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INDUSTRIAL DEVELOPMENT AND ECONOMIC GROWTH NEXUS IN NIGERIA: A DISAGGREGATED ANALYTICAL APPROACH

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ABSTRACT

Purpose. *Industrial development is crucial in converting all resources to humanity's use and benefits. Economists observe that the development and utilisation of the industrial sector are essential in a country's economic growth. Disaggregating the industrial sector into various components, this paper empirically analyses the performance of the industrial sector on economic growth in Nigeria over the 1970-2015 period. Hence, to evaluate the relationship between industrial development and economic growth in Nigeria.*

Design/Methodology. *The paper adopted autoregressive distributed lag (ARDL) as the technique of data analysis.*

Findings and implications. *The results further revealed that the coefficients of all industrial subsectors, such as manufacturing, solid minerals and crude petroleum and gas, have positive and statistically significant influences on economic growth in both the short and long run. Among the industrial subsectors, the crude petroleum and gas sector appears to be the highest driver of Nigerian economic growth compared to other industrial subsectors, showing that the Nigerian economy is still far from diversified.*

Limitations. *Limitation emanates from the problem of missing data from the source of data on the variable labour. However, effort has been made to overcome this challenge by applying a two-year moving average gap for periods of missing data. This method conforms to the rational expectation hypothesis (Muth, 1961).*

Originality. *The development of the industrial sector of any economy can be measured by the contribution of various components (Isiksal & Chimezie, 2016). It is expected that as an economy becomes transformed, the share of industrialisation should be increasing (UNECA, 2011). The examination of industrial sector performance involves its sectoral components.*

1. INTRODUCTION

Industrialisation is regarded as a central economic policy objective in most developing economies. This is predicated on the belief that industrialisation and agriculture are integral parts of development and structural change (Sullivan and Sheffrin, 2003). The development process of any economy is substantially determined by the way the productive forces in and around that economy are organised. At independence in 1960 and for the larger part of that decade, agriculture was the mainstay of the Nigerian economy, providing food and employment for the populace, raw materials for the nascent industrial sector, and generating the bulk of government revenue and foreign aid exchange earnings.

Negative growth, however, surfaced in the early 1980s, but this was reversed with the introduction of SAP in 1986, with real GDP annual growth of 4 percent in the periods 1988-1997. The country recorded a growth that remained sustainable until 1997. SAP remarkably led to some initial improvements in the fortunes of the industrial sector. For instance, capacity utilisation, which was 30 per cent at the end of 1986, increased to 36.7 percent by mid-1987 and further to 40.3 per cent in 1990 and later to 42.0 percent in 1991 (see Dagogo, 2014 & Dare-Ajayi, 2007). According to Kniivilä (2004), the fundamental conditions for sustainable economic growth and industrial development include political, social and macroeconomic stability, well-functioning institutions and creating the rule of law. The role of government becomes essential in meeting the above-listed conditions. The history of industrial development and manufacturing in Nigeria is a classic illustration of how a nation could neglect a vital sector through policy inconsistencies and distractions attributable to the discovery of oil (Adeola, 2005 & Bankole, 2005). The declining contribution of the industrial sector, especially the suboptimal performance of manufacturing and solid minerals, to national output is an issue of grave concern to authorities in Nigeria. It has continued to engage the attention of academics and other stakeholders.

Several empirical studies have been carried out on the nexus between industrial development and economic growth in Nigeria (Isiksal & Chimezie, 2016; Jelilov, Enwerem & Isik, 2016; Mbaegbu, 2016; Obioma, Uchenna & Alenxanda, 2015; Ojo & Ololade, 2014; Sola, Obamuyi, Adekunjo & Ogunlye, 2013 & Udah, 2010). Most of the studies have one or two shortcomings, and most importantly, their inability to disaggregate the industrial sector into its various subsectors.

