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Trade Openness and Petroleum and Natural Gas Sub-Sector Growth in Nigeria

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Abstract: *Trade openness is adjudged a potent driver of industrial growth. But the Nigerian case is different, empirical evidence show that about 70 to 97 percent of the major products of the industry are imported for domestic consumption indicating that the industry is under performing. Hence, the study examines the impact of trade openness on petroleum and natural gas sub-sector growth in Nigeria from 1981 to 2020. Auto Regressive Distributed Lag (ARDL) econometrics technique was employed in the analysis of the study. The ARDL Bound Test Co-integration, ADF unit root test and some diagnostic tests were conducted. The results of the short run analysis revealed that trade openness triggered the performance of the petroleum and natural gas sub-sector. Foreign direct investment and Foreign portfolio investment were not positively related to petroleum and natural gas sector during the period under consideration. Based on these findings, the study recommended that government in Nigeria should reduce duties on the import of capital goods into the petroleum sub-sector to improve local refining to enhance the export of refined products; promote peace and security in the oil-bearing regions through holistic development as this could attract more foreign investors into the industry. Also, government should encourage modular refineries to complement the main refineries.*

Keywords: trade openness, petroleum and natural gas, economic growth

INTRODUCTION

The petroleum and natural gas sub-sector are the back bones of the Nigerian economy. Appah, (2022) observed that petroleum and natural gas are the foremost export products of the nation, Nigeria is one of the African largest oil and gas producers, with over two million barrels per day in 2016. Nigeria possesses the largest oil and gas reserves in sub-Saharan Africa, with an estimated 37 billion barrels of oil and 188 trillion cubic feet of gas. The export earnings of the nation are largely determined by oil export.

Despite being one of the African giants in crude oil production, Nigeria has a history of importing about 70 to 97 percent of refined petroleum products (PMS, diesel, aviation fuel, kerosene, lubricants, base oils etc) for its domestic consumption. This is a red flag, it is an indication that despite its huge contributions to GDP, the sub-sector is under-developed. The

Nigerian extractive industries transparency initiative (NEITI) reported that Nigeria imported over 97% of its refined petroleum products between 2015 to 2020 (NEITI 2021), this position was collaborated by World Bank (2021**)** as it observed that NNPCL relied mostly on imported PMS to supply the domestic market. This dependence stems from decades of non-functional or under-performing refineries (Port Harcourt, Warri, Kaduna) and insufficient domestic refining capacity (Deloitte (2022).

According to Njoku et al (2025**)** the Nigerian petroleum industry is bedeviled by a number of challenges, including outdated and under-performing refineries, poor infrastructure, insecurity in the host communities, corruption and misappropriation of revenue, excessive dependent on imported petroleum products for domestic consumption. To this end, the study seeks to explore the impact of trade openness on petroleum and nature gas from1981 to 2020. The remaining aspect of the investigations are presented thus: theoretical review, empirical review, methodology of study, conclusion and policy recommendations.

THEORETICAL REVIEW

This study is hinged on Heckscher-Ohlin theory. In the 1930's, the Swedish economists Eli Heckscher and Bertil Ohlin developed a mathematical model for international trade. This Model is also called the H-O model or the 2x2x2 model. It is a general mathematical model that reveals that it is best for countries to concentrate in the production and exportation of commodities they have surplus factors of production. The Model makes it possible to find the trade balance between two countries. Each country has its own natural resources and specific area of production. The theory argues that countries will produce and export goods in which it is relatively abundance in the factors of production. Countries gain from trade openness because it expands consumption and efficient use of productive capacities. According to Kerebana and Orlu (2021), "some of the major assumptions of the model are: Only two countries, two factors of production, two products, natural resources endowment defers among countries, identical technological level between the countries, perfect competition, zero transportation cost and no trade restrictions etc".

Some of the proponents of the model are: Haberler (1982) in Baldwin (1982) opined that the theory gives attention to space factor in international trade through factor endowments of trading countries which the classical comparative cost theories fall short of in analyzing the reason for international trade. Again, after empirically subjecting the Heckscher- Ohlin theory to test using data from Croatia and the rest of European union members' states concluded that the relationship between import, export and economic growth were positive for both Croatia and the rest of EU members' states. This buttresses the Heckscher- Ohlin theory of international trade. Weida et al. (2015) argued in support of the Heckscher-Ohlin theory that international trade and FDI affects the economic growth of the BRICS (Brazil, Russia, India, China and South Africa) countries positively.

