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CRUDE OIL REVENUE AND MANUFACTURING SECTOR GROWTH IN NIGERIA

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ABSTRACT

The manufacturing sector has been identified in extant economic literature as a critical sector in an economy. It has a huge potential for promoting and stimulating economic growth, reducing poverty and creating employment for a large number of people especially in developing countries. Thus, the objective of this paper is to empirically examine the effect of crude oil revenue on manufacturing sector output in Nigeria between 1981 and 2017. Time series data were sourced from secondary sources on Manufacturing Sector Output (MAN), Crude Oil Revenue (COR), Labour (LAB), Interest Rate (INR) and Exchange Rate (EXR). The data sets employed Vector Auto Regressive (VAR) modeling technique for the analysis. The result of the analysis shows that the shocks due to exchange rate (EXR) contributes more to variance in manufacturing sector output (MAN) with an average of about 15.85 per cent followed by interest rate (INR) with an average of about 15.33 per cent within the period under review. The study also reveals that crude oil revenue (COR) contributed the least to variance in manufacturing sector by about 1.42 per cent. This implies that crude oil revenue (COR) is not the main shocks causing the variation in manufacturing sector output (MAN) in Nigeria but exchange rate and interest rate within the period of study. Based on this finding, the study recommends that government should diversify the economic base of the nation by investing substantial share of the oil revenue into the productive (real) sector of the economy especially the manufacturing sector.

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INTRODUCTION

The manufacturing sector of any economy is seen as critical in the development process. This was aptly summed up by Libanio (2006) who defined the manufacturing sector as an engine of growth through the use of Kaldor's first law. According to Adebayo (2010) the manufacturing sector refers to those industries which are involved in the manufacturing and processing of items and indulge or give free rein in either the creation of new commodities or in value addition. To Dickson (2010), manufacturing sector accounts for a significant share of the industrial sector in developed countries. The final products can either serve as finished goods for sale to customers or as intermediate goods used in the production process. Loto, (2012) refers to manufacturing sector as an avenue for increasing productivity in relation to import replacement and export expansion, creating foreign exchange earning capacity, raising employment and per capita income which causes unrepeatable consumption pattern. Mbelede (2012) opined that manufacturing sector is involved in the process of adding value to raw materials by turning them into products. Thus, manufacturing industries is the key variable in an economy and motivates conversion of raw material into finished goods. In the work of Charles (2012), manufacturing industries creates employment which helps to boost agriculture and diversify the economy on the process of helping the nation to increase its foreign exchange earnings.

In order for the manufacturing sector of the economy to optimize these potentials, however, it has to be supported by the government through the provision of an enabling environment. One of the ways in which the government can do this is through the provision of revenue raised from the crude oil.

The dynamic effect of crude oil revenue in an economy is that when revenue are raised through crude oil, government usually use the proceeds to provide public goods, maintain law and order, defend against external aggression, ensure social and economic stability, create an enabling environment by providing infrastructural facilities that will enhance the performance of the manufacturing sector which in turn will lead to economic growth and development.

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Arising from the above, since the Nigeria's independence in 1960 different administrations have introduced policies targeted at not only diversifying the country's economy but making the industrial sector especially the manufacturing an engine of economic growth. Some of these policies include the import substitution program and the indigenization programme. Import Substitution or Resource- based Strategy was adopted under the First National Development Plan (1962-1968) essentially to enable the country import capital goods like machinery, tools and spare parts and by so doing, facilitate the assemblage of these products within the country, while encouraging the manufacture of consumer goods. Though still largely dominated by low technology light industries (Dare-Ajayi, 2007), the introduction of the indigenization policy as contained in the Nigerian Enterprises Promotion Decree of 1972 reserved certain categories of industrial activity, mostly services and manufacturing, for Nigerians (Ikpeze *et al*., 2004) which made Nigerian shareholders obtain majority shares in companies but this hardly changed the control of neither the companies nor the relationship with their parent companies. Several other policies like Industrial Policy in 1988, Structural Adjustment Programme (SAP) in 1986 could be argued to have further worsened the already difficult situation of Nigeria's industries. For instance, the liberalization of the foreign exchange regime and the high interest rate associated with the period was to lead to inflation and low purchasing power of consumers. Further, a collapse of basic infrastructures and social services since early 1980s accompanied this trend (World Fact Book, 2013).