Concerning the issue of appropriate proxies to be used for industrial development, some studies, such as Obioma, Uchenna & Alenxanda (2015) and Jelilov, Enwerem & Isik (2016), have failed to disaggregate the industrial sector to its various subsectors. The studies mentioned above assumed that the manufacturing industry, a subsector of the whole industrial sector, will be a true representation of the industrial sector. The development of the industrial sector of any economy can only be adequately measured by the contribution of its various components (Isiksal

& Chimezie, 2016; CBN, 2014). The Nigeria industrial sector consists of crude petroleum and natural gas, solid minerals, and manufacturing (see CBN, 2014). This study argues that to have a true understanding of this critical sector's contribution to growth, there is a need for a sector-by-sector analysis. Therefore, this study attempts to follow CBN disaggregation of the industrial sector to investigate the differential influence of the Nigerian industrial sector on economic growth over the 1970-2015 period. Hence, we evaluated the relationship between industrial development and economic growth in Nigeria. We test the hypothesis that there is no significant relationship between industrial development and economic growth in Nigeria.

2. LITERATURE REVIEW

John (1988) conceptualised industrialisation as a process through which the share of the industry in general and of manufacturing in particular in overall economic activity is increased. In this regard, industrialisation is associated with rising per capita income. Industrialisation, therefore, is a process of building up a country's capacity to produce a variety of products - extraction of raw materials and manufacturing of semifinished and finished goods. According to the central bank of Nigeria (2012), the industrial sector consists of crude petroleum and natural gas, solid minerals and manufacturing. Udegbunam (2002) asserted that industrial development in developing economies is bound to be frustrated unless there is simultaneous progress on service sector components such as science and technology, education, energy, and transportation.

Industrialisation does not necessarily mean prioritising manufacturing alone and neglecting other sectors. Agriculture, for instance, forms an initial base for the industrial development of some countries. The agricultural sector can strengthen industries by providing various materials for processing food products and serving as consumers of industrial output. The agricultural sector's backward and forward linkages role underscores the higher economic growth in many countries. Economic growth is measured in terms of nominal or real growth. Nominal GDP is measured as the total value of the output of an economy in current prices; therefore, a nominal growth rate is deflated from inflation. Real GDP is inflation-adjustedinflation-adjusted and known as real growth (Dornbusch, Fischer & Startz, 2004). Economic growth has been conceived as an increase in per capita income over a period of time (Clunies -Ross, et al., 2010; Jhingan, 2007).

There are numerous theories explaining the growth and factors that are critical for sustainable economic growth. Michael and Stephen (2001) observed that the Solow-Swan Growth Model made major contributions to the development of growth theory. The Solow model believes that a sustained rise in capital investment increases the growth rate; hence, the ratio of capital to labour increases. However, the marginal product of additional units of capital may decline, thereby bringing the economy to a long-term growth path with real gross domestic product GDP growing at the same rates as the growth of industrialisation as a whole (Kibritcioglu, 1997).

A steady-state growth path is reached when output, capital, and labour are all growing at the same rate. Neo-classical economists believe that raising the trend of growth requires an increase in the labour supply plus a higher level of productivity of labour and capital. Therefore, this study adopts the Solow-Swan model as a working theoretical foundation. This is based on the fact that the long-run rate of growth is determined by an expanding labour force and technical progress. This theory features catch-up growth and thereby predicts some convergence of living standards.

Empirical studies conducted in Nigeria alongside other studies around the World were reviewed are abound. Jelilov, Enwerem, and Isik (2016) empirically investigated the impact of industrialisation on economic growth in Nigeria, with a specific focus on fiscal and monetary policy on GDP. The study applied ordinary least squares (OLS) techniques. The study revealed that industrialisation harms economic growth in Nigeria in the long run. Obioma, Uchenna, and Alexanda (2015) investigated the effect of industrial development on Nigeria's economic growth covering the period of 1973 - 2013 using the ordinary least squares (OLS) method. The study reveals an insignificant influence of industrial output on economic growth. Udah (2010) investigated the causal and long-run relationship between electricity supply, industrialisation and economic development in Nigeria from 1970-2008. The Granger causality results showed a feedback relationship between GDP per capita and electricity supply and no causal link in the case of industrial output and GDP per capita. Isiksal and Chimezie (2016) investigated the impact of industrialisation in Nigeria by analysing the relationship between GDP and Nigeria's agricultural, industry, and service sectors. The results of the estimated model revealed that agriculture, industry, and services have a significant positive relationship with GDP. The causality results demonstrate a bidirectional causal relationship between gross domestic product, agriculture, industrial output, and the service sector. Ojo and Ololade (2014) assessed the manufacturing sector's contribution to economic growth in Nigeria in the era of globalisation for the period of 1980-2009. The study employs ordinary least squares (OLS) econometric techniques to analyse the impact of manufacturing and trade openness on the current account balance. The study revealed that although the Nigerian manufacturing sector benefited from the globalisation process, the level of development in the sector was found to be highly negligible.