However, the Heckscher-Ohlin theory has been widely criticized based on its assumptions. For instance, Feenstra (2025) and Krugman et al (2025) observed that the H-O model's assumptions of identical technology; constant returns and mobility of factor across nations make it less equipped for modern technology-driven trade environment.

Empirical Review

Obisike et al (2022) studied the impact of oil trade on Nigeria's oil sector growth and adopted a simple OLS techniques in the analysis. The result revealed that export exceeded import within the study period. This means that, Nigeria should make concerted effort to increase the exportation of petroleum products and should ensure that the refineries are fixed to produce at full capacity in other to achieve zero import of refined petroleum products.

Longe et al. (2019) exploited the relationship between oil price, trade openness, current account balances, and the official exchange rate in Nigeria from 1980 to 2016, using the non-linear auto-regressive distributed lag (NARDL). The findings of the study show that trade openness manifested positive changes in the prices of petroleum products in the short-run and long-run. The study recommended that trade policies should be reviewed to attract other sectors that will trigger the appreciation of the naira.

Tawfik et al. (2019) examined the impact of economic growth and trade openness on energy consumption in Egypt from 1971 to 2014. The study suggested that both economic growth and trade openness have asymmetrically affected energy consumption in both the long and short runs and recommended that the Egyptian government should redirect energy consumption from fossil fuel to renewable energy.

Arif et al. (2017) evaluated the impact of trade on energy consumption in oil-importing Asian countries (Pakistan, India, China, and Bangladesh) from 1972 to 2011 using CD-test, CIPS panel unit root test, Panel co-integration, and Pooled Mean Group estimates approaches. The results of the study indicated that there is a positive Long-run relationship between trade openness and energy consumption.

Hussaini et al. (2017) evaluated the impact of both oil and non-oil foreign direct investment (FDI) on economic growth in Nigeria for the period between1980 and 2015 using ordinary least squares (OLS) technique. The result from short-run and long-run elasticity analysis indicated that non-oil FDI has a positive effect on the growth of GDP while oil FDI manifested a negative effect on the economy due to the high-profit repatriation and low level of domestic employment in the sub-sector. The study suggested that measure should be taken to increase inflows of FDI in the non-oil sectors.

Bala and Mairiga (2016) investigated the role of trade openness and oil price on the exchange rate in Nigeria. The study used an autoregressive distributed lag (ARDL) bounds testing approach to co-integration based on annual time series data from 1982 to 2014. The study found that exchange rate negatively impacts trade openness in both the short run and long run, while oil price was negative and insignificant in the long run. The study recommended that the Nigerian economy should be diversified. Particular attention should be directed to the non-oil sectors for example agriculture, mines, industry and manufacturing to avoid the negative aftermath of over-dependence on oil and its price volatility on the Nigerian economy.

Solarin and Shahbaz (2015) investigated the natural gas sector, trade openness, and economic growth, including foreign direct investment and capital in Malaysia from 1971to 2012. The structural break unit root test and ARDL bounds test were employed. The study established

that natural gas consumption, foreign direct investment, capital formation, and trade openness have a positive influence on economic growth in Malaysia.

Umaru et al. (2013) examined the impact of trade openness on the Performance of the petroleum and solid minerals sub-sectors of the Nigerian economy from 1970 to 2009 using the comparative analysis of Average Annual growth rates. The study indicated that trade openness hurt petroleum, and solid minerals but have a positive impact on the overall performance of the economy which is measured by GDP. The study recommended that policy measures should be taken to boost the performance of the petroleum and solid mineral sub-sectors of the Nigerian economy.

Kareem et al. (2012) studied the impact of foreign direct investment on the oil sector in Nigeria and its attendant impact on economic growth using the co-integration analysis. The results of study revealed that foreign direct investment affected GDP negatively. The impact of domestic capital formation was relatively small compared to the impact of foreign direct investment in the oil sector. The study recommended that locals should be encouraged to invest in the oil sector of the Nigeran economy to reduce the dominance of foreign investor in the sector.