Despite all these policies and programs put in place by various governments to encourage the manufacturing sector, available data shows that the manufacturing sector had an unimpressive performance within the period under review. For instance; on an average the percentage of manufacturing sector contribution to GDP decreased from 18.33 per cent in 1981-1985 to 18.1 per cent in 1986-1990 to 17.48 per cent in 1991-1995 to 12.98 percent in 1996-2000 to 9.73 per cent in 2001-2005 to 7.06 per cent in 2006-2010 and increased slightly to 8.7 percent in 2011-2017 (CBN, 2017).

However, there is dearth of information about the impact of crude oil revenue on manufacturing sector performance in Nigeria, giving rise to the basic question: 'To what extent does crude oil revenue impact the manufacturing sector in Nigeria'? This study therefore seeks to fill this gap in knowledge by examining the impact of crude oil revenue on manufacturing sector output in Nigeria from 1981 to 2017. This paper is organized as follows:

Section one is the introduction while section two reviews the empirical literature; section three discusses the model and methodology while section four provides data and empirical evidence and the final section which is five, provides the summary and conclusion of the study.

LITERATURE REVIEW

Theoretical Literature

The Dutch Disease Theory

The Dutch Disease theory originated in the late 1950s when natural gas discoveries in the Netherlands eventually hurt the competitiveness of the Dutch manufacturing sector. The country faced the risk of a de-industrialization process. It is also referred to as the adverse effects on manufacturing of natural resource "discoveries".

Dutch disease theory states that, the discovery of a natural resource (primary) has negative consequences which results from any large increase in foreign currency, including foreign direct investment, foreign aid or a substantial increase in natural resource prices. The impediments of oil revenue to economic growth and development of oil-dependent sector at the neglect of other sectors is what is cumulatively called Dutch Disease in the literature of development economics (Otawa, 2001). The enormous influx of cash resulting from oil tends to foster, overzealous and imprudent expenditure. High oil revenue raises exchange rates, promotes adverse balance of payment as the cost of imports rises. In fact, it kills incentive to risk investment in non-oil sectors, the competiveness of all non-oil sectors such as agriculture and manufacturing industries would be crowded out.

Specifically, when a country experiences a resource boom due to a tradable resource discovery and/or to an increase in a resource price, it normally undergoes a real appreciation of its exchange rate and, as a result of rising wages, a relocation of some of the labour force to the resource sector. A real appreciation reduces the international competitiveness of other tradable sectors because resource-based exports crowd out commodity exports produced by those sectors (Krugman, 1987). This description is a perfect fit for the Nigerian experience with the Agricultural sector as an example. Before the discovery of oil in Nigeria in early 1956 and the oil boom between 1971 and 1973, Nigeria was a major producer and exporter of Agricultural products. Its revenue base was anchored on product exports such as Cocoa, groundnuts, Cotton and Palm produce. These accounted for close to 70% of the export earnings. Agriculture as an arm of the real sector provided food, employment, created local cottage industries and transferred processing skills to the populace apart from being the major contributor to GDP. However, in 1973, due to the Arab Oil embargo which led to oil boom in Nigeria the attention was moved completely from agriculture to Crude oil export which made the economy completely dependent on oil revenue which eventually accounted for about 90% of our total foreign exchange earnings. 'The discovery of oil came with both positive and negative consequences. For instance, environmental degradation, neglect of other sectors of the economy and official corruption can all be deduced as the negative consequences of crude oil trade.

Empirical Literature

Very few studies have been carried out on the relationship between crude oil revenue and the manufacturing sector output of countries. For instance, Mohammed and Amirahi (2010) investigated the relationship between oil price, world oil supply and demand production capacities and export growth of Iran using Error Correction Version of ARDL. It was found that there is an inverse relationship between oil production, consumption and oil export revenues. Iran had a significant positive growth in its oil revenues.

