LABOUR PRODUCTIVITY AND ECONOMIC GROWTH IN NIGERIA: A DISAGGREGATED SECTOR ANALYSIS

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Abstract
This study examined the relationship between labour productivity and economic growth in Nigeria covering the period of 1980 to 2015. Auto-regressive Distributed Lag (ARDL) model was used for the analysis since some variables incorporated in the model were stationary at level while others were integrated at first difference at 5% level of significance. The study found that there is significant relationship between labour productivity and agricultural sector growth and between labour productivity and the growth in the service sector. However, there was no significant relationship between labour productivity and manufacturing sector growth and between labour productivity and the growth in the oil and gas sector. The study therefore recommends that the Nigerian government should continue to investment in human resource development that could improve labour productivity in all the sectors in the recent changing world towards highly technological growth oriented economy, and should create an enabling environment for the agricultural sector through advancing of loans to farmers and manufacturers through formal financial institutions.
Keywords: Agricultural sector growth, Economic Growth, Labour Productivity, manufacturing sector growth, Oil and Gas sector growth and Services sector growth.

1.1 INTRODUCTION

It has been observed that the ability of any nation to attain sustainable growth and development largely depends not on the available natural resources and other supportive factors, but on the ability to perfectly combine, transform and distribute these factors; which in turn, depends on the quality and quantity of human resources in the economy (Korkmaz & Korkmaz,

2017;Todaro, 2007). Hence, the wealth and vitality of nations rest ultimately upon the development of people and the effective commitment of their energies and talents to production.

The productive structure of a country determines the level of economic growth(Todaro, 2007). This improved labour productivity is enhanced through investment in human capital. UNDP (2010) observed that no country has achieved sustained economic development without substantial investment in human capital and improved labour productivity. Lyakurwa (2007) is of the view that education alone has the capacity to enlarge peoples' choices and opportunities, improve healthy living through acquired skills and eventually enhance growth in the nation's Gross Domestic Product (GDP) through increased productivity.

Studies on the relationship between productivity and economic growth show that productivity influences economic growth positively (Korkmaz & Korkmaz, 2017; Ngutsav, Akighir & Iorember, 2017; Jorgenson, 2009). In separate studies, Christensen, Cummings, and Jorgenson (1980) and Maddison (1987) reviewed international comparisons of sources of economic growth among industrialized countries, while Kravis (1976) surveyed international comparisons of productivity. Griliches (1984) and Mansfield (1984) have reviewed on productivity at the level of the individual firm. Detailed surveys of the literature on productivity have been presented by Kennedy and Thirlwall (1972) and Nadiri (1970). All have emphasis the relevance of labour productivity in enhancing economic growth of a country. The essential idea of the disaggregated approach is to model producer behavior through complete systems of demand functions for inputs into each sector. This approach is a lineal descendant of the general equilibrium models of production introduced by Leontief (1951).

But, several empirical studies have not considered the disaggregated sector effects of labour productivity on economic growth in Nigeria. The study therefore examines the effects of labour productivity on economic growth paying particular attention to the labour productivity effects on agriculture, manufacturing, oil and gas as well as services sub-sectors.

2.0 REVIEW OF RELATED LITERATURE

Labour Productivity: Labour productivity is a measure of economic growth within a country. It measures the amount of goods and services produced by one hour of labour. Specifically, labour productivity measures the amount of real gross domestic product (GDP) produced by an hour of labour. Workforce productivity is the amount of goods and services that a worker produces in a given amount of time. It is one of several types of productivity that economists measure. Workforce productivity, often referred to as labour productivity, is a measure for an organization or company, a process, an industry, or a country (Freeman,2008).