EVALUATION OF LITERATURE REVIEWED

The relevant literature revealed that no previous study known to this review conducted a study on the impact of trade openness and petroleum and natural gas sub-sector growth in Nigeria. For instance, Obisike et al (2022) studied Impact of oil trade on Nigeria's oil sector growth, Longe et al. (2019) examined the relationship between oil price, trade openness, current account balances, and the official exchange rate in Nigeria, Hussaini et al. (2017) assessed the impact of both oil and non-oil foreign direct investment (FDI) on economic growth in Nigeria among others.

METHODOLOGY OF STUDY

The ex-post facto research design was employed in carrying out the study since the study is a retrospective analysis of the variables. Major tools for analysis were descriptive and econometric approaches (graph, unit root test, co-integration Test, Bound Test and ARDL). The study equally, carry out some diagnostic test (normality test, and Parameter Stability test).
Model Specification

$$PNG = f(TPN, FDI, FPI, RMT, EXR) \quad (1)$$

Where;
PNG = Petroleum and Natural Gas Industry
TPN = Trade Openness
FDI = Foreign Direct Investment
FPI = Foreign Portfolio Investment
RMT = Foreign Remittances
EXR = Exchange Rate
The explicit econometric forms of equations (1) is stated as follows:

$$PNG = \beta 0 + \beta 1TPN + \beta 2FDI + \beta 3FPI + \beta 4RMT + \beta 5EXR + \mu t \quad (2)$$

$\beta 0$ = Intercept

β1- β5 = coefficients and
μ = Error term

On a priori:

β1>0, β2>0, β3>0, β4>0 and β5<0

Thus,

$\frac{\partial PNG}{\partial TPN} > 0$, $\frac{\partial PNG}{\partial \text{FDI}} > 0$, $\frac{\partial PNG}{\partial \text{FPI}} > 0$, $\frac{\partial PNG}{\partial \text{FPI}} > 0$, $\frac{\partial PNG}{\partial \text{RMT}} > 0$ and $\frac{\partial PNG}{\partial \text{EXR}} < 0$

RESULTS AND DISCUSSION

Descriptive Statistics

The upward trending of PNG in figure 1 above is an indication of inconsistency in the performance of the sub-sector. It slightly dropped from 5.92 billion naira in 1981 to 5.24 billion naira in 1984 and peaked up steadily from 15.48 billion-naira in1987 to 67.50 billion naira in 1991 and continue rising to 1266.67 billion naira in 2000. However, the value shrank two years later to 1,042.00 billion naira in 2002 and again increased to 1,588.09 billion naira in 2003. PNG swung upward from 2,460.55 billion naira in 2004 to 5,270.01 in 2008 and dropped to 4,297.07 billion naira in 2009, from which it awesomely double up to 8,402.68 billion naira in 2010 and progressed rapidly to 11,315.03 billion naira in 2012 but fell drastically by 47.44 percent to 5,367.32 in 2016. The value depreciated by 4,249.17 billion naira from 9616.17 billion naira in 2014 to 5367.32 billion naira in 2016. PNG value peaked exponentially to 10,355.95 billion naira in 2017 and progressed further by 3,093.69 billion naira representing about 29.9 percent increase. Finally, the value of petroleum and natural gas sub-sector slightly drop from 13,449.59 billion naira in 2018 to 11,176.61 in 2020 representing about 16.9% fall in its value.