Ushie, Adeniyi and Akongwale (2012) examined oil revenues, institutions and macroeconomic performance in Nigeria. The study used the Impulse Response Functions (IRFs) and Variance Decomposition (VDC) techniques within a Vector

Autoregressive (VAR) framework for the analysis. The study revealed that fluctuations in oil revenues have resulted in inflation, lower output growth and real exchange rate appreciation in Nigeria. Importantly, the institutional variable was found to be significant. The study concluded that government should offer appropriate policy recommendations, which involve a combination of economic, socio-political and institutional actions that may be adopted to enhance the management of future oil windfalls in Nigeria.

Riman *et al*. (2013) examined the effect of oil revenue shock, non-oil export on the industrial output in Nigeria for 41 years spanning from 1970 to 2010. The study adopted the Vector Autoregressive (VAR) model and cointegration techniques to analyse the relationship. The study revealed that oil revenue shock and policy/regime shift had negative impact on industrial output and non-oil export. The impulse response function and variance decomposition analysis suggest that the major drivers of industrial development in Nigeria are non-oil export, regime shift and oil revenue. The study therefore suggested among other things that the panacea to industrial growth in Nigeria rest on diversifying the economy away from crude oil export and ensuring a stable government in Nigeria that will endure long enough to sustain industrial and other economic policies.

Hodo, Emmanuel, Amenawo and Cornelius (2013) examined the effect of oil revenue shock, non-oil export and industrial output in Nigeria for 40 years spanning from 1970 to 2010. The study used cointegration and Vector Autoregressive (VAR) modeling techniques for the analysis. The study revealed a very slow process for industrial output to recover from shock arising from variation in oil revenue while the long run result shows that oil revenue shock and policy/regime shift had negative impact on industrial output and non-oil export.

Binuomote and Odeniyi (2013) examined the impact of crude oil price on agricultural productivity in Nigeria from 1981 to 2010. The study used unit root test, Co-integration and Error Correction modeling techniques for the analysis. The study revealed that exchange rate, capital, labour and trend are the major determinants of agricultural productivity in the long-run, while price of crude oil is the most important determinant of agricultural productivity in the short–run.

Ijirshar (2015) investigated the effect of oil revenue on industrial growth in Nigeria from 1986 to 2013. The study employed the VEC estimation technique for the analysis. The study revealed that oil revenue impacted positively on industrial growth in Nigeria on the long run but had insignificant influence in the short run. The study recommended a sustained policy formulation and implementation in the industrial/petroleum sector of the economy through the involvement of stakeholders. The formulation and implementation of policies on oil revenue should be judiciously used to facilitate infant industries through advanced industrial policies like import substitution, among others.

Asogwa and Okpongette (2016) used econometric method of OLS and granger causality to analyse the relationship between oil revenue and Nigeria's macroeconomic performance from 1981 to 2014. The study found that oil revenue has a positive and significant effect on economic growth in Nigeria. The study also showed that oil revenue does not granger cause economic growth. The study therefore recommended the implementation of the petroleum industry bill with alternative sources of revenue for greater economic performance.

Lawrence and Victor (2016) used a dynamic analysis of co-integration and granger causality to analyze the relationship between oil revenue and the Performance of the agricultural sector in Nigeria from 1981 to 2014. The study revealed that oil revenue was not statistically significant in explaining the level of economic growth. The result of the granger causality test indicates that oil revenue does not granger cause agricultural output. The study therefore recommended that government should make concerted efforts to revamp the agricultural sector through judicious use of the dwindling oil revenue and foreign investors should be encouraged to go into the agricultural sector in Nigeria.

Summary of Literature Reviewed and Research Gap

From the literature review, it was observed that some of the works reviewed either examined the effect of crude oil revenue on economic growth, or on macroeconomic performance, or on the industrial output, or on agricultural productivity. This study deviates from these scholars by examining the effect of crude oil revenue on the output of the manufacturing sector in Nigeria by regressing the contributions of the manufacturing sector to GDP on crude oil revenue (COR), labour (LAB), interest rate (INR) and exchange rate (EXR) from 1981 to 2017. This is the gap the study has filled in literature.