Zhuang and Juliana (2010) explored the determinants of economic growth using 19 American countries for the period 1995-2006. The study applied ordinary least squares (OLS) estimation. The findings suggest that the capital accumulation rate, education of a country's labour force, and trade openness are important determinants of economic growth. However, the impacts are not statistically significant. Renata et al. (2018) investigate China's industrialisation and development growth for data spanning 2000 to 2010. They applied ordinary least squares regression. The findings, however, revealed that mid-low technology level industries have a more significant impact on China's GDP. Anton et al. (2016) studied Russia industrialisation and economic development through the neoclassical growth model. They discovered no evidence that Tsarist agricultural institutions were a significant barrier to labour reallocation to manufacturing. Singariya and Naval (2016) examined the causal relationship between GDP and India's agricultural, industrial and service sector output. Using time-series data spanning the period of 1950-2012. They applied Johansen cointegration, the VEC model and impulse response function and variance decomposition analysis. The study reveals that bidirectional causality exists among agricultural, industrial, the service sector and GDP, while a unidirectional causality exists between agriculture and the industrial sector. They also established intersectoral linkages identifying agriculture as the main economic activity that controls most economic activities in India.

Johannes et al. (2017) examine the relationship between manufacturing growth and economic growth in South Africa using quarterly data ranging from 2001 to 2014. They employed Johansen cointegration to test Kaldor's hypothesis. The Johansen cointegration results revealed that there is a long-run relationship between GDP, manufacturing, service, and employment. The Granger causality results revealed that there is a unidirectional causality running from manufacturing growth to GDP growth. Ellahi (2011) empirically investigated testing the relationship between electricity supply, the development of the industrial sector and economic growth in Pakistan. Using a time-series data set, theoretically based on an endogenous growth model and empirically applied the ARDL approach. The study reveals that labour, capital, electricity supply and industrial sector development play an important role in improving the economic growth of Pakistan. Finally, he recommends that despite policy incentives in the industrial sector, efforts should still be made to fix the problem of electricity in Pakistan. Spehrdoust and Muhammad (2012) empirically studied Iran's intersectoral linkages and economic growth. The authors employed time-series data for 1959-2010 using the advanced cointegration technique (ARDL). The results indicate that a long-run elasticity relationship exists in value-added industrial values added. Agriculture, value-added, service value-added and oil value-added will cause the gross domestic product to increase. Ajmair (2014) investigated the impact of the industrial sector on GDP in Pakistan. Secondary data for 61 years from 1950 to 2010 were used. Ordinary least squares method technique was applied to estimate the relationships. The study reveals that simple linear regression applied by the author shows a positive relationship of the components of industrial sector on GDP except for the mining and quarrying sector that not only shows the negative relationship but also gives an insignificant result. The study, therefore, recommends that there is a need for Pakistan's industrial sector to focus on the development of new products, import replacement, export goods and goods with growing demands. Sahar (2020) empirically studied industrialisation and economic growth relationships by applying the ARDL approach with time series data for the 1975-2015 period. The findings revealed a long-run relationship between industrial output and economic growth. Additionally, we revealed an increase in economic growth caused by industrial output.

3. 3. METHODOLOGY

The study utilised secondary data in the form of time series spanning the period 1970-2015. Due to the nature of time series data, they are notably not stationary due to changes in the time trend. The Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) tests for stationarity were used to confirm the stationarity of the series with the trend and intercept.