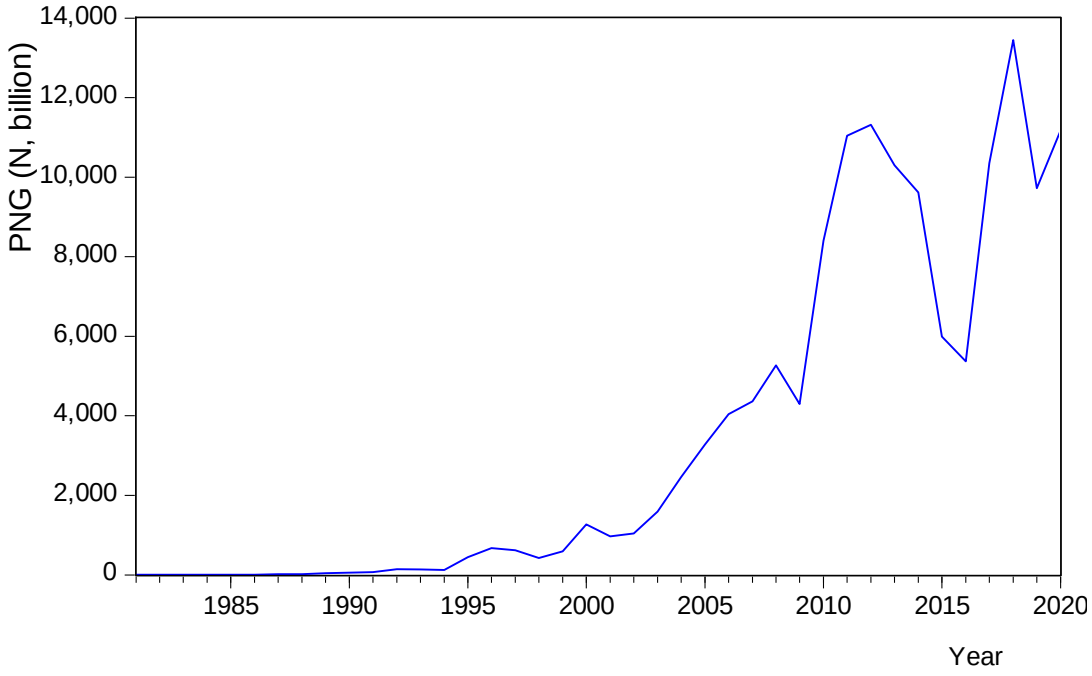

Figure 1: Trend on Petroleum and Natural Gas (PNG)

Table 1: Descriptive Statistics

	PNG	*TPN*	*FDI*	*FPI*	*RMT*	*EXR*
Mean	3467.871	32.02935	1.533238	-436.3492	2.670083	98.83096
Median	1004.394	33.38961	1.129237	-3.483000	1.645826	106.4643
Maximum	13449.59	53.27796	5.790847	403.3410	8.311897	306.0837
Minimum	4.280034	9.135846	0.257422	-3840.685	0.004883	0.617708
Std. Dev.	4286.233	12.28184	1.222741	972.1558	2.600845	96.26770
Skewness	0.959221	-0.305390	1.781342	-2.184833	0.491286	0.746820
Kurtosis	2.413748	2.250473	6.240151	6.571982	1.791111	2.600477
Jarque-Bera	6.706851	1.558073	38.65217	53.08838	4.044771	3.984294
Probability	0.034964	0.458848	0.000000	0.000000	0.132339	0.136402
Sum	138714.9	1281.174	61.32953	-17453.97	106.8033	3953.239
Sum Sq. Dev.	7.16E+08	5882.905	58.30873	36858387	26\114	361431.3
Observation	40	40	40	40	40	40

Source: *Author's Computation using E-views 9*

Table 1 shows that the mean values of the variables – petroleum and natural gas (PNG), trade openness (TPN), foreign direct investment (FDI), foreign portfolio investment (FPI, remittances RMT and exchange rate (EXR) are 3100.367, 32.25799, 1.571703, -322.2862, 2.508384 and 88.54404 respectively. The middle values of the variables are 818.7655, 33.95119, 1.266578, -1.814500, 1.600557 and 97.01772. Similarly, the maximum and minimum for PNG, TPN, FDI, FPI, RMT and EXR are presented thus; 13449.59, 53.27796, 5.790847, 403.3410, 8.311897 and 306.0837: 4.280034, 9.135846, 0.257422, -3840.685, 0.004883 and 0.617708 respectively.