MATERIALS AND METHODS

Model Specification and Analytical Framework

The model for this study mimics the work of Nwoba and Abah (2017) with a slight modification. Nwoba and Abah (2017) who examined the effect of crude oil revenue on economic growth regressed GDP as a function of crude oil revenue only. But this study deviates from these scholars by regressing the ratio of manufacturing sector (MAN) to GDP as a function of crude oil revenue (COR) and added labour (LAB), interest rate (INR) and exchange rate (EXR) as major determinants of the manufacturing sector in line with Otalu and Anderu (2015) and Ijirshar (2015).

Thus, the model is specified as:

$$MAN = f(COR, LAB, INR, EXR) \quad (1)$$

Where;
MAN = Contribution of manufacturing sector to GDP
COR = Crude oil revenue
LAB = Labourproxied by labour participation force
INR = Interest rate
EXR = Exchange rate
The econometrics form of equation (1) is specified as:

$$MAN = \beta_0 + \beta_1 COR + \beta_2 LAB + \beta_3 INR + \beta_4 EXR + \mu \quad (2)$$

Where;
β_i= Parameter estimates
μ= Error term

It is expected that increase in these variables - COR and LAB will promote output of the manufacturing sector while INR and EXR increase will reduce output of the manufacturing sector. Thus, a priori expectations are $\beta_1$and $\beta_2 > 0$ while $\beta_3$and$\beta_4 < 0$

Data Sets and Estimation Techniques

Data on contribution of manufacturing to GDP, crude oil revenue, labour, interest rate and exchange rate were gathered from various issues of Central Bank of Nigeria statistical bulletin between the period 1981and 2017. Thereafter, the data were analysed using Vector Auto Regression (VAR) technique of analysis.

RESULTS AND DISCUSSIONS

The empirical analysis of data in this paper was conducted in six phases. It begins with the descriptive statistics analysis of the data and thereafter conducted the unit root test. Furthermore, co-integration, VAR lags selection, impulse response analysis and forecast error variance decomposition was conducted.

Descriptive Statistics Test Result

The result of the descriptive statistics is presented in Table 1 below. Table 1 shows that, the standard deviation calculated for crude oil revenue was the most volatile in the series with a value of 2.472489 while labour was the least volatile variable with a value of 0.041441. The calculated values for the skewness statistic for MAN, COR, INR and EXR were negatively skewed, suggesting that their distributions have a long left tail while LAB was positively skewed, suggesting that its distribution has a long right tail. Again, the kurtosis statistics of MAN, COR and EXR were platykurtic, meaning that their distributions were flat relative to normal distribution while LAB and INR were leptokurtic meaning that their distributions were peaked relative to normal distribution. 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.

Table 1 Descriptive Statistics

	LOG(MAN)	LOG(COR)	LOG(LAB)	LOG(INR)	LOG(EXR)
Mean	6.336453	6.089459	0.913111	2.829612	3.359430
Median	6.570631	6.585371	0.916291	2.866762	4.529297
Maximum	9.214779	9.091441	1.040277	3.394508	5.722899
Minimum	3.291754	1.981001	0.845868	2.047693	-0.494296
Std. Dev.	1.963860	2.472489	0.041441	0.289572	1.961502
Skewness	-0.179029	-0.448802	0.535849	-0.779623	-0.748100
Kurtosis	1.728208	1.747534	3.904773	3.724196	2.241410
Jarque-Bera	2.691226	3.660480	3.032687	4.556712	4.338360
Probability	0.260380	0.160375	0.219513	0.102452	0.114271
Sum	234.4488	225.3100	33.78511	104.6956	124.2989
Sum Sq. Dev.	138.8428	220.0752	0.061825	3.018669	138.5097
Observations	37	37	37	37	37

Source: *Author's Computation (2018)*

Unit Root Test Result

The results of the unit root test using the ADF are reported in Table 2. The Augmented Dickey Fuller (ADF) test was conducted with intercept and trend. The result of the variables shows that all the variables MAN, COR, LAB, INR and EXR were found stationary in their 1st difference.