Based on theoretical exposition and following the extant literature reviewed. The following growth model was adapted from Isiksal & Chimezie (2016) and Olalekan, Afees, and Ayodele (2016), with some modifications. As pointed out in the works of Olalekan, Afees and Ayodele (2016) and Ajakaiye (1990), the economy is divided into three aggregated sectors: primary (agriculture, forestry, and fisheries), secondary (manufacturing, mining) and tertiary (trade and services). Due to the income elasticity of demand for primary, secondary, and tertiary products, the region becomes specialised in the primary, then secondary, then tertiary products. This study follows the footpath of these studies with modification by determining the industrial development and economic growth nexus in Nigeria through the impact of key sectors in the economy.

$$GDP = f(MAN, SOM, CPNG, AGR, SVC, LAB) \quad (3.1)$$

In an explicit form, the disaggregated growth model becomes:

$$GDP_t = \beta_0 + \beta_1 MAN_{t-1} + \beta_2 SOM_{t-1} + \beta_3 CPNG_{t-1} + \beta_4 AGR_{t-1} + \beta_5 SVC_{t-1} + \beta_6 LAB_{t-1} + \epsilon_t \quad (3.2)$$

Where:

GDP = Gross Domestic Product

β_0 = Constant parameter

β_1-β_6 = Coefficient of independent variables

MAN_{t-1} = Lag value of Manufacturing

SOM_{t-1} = Lag value of Solid Mineral

$CPNG_{t-1}$ = Lag value of Crude Petroleum and Gas

AGR_{t-1} = Lag value of Agriculture

SVC_{t-1} = Lag value of Service sector

LAB_{t-1} = Lag value of Labor

ϵ_t = error term

Gross Domestic Product: The dependent variable for this study is the economic growth proxy by Gross Domestic Product (GDP). GDP is measured in 2010 by constant basic prices. Explaining the growth rate of output overtime is usually referred to as a growth accounting approach

Industrial development: The development of the industrial sector of any economy can be measured by the contribution of various components, including agriculture (Isiksal & Chimezie, 2016). It is expected that as an economy becomes transformed, the share of industrialisation should be increasing (UNECA, 2011). Based on the focus of this study, industrial development is measured in its disaggregated form.

Furthermore, to analyse the nexus of industrial development on economic growth in Nigeria, this study employs the autoregressive distributed lag (ARDL) model developed by Pesaran et al. (2001). This model is a more robust econometric technique for estimating the level relationship between a dependent variable and a set of independent variables that may not necessarily be integrated of the same order. The basic steps of the ARDL approach involve the estimation of the level relationship once the order of integration has been identified, after which we estimate the long-run relationship and short-run impact (Pesaran et al., 2001). Bound testing has the advantage of avoiding the pretesting problem involved in the unit root test, but since the mixture of the series order cannot exceed 1(1) for the estimation to be valid, unit root testing will be necessary to ensure that none of the variables is 1(2). This model is suitable for estimating small or finite sample sizes and estimating both short-run and long-run parameters of the model simultaneously; when there is a single long-run relationship, the ARDL procedure can distinguish between dependent and explanatory variables. The ARDL approach assumes that only a single reduced-form equation relationship exists between the dependent variable and the exogenous variables (Pesaran, Smith, and Shin, 2001).

The ARDL approach to cointegration analysis involves estimation of the unrestricted error correction model (UECM). Hence, the ARDL model for testing the relationship between economic growth and its determinants is stated as shown in model 3.3.

$$\Delta \text{In } GDP_t = \beta_o + \delta_1 \text{ In } GDP_{t-1} + \delta_2 \text{ In } MAN_{t-1} + \delta_3 \text{ In } SOM_{t-1} + \delta_4 \text{ In } CPNG_{t-1} + \delta_5 \text{ In } AGR_{t-1} + \delta_6 \text{ In } SAV_{t-1} \sum_{t=1}^{n} \emptyset_i \, \Delta \text{ In } GDP_{t-1} + \sum_{t=0}^{m} \varphi_j \Delta \text{ In } MAN_{t-1} + \sum_{t=0}^{m} \gamma_l \Delta \text{ In } SOM_{t-1} + \sum_{t=0}^{m} \alpha_m \Delta \text{ In } CPNG_{t-1} + \sum_{t=0}^{m} \omega_k \Delta \text{In} AGR_{t-1} + \sum_{t=0}^{m} \partial_f \Delta \text{In} SVC_{t-1} + \sum_{t=0}^{m} \theta_g \Delta \text{In} LAB_{t-1} + \varepsilon_t \tag{3.3}$$

where δ_i are the long-run multipliers, β_o is the intercept, and ε_t are white noise errors. The first step in the ARDL bounds testing approach is to estimate equation (3.4) by ordinary least squares (OLS) to test for a long-run relationship among the variables.