Also, the standard deviation calculated for petroleum and natural gas (PNG) was the most volatile in the series with a value of about 4069.664 while foreign direct investment (FDI) had the least volatility rate of about 1.2432. The calculated values for the skewness statistics for Petroleum and natural gas (PNG), remittances (RMT) and exchange Rate (EXR) were positively skewed because their values are greater zero suggesting that their distributions have a long right tail. Though, exchange Rate (EXR) reflects a normal distribution that is symmetric around zero (0.802969) while Trade openness (TPN) and (FPI) are negatively skewned because their values are less than zero indicating their distributions have long left tail. That is, more lower values below the sample average since -0.353563 and -2.887760 is less than zero.

The kurtosis statistics of Petroleum and natural gas (PNG) is mesokurtic depicting a normal distribution. However, FDI and FPI respectively are leptokurtic. That is, the distributions have

a positive kurtosis value, they have peaked curves indicating higher values away from their sample average since their values are greater than 3 while TPN, RMT and EXR variables were platykurtic, meaning that their distributions were flat relative to normal distribution.The Jarque-Bera statistics and probability value at 5 percent significant level portrayed that the variables are not a normally distributed. Based on these observations, it therefore means that there is unit root (non-stationarity) in the series. Thus, estimating these variables at level might not give good results, hence, the need to conduct the unit root test. The unit root test is conducted to test whether or not the variables were stationary. The study adopts the Augmented Dickey Fuller (ADF) unit root tests procedures.

UNIT ROOT TEST

Table 2: *ADF Result for Model One (Petroleum and Natural Gas Industry Model)*

Variables	***ADF at Level***	***ADF at 1st Difference***	***Status***	***Remark***
PNG	-1.965070	-5.016646	I(1)	Stationary
TPN	-2.276833	-7.347059	I(1)	Stationary
FDI	-3.895169	-	I(0)	Stationary
FPI	-3.418566	-	I(0)	Stationary
RMT	-1.404193	-6.282245	I(1)	Stationary
EXR	1.736109	-4.212040	I(1)	Stationary
Critical Values				
1% level	-3.621023	-3.632900		
5% level	-2.943427	-2.948404		
10% level	-2.610263	-2.612874		

Source: *Author's Computation using E-views 9*

The results of the unit root test in Table 2 reveal that FDI and FPI variables were stationary at level while PNG, TPN, FDI, RMT, and EXR were stationary at 1st difference. Hence, the study then concludes that the independent variables used in the model were integrated of both order zero and one, that is, I(0) and I(1).

BOUND TEST CO-INTEGRATION

Table 3: *ARDL Bound Test Co-integration Result*

F-Statistics	**1.094422**	
% Critical Levels	**Critical Value for Bond Test**	
Significance	**1(0) Bond**	**1(1) Bond**
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Source: *Author's Computation using E-views 9*

From Table 3, the result of the bound co-integration test shows that the calculated f-statistic value of 1.094422 falls below the theoretical critical value for the lower bound I(0) at 5 percent

level (2.62). This means that there is no co-integration, hence, no long run relationship exists among PNG, TPN, FDI, FPI, RMT and EXR in Nigeria within the period under review.
In line with the above, Omoke (2010), Jawaid and Waheed (2016) and Salisu (2016) have argued that when the co-integration test of any result indicates no co-integration, then there is no need to further subject the variables to error correction test rather the short run regression results can be used to estimate the model; thus we proceed to estimate short-run analysis.

Short Run Estimation Results

Table 4: *ARDL Estimation Result*

Dependent Variable: LOG(PNG)				
Method: ARDL				
Sample (adjusted): 1982 2020				
Included observations: 39 after adjustments				
Maximum dependent lags: 2 (Automatic selection)				
Model selection method: Schwarz criterion (SIC)				
Dynamic regressors (2 lags, automatic): TPN FDI FPI RMT EXR				
Fixed regressors: C				
Number of models evaluated: 486				
Selected Model: ARDL(1, 1, 1, 0, 0, 0)				
Note: final equation sample is larger than selection sample				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(PNG(-1))	0.883731	0.086118	10.26183	0.0000
TPN	0.031154	0.006889	4.522229	0.0001
TPN(-1)	-0.021765	0.009177	-2.371661	0.0248
FDI	0.009533	0.050985	0.186984	0.8530
FDI(-1)	0.089595	0.047545	1.884419	0.0699
FPI	-1.45E-05	8.68E-05	-0.167597	0.8681
RMT	-0.014280	0.043275	-0.329981	0.7439
EXR	0.002634	0.001932	1.363474	0.1836
C	0.232770	0.168125	1.384502	0.1771
R^2 = 0.989; Adj-R^2 = 0.986; F-stat. = 332.94; DW = 2.386				