Table 2 Unit Root Test Results

Augmented Dickey Fuller (ADF) Test				
Variables	Level	1st Difference	Status	Remarks
Log(MAN)	-1.539817	-4.473433	I(1)	Stationary
Log(COR)	-0.680368	-5.222413	I(1)	Stationary
Log(LAB)	-1.849530	-9.513532	I(1)	Stationary
Log(INR)	-3.248129	-5.704414	I(1)	Stationary
Log(EXR)	-1.338580	-5.410794	I(1)	Stationary
Critical Values	Level	1st Difference		
1%	-4.234972	-4.252879		
5%	-3.540328	-3.548490		
10%	-3.202445	-3.207094		

Source: *Author's Computation (2018)*

Co-integration Test Result

Since the series are integration of order one, that is, I(1) we then proceeded to conduct the co-integration using the Engle-Granger two step procedure. The result of the Engle-Granger Co-integration test is presented in Table 3 below.

Table 3 Engle and Granger Co-integration Test Result

Variable	Level	5% Critical Values	Remarks
RESID(ECM)	-2.659041	-3.540328	Not Co-integrated
None Stationary at both 1%, 5% and 10% Level of Significance			

Source: *Author's Computation (2018)*

From Table 3, the Engle and Granger (1987) two stage co-integration procedure of the model depicts that the residual from the regression result is not stationary at 5 percent level of significance. This means that all the explanatory variables (COR, LAB, INR and EXR) are not co-integrated with manufacturing sector output (MAN) in Nigeria within the period under consideration (1981-2017). In other words, there is no long run relationship between the dependent and independent variables.

In line with the above, Omoke (2010), Jawaid and Waheed (2016) and Salisu (2016) and more 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 VAR modeling technique can be used to estimate the model. Hence, in model two the researcher used VAR for the analysis.

VAR Lag Order Selection

The first step in model building, impulse response analysis and decomposition of the forecast error variance is the selection of the lag order. In this study we use some commonly used lag-order selection criteria to choose the lag order, such as the "Akaike information criterion (AIC)", "Schwartz criterion (SC)", "Hannam-Quinn criterion (HQC)" and "final prediction error (FPE)" to determine the optimum lag and then analyze the residuals.

Table 4 Lag Length Selection test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-40.28691	NA	9.88e-06	2.663936	2.888401	2.740485
1	111.2922	249.6596*	5.87e-09*	-4.781892*	-3.435103*	-4.322598*
2	128.6965	23.54712	1.02e-08	-4.335091	-1.865979	-3.493053
3	154.7013	27.53440	1.27e-08	-4.394192	-0.802755	-3.169409

Source: *Author's Computation (2018)*

Table 4 shows that lag 1 is chosen as the optimum lag in the specification of VAR model on the relationship between manufacturing sub-sector and crude oil revenue in Nigeria

between 1981 and 2017. Thus, we now estimate and analyze the VAR, impulse response and decomposition of the forecast error variance.

Impulse Response Function and Variance Decomposition Analysis

Since the long-run relationship has been established amongst the variables, the dynamic properties of manufacturing sub-sector (MAN) are further supplemented by the impulse response analysis and forecast error variance decomposition.

Impulse Response Function Analysis

The results of the impulse response function analysis of the variables are documented in the figure below. Specifically, the result is derived primarily from the estimated VAR model. Figure 1 below present the impulse response function for the models.