$$\Delta \text{In } GDP_t = \beta_o + \delta_1 \text{ In } GDP_{t-1} + \sum_{t=0}^{m} \delta_2 \text{ In } MAN_{t-1} + \sum_{t=1}^{m} \delta_3 \text{ In } SOM_{t-1} + \sum_{t=1}^{m} \delta_4 \text{ In } CPNG_{t-1} + \sum_{t=1}^{m} \delta_5 \text{In} AGR_{t-1} + \sum_{t=1}^{m} \delta_6 \text{In} SVC_{t-1} + \sum_{t=0}^{m} \theta_g \Delta \text{In} LAB_{t-1} + \varepsilon_t \quad (3.4)$$

This involves selecting the orders of the ARDL (P, q1, q2, q3, q4, q5, q6) model in the seven variables using Akaike Information criteria (AIC) and Schwartz information criteria (SIC). The existence of a long-run relationship among the series takes us to the next step, which is to obtain the short-run dynamic parameters by estimating an error correction model associated with the long-run estimates.

$$\Delta \text{In } GDP_t = \beta_o + \sum_{t=1}^{n} \emptyset_i \Delta \text{ In } GDP_{t-1} + \sum_{t=0}^{m} \varphi_j \Delta \text{ In } MAN_{t-1} + \sum_{t=1}^{m} \gamma_l \Delta \text{ In } SOM_{t-1} + \sum_{t=1}^{m} \alpha_m \Delta \text{ In} CPNG_{t-1} + \sum_{t=1}^{m} \omega_k \Delta \text{In} AGR_{t-1} + \sum_{t=1}^{m} \partial_f \Delta \text{In} SVC_{t-1} + \sum_{t=0}^{m} \theta_g \Delta \text{In} LAB_{t-1} \varepsilon_t \quad (3.5)$$

Here, f, j, v, h, θ and g are the short-run dynamic coefficients of the model's convergence to equilibrium, and J is the speed of adjustment. where εt is the error correction mechanism representing the coefficient of the ECM term. Having obtained the short run parameters, we proceeded to test for the stability of the model because the establishment of cointegration among the variables is only a necessary but not sufficient condition. Hence, the study employed the stability test proposed by Brown et al. (1995), known as the cumulative sum and the cumulative sum of squares (CUSUM and CUSUMQ). Finally, to test the robustness of our results, diagnostic tests such as normality (Jargue-Bera), serial autocorrelation (Breusch-Godfrey LM) test, heteroskedasticity (Breusch-Pagan Godfrey) and misspecification tests were conducted.

4. RESULTS AND DISCUSSION

The analysis commenced with the test of stationarity, the result of which is presented in Table 1.

Table 1.: Unit Root Test Result

Variables	ADF Test Level	ADF Test 1st Diff.	PP Test Level	PP Test 1st Diff.
Gross Domestic Product (GDP)	-0.240645	-6.860206*	-0.042169	-7.007570*
Manufacturing (MAN)	3.199769	-4.021794*	3.199769	-3.962141*
Solid Mineral (SOM)	-2.665799***	-6.357072*	-2.706359***	-6.536453*
Crude Petroleum and Gas (CPNG)	-1.717625	-7.061996*	-1.709477	-7.065284*
Agriculture (AGR)	-1.410084	-6.77554*	-1.402756	-6.778049*
Service Sector (SVC)	4.816339	-4.364857*	5.114017	-4.597651*
Labor (LAB)	0.252980	-6.358351*	0.101698	-6.412172*

Source: Author's computation using EVIEWS version 9 software. Notes: *, ** and *** denote levels of significance at 1%, 5% and 10%, respectively.

The summary of the results shown in Table 1. reveals that all the variables are non-stationary in the level values, with the exception of solid minerals (SOM), which was stable at the 10% level of significance and assured to be weak. Nevertheless, the stationarity property was found after taking the first difference of all the variables at the 1% critical level. According to Chigusiwa et al. (2011), in the presence of I(2) variables, the computed f-statistics of the bounds test are rendered invalid. Hence, the stationarity of the series at 1 (1) provides econometric support for the application of ARDL.

Examining for the long-run relationship among the variables. The bounds tests for cointegration are presented in Table 2. for all functional models. Going by the table, the computed F-statistic of 5.97 for the functional model was discovered to be greater than both the lower and upper bounds of 2.88 and 3.99 critical values, respectively, as developed by Pesaran and Narayan at the 1% level of significance. This suggests the rejection of the null hypothesis that there is no long-run relationship between industrial development and economic growth.