Source: *Author's Computation using E-views 9*

The result above shows that the calculated Adj-R^2 = 0.986 which is about 98.6 per cent of the total variations in PNG are caused by the explanatory variables TPN, FDI, FPI, RMT and EXR. Thus, the remaining 1.4 per cent of variations is caused by exogenous factors to the model. Also, the f-statistic calculated of 332.94 is greater than $F_{0.05,V1,V2}$ of 2.42. This means that the overall model is significant at 5 per cent level. The value of the Durbin Watson (D.W) is 2.386, suggesting that there is a minimal or absence of serial autocorrelation in the model.

The result of the analysis also revealed that the coefficient of trade openness (TPN) is 0.031154; implying that a unit increase in trade openness will increase the growth of the petroleum and natural gas by about 0.03 percent. The positive sign of trade openness conforms to a priori expectation that an increase in trade openness will increase petroleum and natural gas. The coefficient of trade openness is statistically significant with petroleum and natural gas at a 5

percent level. Hence, the study, therefore, rejects the null hypothesis indicating a significant relationship between trade openness and petroleum and natural gas in Nigeria within the period under review.

The analysis of foreign direct investment (FDI) reveals that the coefficient of foreign direct investment (FDI) is 0.009533; implying that a unit increase in foreign direct investment (FDI)) increases Petroleum and natural gas (PNG) by about 0.009533 percent in Nigeria. The positive sign of foreign direct investment (FDI) conforms to our a priori expectation that an increase in foreign direct investment (FDI) will increase petroleum and natural gas (PNG).

The coefficient of foreign direct investment (FDI) is not statistically significant with petroleum and natural gas at a 5 percent level. This is because the t-calculated of 0.186984 is less than the t-table value of 2.042 and the probabilities are greater than 0.05 (5 percent significant level) in both current and past lag 1. Hence, the study, therefore, accepts the null hypothesis that there is no significant relationship between foreign direct investment (FDI) and petroleum and natural gas in Nigeria within the period under review.

The result of the analysis reveals that the coefficient of foreign portfolio investment (FPI) is -1.4505. This implies that a unit increase in foreign portfolio investment (FPI)) will reduce the petroleum and natural gas industry by about 1.4505 percent in Nigeria. The negative sign of foreign portfolio investment (FPI) does not conform to our a priori expectation in line with economic theory.

The coefficient of foreign portfolio investment (FPI) is not statistically significant at 5 percent level. This is because the t-calculated of 0.167597 (in absolute terms) is less than the t-table value of 2.042. Hence, the study, therefore, retains the null hypothesis that there is no significant relationship between foreign portfolio investment (FPI) and petroleum and natural gas industry in Nigeria within the period under review.The result reveals that the coefficient of remittances (RMT) is -0.014280. This implies that a unit increase in remittances (RMT) will reduce the petroleum and natural gas industry by about 0.014280 percent in Nigeria. The negative sign of remittances (RMT) negates our a priori expectation in line with economic theory.

The coefficient of remittances (RMT) is not statistically significant with the petroleum and natural gas industry at 5 percent level. This is because the t-calculated of 0.329981 (in absolute terms) is less than the t-table value of 2.042. Hence, the study, therefore, accepts the null hypothesis that there is no significant relationship between remittances (RMT) and the petroleum and natural gas industry in Nigeria.The result of the analysis reveals that the coefficient of the exchange rate (EXR) is 0.002634; implying that a unit increase in the exchange rate (EXR) increases Petroleum and natural gas (PNG) by about 0.002634 percent in Nigeria. The positive sign of exchange rate (EXR) does not conform to our a priori expectation that a decrease in the exchange rate (EXR) will increase petroleum and natural gas (PNG).The coefficient of the exchange rate is not statistically significant at the 5 percent level. This is because the t-calculated of 1.363474 is less than the t-table value of 2.042. Hence, the study, therefore, accepts the null hypothesis that there is no significant relationship between the exchange rate and petroleum and natural gas industry in Nigeria within the period under review.