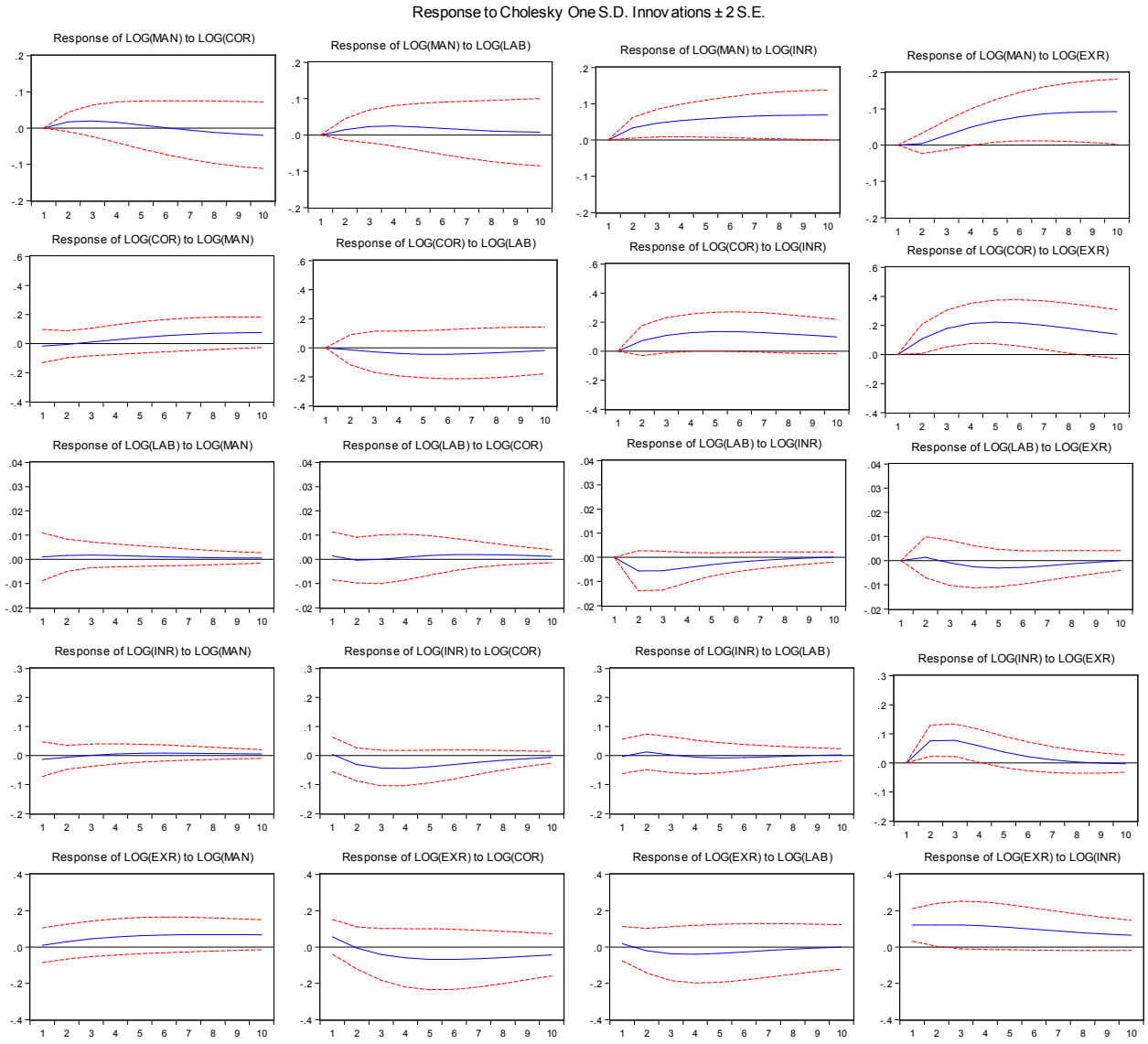

Figure 1 Impulse Response of the Manufacturing Sector Output to Shocks in the Explanatory Variables

From Figure 1, the response of manufacturing sub-sector (MAN) to one standard innovation in crude oil revenue is both positive and negative at each time responsive period. Also, the manufacturing sub-sector responded positively to labour shocks, interest rate shocks and exchange rate shocks within the period under review. Furthermore, the response of crude oil revenue to manufacturing sub-sector shocks is negative and positive; negative to labour shocks; positive to interest rateand exchange rate shocks. The response of labour to manufacturing sub-sector shocks is positive and negative within the period; negative and positive to crude oil revenue shocks; negative to interest rate shocks and positive and negative to exchange rate shocks.

Again, the response of interest rate to manufacturing sub-sector shocks is negative and positive; negative to crude oil revenue shocks; positive and negative to labour shocks; and positive to interest rate shocks. While the response of exchange rate to manufacturing sub-sector shocks is positive; positive and negative to crude oil revenue shocks; positive and negative to labour shocks; and positive to interest rate shocks.

