statistic**	**0.05Critical Value**	**Prob.**	**Max-Eigen Statistic**	**0.05Critical Value**	**Prob.**
None	0.464089	32.98707	29.79707	0.0207**	21.83256	21.13162	0.0398**
At most 1	0.266844	11.15451	15.49471	0.2022	10.86389	14.26460	0.1611
At most 2	0.008269	0.290620	3.841466	0.5898	0.290620	3.841466	0.5898

* * represent rejecting the hypothesis at 0.05 level.

Causality and Exogeneity Tests

To ascertain the direction of the causality between the petroleum/oil and gas and the construction sectors of the economy in Nigeria, hypotheses were tested. The null hypotheses states that the Nigerian Construction Sector (CNS) do not cause the Petroleum and Gas Sector, and that the PGS do not cause the development of CNS. The Table 4 presented the short-run granger causality estimates and the result revealed that there is causality between LCNS, LGDP

and LPGS. The LGDP significantly Granger caused the LCNS χ =9.058376, p-value =0.002615; and the LCNS also significantly Granger caused the LGDP χ= 6.286385, p-value=0.012167. This implied that there exists bidirectional causal linkage between the economy and the construction industry. Also, LCNS Granger caused the LPGS χ=6.286388, p-value =0.012167 but the LPGS does not Granger caused the LCNS (p = 0.765), indicating unidirectional causality between the petroleum/oil and gas and construction sectors. Furthermore, the LGDP also granger caused the LPGS χ=9.058378, p-value =0.002615 while the LPGS does not significantly Granger caused the LGDP indicating a unidirectional causality existing between the economy and the petroleum/oil and gas sector.

On the other hand, evidence was provided by the weak exogeneity estimates in the long run indicating that the LCNS, LPGS, and LGDP are not weakly exogenous in the system χ= 4.589204, p-value= 0.032174; χ= 9.789890, p-value=0.001755; and χ= 2.828242, p-value= 0.092620 respectively. This implied a bidirectional long run causality relationship existing between the time series data. Although the no causal effect of LPGS on LGDP cannot be rejected, the long run strong exogeneity testing estimates show that all null hypotheses are rejected. This implied an insignificant long run causality between the petroleum/oil and gas sector and the economy.

Table 4: Causality and Exogeneity Tests

	Null hypothesis	**Chi-Square**	**Prob.**
1.Granger causality			
a. LGDP→ LCNS	$b_{13}=0$	9.058376	0.002615***
b. LCNS →LGDP	$b_{32}=0$	6.286385	0.012167**
c. LPGS →LCNS	$b_{13}=0$	0.089333	0.765027
d. LCNS →LPGS	$b_{22}=0$	6.286388	0.012167**
e. LPGS →LGDP	$b_{33}=0$	0.089325	0.765037
f. LGDP →LPGS	$b_{23}=0$	9.058378	0.002615***
2. Weak exogeneity test			
a. LCNS	$a_{11}=0$	4.589204	0.032174**
b. LPGS	$a_{12}=0$	9.789890	0.001755***
c. LGDP	$a_{13}=0$	2.828242	0.092620*
3. Strong exogeneity test			

a. LGDP→ LCNS	$B_{13}=a_{11}=0$	9.169727	0.010205**
b. LCNS →LGDP	$B_{32}=a_{13}=0$	7.624068	0.022103**
c. LPGS→ LCNS	$B_{12}=a_{11}=0$	5.281930	0.071292*
d. LCNS→ LPGS	$B_{22}=a_{12}=0$	25.42877	0.000003***
e. LPGS →LGDP	$B_{33}=a_{13}=0$	3.311283	0.190970
f. LGDP→ LPGS	$B_{23}=a_{12}=0$	24.95301	0.000004***

*, **, and *** denotes rejecting the null hypothesis at 10% 5% and 1% respectively.

Discussions of Results

This study investigated the causal linkage between the revenues of the petroleum/oil and gas sector and the outputs of the construction industry. Through the estimates, the result reveals that in one direction, the linkage between GDP and the Nigerian Construction Sector (CNS) (GDP→CNS) causality test indicates a short-term significant contribution of the GDP on the CNS. Similar to this, the long-term results of the weak and strong exogeneity tests show that the GDP greatly contributed to the CNS. In the opposite way, the short run causality test's conclusion that there is a significant causal relationship between the CNS and GDP (CNS→GDP) i.e, the CNS significantly caused the GDP. Similar to this, the results of the long run weak and strong exogeneity tests indicate that the CNS has a large causal impact on GDP. In summary, there is a two-way interaction between the economy and the construction industry. The impact of CNS on the GDP can be explained through the nexus of investment. Investment like construction is one of the engines of growth in developing economies. The GDP or economic activities is a critical component of construction demand function. As a result, the growth of the construction industry is greatly influenced by the state of the economy. Besides, the macroeconomic situation and the construction industry are intricately linked. (Okoye, 2018; Erol and Unal, 2015). However, this aspect of the result is not the main focus or aim of this current study. The premise being that this finding has been established by international studies in Sri Lanka, UK, Turkey, South Africa, etc (Pheng and Hou, 2019; Dlamini, 2018; Erol and Unal, 2015; Ramachandra et al, 2013); and in Nigeria (Saka and Olanipekun, 2020; Okoye et al, 2018; Olandinrin et al, 2012).