Table 2.: Bound F test results for cointegration (2, 2, 2, 1, 2, 2, 1)

Dependet variable	Function	F-statistic
LGDP	F_{GDP}(GDP,MAN,SOM,CPNG,AGR,SVC,LAB)	5.977215*
Asymptotic critical value	10% 5%	1%
Lower bound	1.99 2.27	2.88
Upper bound	2.94 3.28	3.99

Source: Author's computation using EVIEWS version 9 software. Notes:*, **and *** indicate the level of significance at 1%, 5% and 10%, respectively.

Table 3. indicates the existence of a long-run equilibrium relationship between economic growth (GDP), which serves as the dependent variable, and other explanatory variables. The long-run coefficients are estimated using the ARDL. The ARDL model is estimated by setting the maximum lag length to 2 based on automatic selection criteria by the Akaike information criterion, Schwarz information criterion, final prediction error and Hanna-Quinn information criterion.

Table 3.: Presentation of Results of Estimated Long run Coefficient Using ARDL Approach (2, 2, 2, 1, 2, 2, 1)

Regressor	Coefficient	Standard error	T-stat.
Dependent variable: GDP			
MAN	2.8651	0.6958	4.1175*
SOM	11.4808	2.8358	4.0486*
CPNG	0.5563	0.0718	7.7442*
AGR	1.7073	0.0809	21.0851*
SVC	0.9891	0.1431	6.9125*
LAB	-323.9119	516.3338	-0.6273

Source: Author's computation using EVIEWS version 9 software. Notes: * indicate the level of significance at 1%.

A careful look at the long-run result in Table 3. shows that the coefficients of the long-run elasticity on economic growth in Nigeria are generally positive, as expected, and based on economic theories. The long-run impact of the manufacturing sector on economic growth is approximately 2.87% and statistically significant at the 1% level, meaning that a 1% increase in manufacturing sector performance in Nigeria will result in a 2.87% increase in the level of economic growth. The long-run impacts of solid minerals, crude petroleum, gas, agriculture and the service sector are 11.48%, 0.56%, 1.71% and 0.99%, respectively, and were all found to be positive and statistically significant at the 1% level, while labor has an insignificant negative impact on economic growth.

In the short run, deviations from the long-run equilibrium can occur as a result of shocks in any of the variables in the model. Table 4. shows the result of the short-run dynamic coefficients associated with the long-run relationships obtained from the error correction model. Again, the manufacturing, solid minerals, crude petroleum, and gas, agriculture and service sector variables were statistically significant and positive at the 1% level.

Table 4.: Error Correction Representation for the selected ARDL Model (2, 2, 2, 1, 2, 2, 1)

Regressor	Coefficient	Standard error	T-ratio
Dependent variable: ΔGDP			
ĆMAN	0.668581	0.216001	3.095262*
ĆSOM	2.679129	0.667571	4.013251*
ĆCPNG	0.129805	0.035047	3.703795*
ĆAGR	0.398413	0.058752	6.781263*
ĆSVC	0.230822	0.045098	5.118280*
ĆLAB	-75.58715	118.6119	-0.637264
ECM (-1)	-0.233357	0.042724	-5.462025*
R^2	0.99%		
D.W	1.95		
F value	458.7430*		
Diagnostic Test			
Breusch-Godfrey L-M	0.4334	(0.8052)	
Breusch-Pagan-Godfrey. Het.	8.5109	(0.9700)	
Jargue-Bera-Normality	1.0985	(0.5774)	
Ramsey-Reset	2.7433	(0.1107)	

Source: Author's computation using EVIEWS version 9 software. Notes: * indicates the level of significance at 1%. Ć represents all short-run coefficients at their first difference while the values in the parentheses are the p values.