Diagnostic Testing

The study also conducted some diagnostic tests to ascertain whether or not the series were free from linearity (Ramsey Reset Test), autocorrelation (Breusch-Godfrey Serial Correlation LM Test), heteroscedasticity (Breusch-Pegan-Godfrey Test). See table 5 details of these tests.

Ramsey Reset Test

Table 5: *Ramsey Reset Test, Serial Correlation LM Test and Homoscedasticity Test Results*

	F-Statistic	***t-Statistic***	***Obs*R-Square***	***Prob. Value***
Ramsey Reset Test	1.719928	1.311460	-	0. 2007
Breusch-Godfrey Serial Correlation LM Test	1.832562	-	2.351674	0.1870
Breusch-Pagan-Godfrey Heteroskedasticity Test	0.687095	-	6.071639	0.6993

Source: *Author's Computation using E-views 9*

From Table 5 above, the results of the diagnostic test show that the linearity test using Ramsey reset test indicates that the f-statistic (1.719928) and t-statistic (1.311460) with a computed p-value of 0. 2007 which is greater than 5 percent (0.05) critical value rejects the null hypothesis and conclude that the model is correctly specified. The result of the serial or autocorrelation test using the Breusch-Godfrey Serial Correlation LM Test shows that the f-statistic is 1.832562, observed *R is 2.351674, Chi-Square probability value is 0.1870. This indicates that the probability value of about 19 percent (0.1870) is greater than 5 percent (0.05) critical value; hence we confirm no serial correlation in the model.

The result of the heteroscedasticity test using the Breusch-Pegan-Godfrey test shows that the f-statistic is 0.687095, Obs*R2 is 6.071639, while the Chi-Square probability value of 0.6993. The result suggests that there is no evidence of heteroskedasticity in the model since the probability of Chi-square value is more than 5 percent (P >0.05). So, residuals do have constant variance which is desirable in regression meaning that residuals are Homoscedastic.

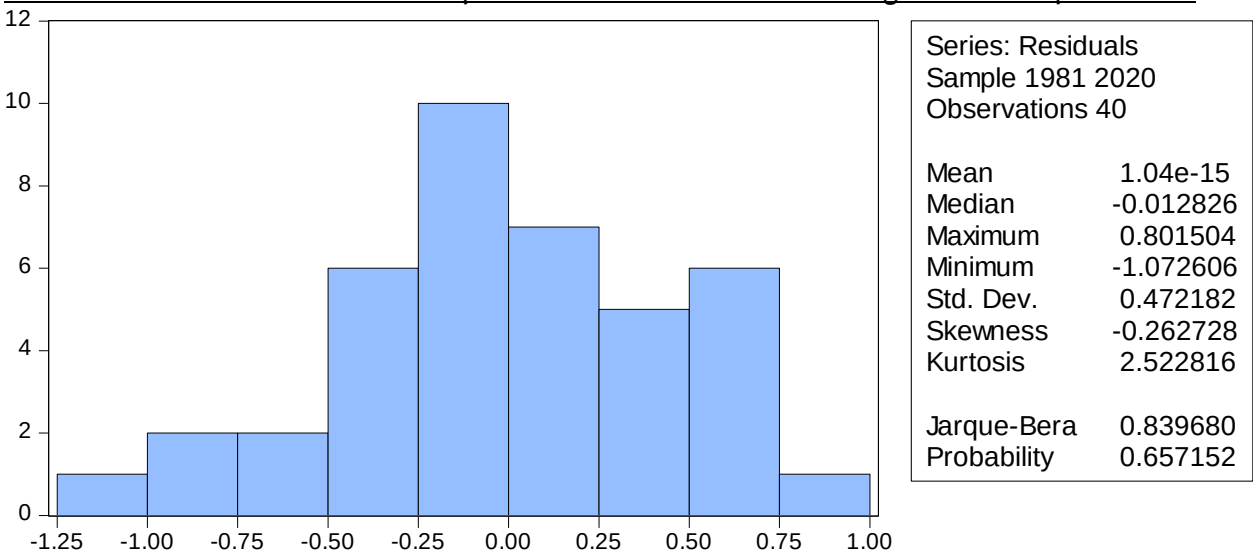

Figure 2: Jarque-Bera Normality Test

Normality Test

The result of the normality test using the Jarque-Bera test is presented in figure below. The result revealed that the Jarque-Bera test for normality of the model has a probability value of about 69 percent (0.692745) which is higher than 5 percent (0.05), therefore the model is normally distributed.