Furthermore, the link between the Petroleum and Gas Sector (PGS) and GDP causalities through the short-run test indicates insignificant effect of the PGS on the GDP. In the long-run, the weak exogeneity test depicts that the PGS largely caused the GDP whereas the strong exogeneity test indicates that the PGS insignificant impact the GDP. Summarily, only the weak

exogeneity test returned a significant causal effect of petroleum and gas sector on the GDP of the economy. On the other direction, the causal link between GDP and PGS in short run indicates that the GDP greatly caused the PGS. The long run weak and strong exogeneity tests shows that the GDP significantly caused the PGS. This implies that the GDP creates demand for investment in both the upstream and downstream subsectors of the PGS. All investments in the PGS except from the IOCs (foreign investments) are sourced from the national economy. Due to the policy of local content development, there is increasing interest in the PGS (Udok et al, 2020; NNPC, 2005a).

More specifically, the study reveals that a unidirectional causal relationship exists between the petroleum/oil and gas and the construction sectors. In one direction, the linkage between PGS and CNS in the short run through causality test shows that PGS do not influence or contribute to the development of CNS. This was established by Khan et al (2013) that there is no linkage existing between Malaysia's construction and, oil and gas sectors. However, Al-Tabtabai and Soliman (2021) submitted that the oil sector in Kuwait has causal relationship with the construction sector in terms of the capital and infrastructural projects. Notwithstanding, the result of this current study on the long run weak and strong exogeneity tests indicates significant causal effect of the PGS on the CNS. On the other hand, the short-term relationship between the CNS and PGS suggests that the CNS largely contributed to the PGS. Likewise, the long-term results of the weak and strong exogeneity tests also indicate that the CNS considerably contributed to the PGS. This is reflected in how the CNS relates closely to the PGS mostly through the downstream operations. Globally, the construction sector with active participation serve as EPCs of oil and gas facilities construction which include petrol and gas stations, pipeline, depot, refineries, gas plant and petrochemical complexes (Suppramaniam and Ismail, 2020; Kassem et al, 2019; Okoye, 2018; Tsiga et al, 2017).

The observed minimal causal impact of the PGS on the CNS and GDP may not be too surprising given the enclave nature of the PGS in the economy (Soremi, 2019; Opalo, 2014). The PGS has low local content and thus little backward and forward connections in the Nigerian economy since it is being dominated by International Oil Corporations (IOCs). Because of the massive involvement of IOCs, most of the values adding activities are sourced from foreign Oil Service Corporations (OSCs). There is a tendency for IOCs to isolate the PGS from the rest of the economy due to the highly capital-intensive nature of the PGS coupled with the significant vertical integration of IOCs. Other factors such as volatility of the international oil market and economic instability, crowding out agriculture and manufacturing, Dutch

disease (Adetutu et al., 2018), corrupt practices (Adamolekun, 2020), sparking violent conflicts (Elwerfelli and Benhin, 2018; Ogbonifo, 2015), negative social and environmental impact (Soremi, 2019), undermining democracy, the use of joint venture (JV) instead of Production Sharing Contract (PSC) and low refining capacity which necessitates the importation of refined products may have also contributed to the negative effect of the PGS on the CNS & GDP. However, given that the PGS is the single greatest source of revenue in the Nigerian economy (86%), it is possible to explain the observed considerable impact of the PGS on the CNS & GDP. As a result, the PGS is the primary driver of public spending on governance and capital goods, such as construction (Saka and Olanipekun, 2020).

Conclusion and Implications

As other sectors of the economy are dependent on the petroleum and gas sector, there is possible causal relationship between them. In this study therefore, the causal relationship between the Construction Sector (CNS) and the Petroleum/oil and Gas Sector (PGS) in Nigeria was examined by analyzing time series data with an econometric technique. From the results of the estimation obtained, the study found that the PGS has no substantial impact on the construction sector in the short run through the granger causality test but in the long run, the weak and strong exogeneity tests revealed that the PGS has a considerable impact on the sector. It is noteworthy that the PGS provide government revenue for construction expenditure whereas its enclave nature delays or denies the economy maximum benefits of its potential. In order words, the short-term effect of the PGS on the GDP is insignificant but significant in the long run.

Also, the effects of the GDP on the CNS & PGS are significant. The GDP generate employment, income, saving and investment demand for both the construction sector and the PGS though the foreign investment demand of the PGS is significantly driven by the IOCs. In addition, the effects of the CNS on the GDP & PGS are significant. Up to 10% of the GDP, about 50% of DFC production, up to 20% of employment, and significant ties to numerous other economic sectors are all contributed by the construction industry. Also, engineering, procurement and construction (EPC) contractors provide significant services to the PGS both in the upstream and downstream operations. Furthermore, the study established the importance of the PGS to the CNS and the GDP growth. The mixed effects of the PGS on the CNS imply that the potentials of the PGS in Nigeria as the largest revenue and foreign exchange earner are

regrettably underutilised. The PGS remained an enclave in Nigeria and thus unable to help pull most sectors especially the construction sector through backward linkages.

Therefore, the study suggests that government should embark on massive local content development to create extensive forward and backward links of the PGS to all economic sectors in Nigerian. With significant improvement in local content development (LCD) in the PGS, it is obvious that PGS related activities will encompass a number of sectors including the construction sector. Also, the construction sector stands to gain significantly by servicing the PGS in related construction including pipeline, refineries, petrochemicals, gas plant, platforms and depots etc. Moreover, the Nigerian indigenous construction contractors stand to have the potentials to be among the best through implementation of global best practices due to years of active involvement in PGS-related construction and meeting the global standard of the International Oil Corporations (IOCs). Finally, Nigeria must improve on transparency and due process in the PGS by working with interest group such as the UK's extractive industries transparency initiatives to build international confidence in the PGS.

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