However, the impact of labour on growth remains negative and insignificant. This result tends to produce similar results as those obtained in the long-run estimate. The error correction coefficient estimate of -0.233 is highly significant at the 1% level and correctly signed. This implies a very low 100 speed of adjustment to equilibrium. In specific terms, approximately 23per cent of disequilibrium from the previous year's shock will be re-adjusted back to the long-run equilibrium in the current year. As presented in Table 5., there is no evidence of a diagnostic problem with the model. The Breuch-Godfrey LM test for serial correlation indicates no serial correlation with an F-statistical value of 0.433 and an insignificant probability value of 0.805. The Jargue-Bera normality test implies that the residuals are normally distributed with an insignificant probability value of 0.577. The Breusch-Pagan test (BP) for heteroskedasticity shows that the disturbance term in the model is homoskedastic. Additionally, the Ramsey RESET was used for functional specification. There is no evidence of misspecification with an F-statistic of 2.74 and a probability value of 0.1107; thus, the ARDL model is correctly specified.

Figure 1.: Cumulative Sum of Residuals

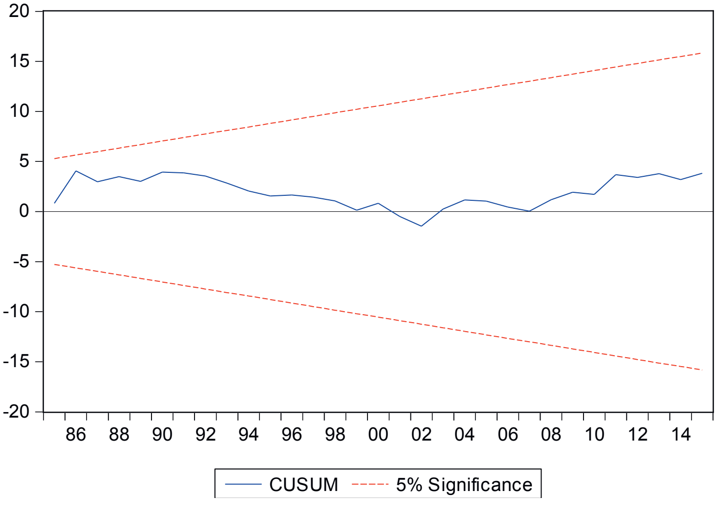
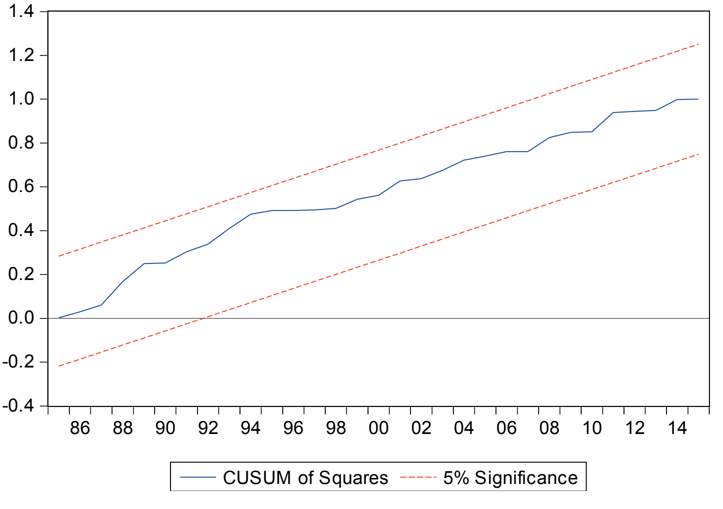


Figure 2.: Cumulative Sum of Squares of Residuals



The results of the CUSUM and CUSUMSQ tests for the short-run equilibrium are represented in Figures 1. and 2., respectively. Neither CUSUM nor CUSUM sum of square tests provided any evidence of instability in the estimates at the 5 percent significance level for conventional specification. Both tests fall within the 5% critical bound, which implies that all the coefficients in the short-run model are stable and robust for prediction.