Variance Decomposition Analysis

Table 5 below presents a fraction of the forecast error variance for each variable that is attributed to its own innovations and to innovations in other variables.

Table 5 Variance Decomposition Results MAN Model

Period	S.E.	LOG(MAN)	LOG(COR)	LOG(LAB)	LOG(INR)	LOG(EXR)
1	0.098934	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.138430	91.57762	1.518508	1.088401	5.707205	0.108268
3	0.171653	81.55565	2.340625	2.533193	11.01559	2.554943
4	0.203406	71.97109	2.275320	3.284500	14.76345	7.705639
5	0.234865	63.67764	1.850878	3.352920	17.30308	13.81548
6	0.265929	56.93927	1.446418	3.079065	19.05026	19.48499
7	0.296140	51.65715	1.202274	2.712362	20.28240	24.14581
8	0.325040	47.59313	1.124167	2.366744	21.16858	27.74738
9	0.352301	44.49320	1.169729	2.077040	21.81465	30.44538
10	0.377741	42.13537	1.290904	1.844921	22.29061	32.43819
	Average	65.16	1.42	2.23	15.34	15.85

The forecast error variance decomposition was estimated so as to identify the forecast error components of each of the variables originating from shocks in the system. The ordering of the variables in the variance decomposition is vital and this is stated in table 5 above over the same forecasting horizon for a period of ten (10) years. The result shows that 100 percent of variance in manufacturing sub-sector output (MAN) in period 1 is explained by the shock from the variable itself. This implies that there was no shock from other variables. In period 2, 91.57percent of the variance in manufacturing sector output (MAN) was explained by the shock from the variable itself; 1.51 percent from crude oil revenue (COR), 1.08 per cent from labour (LAB); 5.70 per cent from interest rate(INR) and 0.10 percent from exchange rate (EXR).

Inferences from 2nd to the 10th periods show that apart from the variance due to the shock from the variance of the manufacturing sub-sector output (MAN) itself, exchange rate (EXR) has the highest percentage of induced variance on manufacturing sub-sector output (MAN) of about 32.43 percent in 10th period while crude oil revenue (COR) has the least percentage of induced variance on manufacturing sub-sector output (MAN) of about 1.29 per cent in 10th period.

In sum, the study reveals that among the explanatory variables, the shocks due to exchange rate (EXR) contributes more to variance in manufacturing sector output (MAN) with an average of about 15.85 per cent followed by interest rate (INR) with an average of about 15.33 per cent within the period under review. The study also reveals that labour on an average contributed to variance in manufacturing sector output (MAN) by about 2.23 per cent whilecrude oil revenue (COR) contributed the least by about 1.42 per cent. This implies that crude oil revenue (COR) is not the main shock causing the variation in manufacturing sector output (MAN) in Nigeria but exchange rate and interest rate within the period of study.

Concluding Remarks

This paper examined the impact of crude oil revenue on the manufacturing sector output in Nigeria from 1981 to 2017. Secondary data were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin (various issues). Vector Auto Regressive (VAR) modeling technique was used to analyze the relationship between crude oil revenue and manufacturing sector output in Nigeria. The result of the analysis shows that the shocks due to exchange rate (EXR) contributes more to variance in manufacturing sector output (MAN) with an average of about 15.85 per cent followed by interest rate (INR) with an average of about 15.33 per cent within the period under review.

The study also reveals that labour on an average contributed to variance in manufacturing sector output (MAN) by about 2.23 per cent while crude oil revenue (COR) contributed the least by about 1.42 per cent. This implies that crude oil revenue (COR) is not the main shock causing the variation in manufacturing sector output (MAN) in Nigeria but exchange rate and interest rate within the period of study. Consequent upon these findings, it is recommended that;

1. Government should judiciously manage oil windfall revenues in such a way that could boost the nation's macroeconomic growth by investing more of the revenue into the productive (real) sector of the economy.
2. Government should remove unnecessary bureaucratic bottlenecks that act as barriers to the smooth operation of the sector.
3. Government should diversify the economic base of the nation by investing substantial share of the oil revenue into the productive (real) sector of the economy especially the manufacturing sector.

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