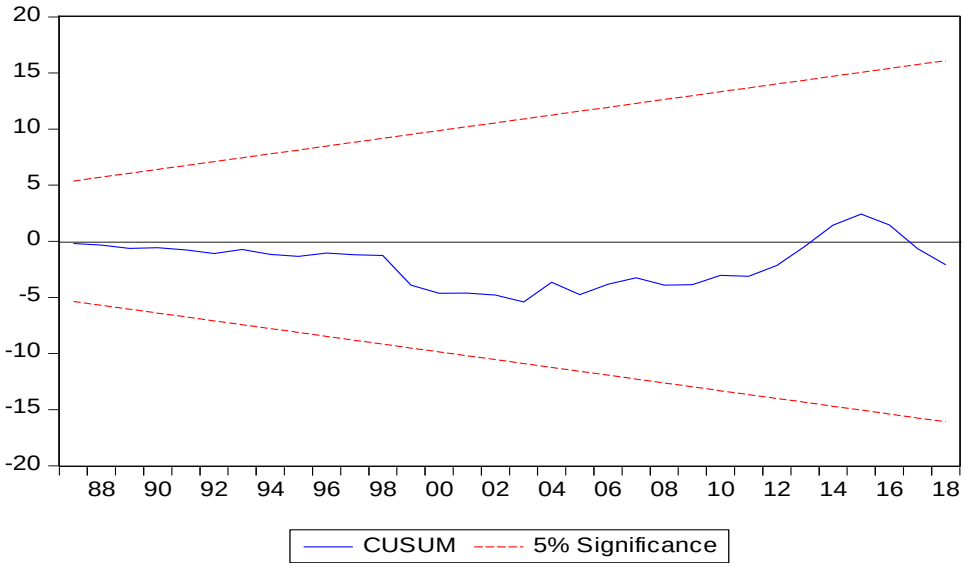

Figure 3: *CUSUM Residuals Graph*

Parameter Stability Test

The CUSUM test is particularly useful for detecting systematic changes in the regression coefficients. If any of the straight lines in the graph is crossed, the null hypothesis that the regression equation is correctly specified is rejected at 5 percent level of significance. From figures 3 above, the curve stayed between the two doted lines indicating parameter constancy throughout the sample period.

CONCLUSION AND RECOMMENDATION

The study focused on the impact of trade openness on the petroleum and natural gas Sub-sector growth of the Nigerian economy from 1981 to 2020. Petroleum and natural gas Sub-sector was the dependent variable while trade openness, foreign direct investment, foreign portfolio investment, remittances were adopted as independent variables. Exchange rate was used as check variable. Descriptive statistics and ARDL econometric approach were major tools of analysis. The outcome of the investigation revealed that foreign direct investment (FDI) was positively related to petroleum and natural gas sub-sector in Nigeria but not impactful reason been that it was not significant during the period of study. On the other hand, Foreign portfolio investment and foreign remittances were found to be negatively related to the petroleum and natural gas sub-sector during the study period. A major reason why foreign remittances were negative was because remittances by expatriates in the sector were higher than foreign remittances (RMT) inflow. Probably, because most Nigerians abroad are into menial jobs. More so, the few inflows into Nigeria were not channeled into the petroleum and natural gas industry rather spent on the consumption of more imported goods and services within the period under consideration. Exchange rate was positively related the petroleum sub-sector.

Base on these findings, the study recommended that the government should implement measures that will improve the existing relationship between trade openness, petroleum and natural gas sector in Nigeria. Also, ensure transparency and accountability in the petroleum and natural gas sub-sector.

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