The result of the estimated model shows that manufacturing has a positive and significant impact on economic growth in Nigeria. The estimation of both short- and long-run models, as evidenced by the results, shows that a percentage change in the manufacturing sector tends to increase in its contribution to economic growth tremendously if properly handled by the Nigerian government. This finding concurs with the findings of Olalekan, Afeez, and Ayodele, (2016), Mbaegbu, (2016) and Sola, Obamuyi, Adekunji and Ogunleye (2013). However, the findings of this study are contrary to the findings of Ojo and Ololade (2014), which revealed that the manufacturing sector has a negative and insignificant impact on economic growth. The significant positive impact of manufacturing on growth might be attributed to the improvement in the agricultural sector in terms of the provision of raw material for the manufacturing sector and the recent embargo placed on the importation of finished goods in Nigeria. Solid minerals have a positive and significant impact on economic growth in Nigeria. This is in addition to the indirect benefits that come in the form of local or international purchases of solid mineral inputs. This could be attributed to efficient policy support and guidance. Crude petroleum and gas have a positive and significant impact on economic growth. The result was evidenced by both the short- and long-run coefficients. From the results obtained, crude petroleum and gas have the least contribution to economic growth in the short run, compared to the long run coefficients. The implication of this is that the objective of economic diversification has not been adequately achieved. This is in line with Umaru and Zubairu (2012) findings, who discovered a significant relationship between crude petroleum and gas and economic growth in Nigeria. This finding is in contrast to the findings of Olalekan, Afeez, and Ayodele (2016), who also confirmed that crude petroleum and gas have an inverse relationship with economic growth. The reason for this could be that Nigeria is still operating a monoculture economy. Measures for proper diversification of the Nigerian economy have not been fully achieved.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The development of the industrial sector of any economy can be measured by the contribution of various components. It is expected that as an economy becomes transformed, the share of industrialisation should be increasing. Based on the focus of this paper, industrial development was measured in its disaggregated form (sector by sector). This paper empirically analysed the industrial development and economic growth nexus in Nigeria (a disaggregated approach) during the 1970-2015 period. The study applied the ARDL test techniques to establish the short-run and long-run relationships between the variables in the model. Using both the ADF and Philip Peron, the stationarity of the variables was confirmed, followed by the selection of the optimal lag and then testing for the existence of cointegration. Empirical findings suggest that a long-run relationship between economic growth and industrial development exists in Nigeria.

Evidence from both short-run and long-run estimations of industrial sub-sectors, such as manufacturing, solid minerals and crude petroleum and gas, has a positive and significant impact on economic growth in Nigeria. Additionally, the estimated result shows that the agriculture and service sectors have positive and significant impacts on economic growth, while labor was discovered to exert a negative and insignificant impact on growth in Nigeria. Therefore, the study concludes that among the industrial subsectors, the crude petroleum and gas sector appears to be the highest driver of economic growth in Nigeria compared to other industrial sub-sectors, therefore achieving the research goal. Hence, the null hypothesis is rejected, showing that there exists a significant relationship between industrial development and economic growth in Nigeria. Different diagnostic tests were carried out on the estimated model, and the results show that the model passes through all the tests. Confirming the stability of the model, CUSUM and CUSUMQ provide evidence in support of the stability of the model.

Despite the positive performance of industrial sub-sectors on economic growth in Nigeria, the government should make efforts to fix the problem of overreliance on the oil sector, thereby redirecting its industrial policy towards the nonoil sector as a way of promoting domestic capabilities. To achieve this, the government should ensure easy access to credit for local manufacturing industries in Nigeria. Additionally, there is a need for the government to ensure that a standard is set across the secondary educational system in the country so that the qualitative human capita, required for any individual to become productive is enhanced.

Having established a long-run relationship between industrial development and economic growth, proper attention should be channeled towards ensuring an enabling environment for structural transformation, while resource rent should be distributed to the targeted objective. This may include investing in human capital and infrastructural development.

Finally, it should be emphasised that the results of this study could be augmented in future works to investigate the necessary channels by which industrialisation and economic growth interact. However, further studies may, therefore, use updated sample sizes, and the econometric methods applied could be extended to include other growth model variables that the study could not capture.

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APPENDIX

Variables Measurement

Variables	Measurement
Gross Domestic Product (GDP)	GDP is measured in 2010 constant basic prices.
Manufacturing	Measured manufacturing as its contribution to GDP as a proxy for the operation and output of manufacturing.
Solid Minerals	Measured as contributions of solid minerals value capacity utilisation to economic growth measured in Naira.
Crude Petroleum and Gas	This is measured as the value contribution of Crude Petroleum and Gas to economic growth.
Agriculture	Measured agriculture as the total value of agricultural output which will be used to capture the contribution of agriculture to economic growth.
Service Sector	Measured by the value of its contribution to economic growth.
Labour	The use of percentage of secondary school enrolment as a proxy for labor force.

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