Labour productivity is an important economic indicator that is closely linked to economic growth, competitiveness, and living standards within an economy. It represents the total volume of output (measured in terms of Gross Domestic Product, GDP) produced per unit of labour (measured in terms of the number of employed persons) during a given time reference period. The indicator allows data users to assess GDP-to -labour input levels and growth rates over time, thus providing general information about the efficiency and quality of human capital in the production process for a given economic and social context, including other complementary inputs and innovations used in production. Given its usefulness in conveying valuable information on a country's labour market situation, it was one of the indicators used to measure progress towards the achievement of the Millennium Development Goals (MDGs), under Goal 1 (Eradicate poverty and hunger), and it was included as one of the indicators proposed to measure progress towards the achievement of the Sustainable Development Goals (SDG), under Goal 8 (Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all) (Freeman, 2008). Productivity represents the amount of output per unit of input. The indicator of labour productivity is calculated as follows: Labour Productivity = GDP at constant prices/Number of employed persons. This study will consider labour productivity by sectors such that Labour Productivity of sector *i* = GDP from the sector *i* /Number of employed persons in sector *i* where *i* = agricultural sector, manufacturing sector, oil and gas sector and service sector.

Economic Growth: Economic growth is an important element that when sustained, can lead to development of a country. It is an expansion in a

country's productive capacity as measured by comparing Gross National Product in a year with the Average National Product of the previous year. Increases in capital stock, advancement in technology, improvement in the quality and level of literacy are considered to be the principal causes of economic growth. Anyanwuocha (2001) defined economic growth as a quantitative increase in a country's per capita output or income, accompanied by expansion in consumption, capital and volume of trade without a change in technical and institutional arrangement. Jhinghan (2003) views economic growth as a gradual and steady change in the long- run which comes about by a gradual increase in the rate of savings and population.

According to Todaro and Smith (2009), economic growth is the steady process by which the productive capacity of the economy is increased over time to bring about rising levels of national income. Similarly, it can as well be seen as a persistent rise in the national income over a range of time of the economy's capacity to produce those goods and services needed to improve the wellbeing of the citizens in an increasing number of diversity.

Thus, economic growth is seen as a process by which a nation's wealth increases over time. In other words, it is that physical and quantitative increase in the capacity of an economy to produce goods and services, compared from one period of time to another and the most widely used measure of economic growth is the rate of growth of the economy's Gross Domestic Product (GDP). This paper disaggregated economic growth in terms of sector growth of agriculture, manufacturing, oil and gas, and service sectors.

3.0 RESEARCH METHODOLOGY

This research work is fundamentally analytical and descriptive as it embraces the use of secondary data in examining the relationship between labour productivity and economic growth in Nigeria. The descriptive statistics include the use of mean, median, mode, skewness, kurtosis, Jacque-Berra, probabilities, among others.The analytical tools consist of econometrical techniques such as; Augmented Dickey-fuller (ADF) Unit Root Test for stationarity test and Autoregressive Distributed Lag Model (ARDL) forthe empirical analysis.

The data required for this study includes; Real Gross Domestic Product (Agriculture, manufacturing, oil and gas and services) and labour productivity which were sourced from Central Bank of Nigeria statistical Bulletin while

exchange rate, inflation rate and foreign direct investment which were sourced from World Bank statistics for Nigeria. Data on labour force and foreign direct inflows by sectors were sourced from other sources such as National Bureau of Statistics, CBN Annual Reports and other published literature relevant to the study. The data for the study covered the period of 1986 to 2015.

3.1 Model Specification

Given that labour productivity has effect on the growth of national output, we express our national output model as:

$$GDP_t = f(GDPL_t, FDI_t, INFL_t, EXR_t) \quad - \quad - \quad - \quad - \quad (1)$$

Where GDP is the national output, GDPL is labour productivity, EXR is the exchange rate, INFL is the inflation rate, FDI is foreign direct investment and *t* is the time period

Using GDP by sector and labour productivity by sector, Equation 1 is further decomposed in GDP growth in Agriculture, Manufacturing, oil and gas and services, labour productivity and foreign direct investment in agriculture, manufacturing, oil and gas and service sector, the equations are specified below. The stochastic equations are expressed in terms of Auto-Distributed Lag Model (ARDL). The ADRL is considered as the most appropriate estimation technique in this study because it has superior small sample properties as compared to the Johansen (1991) and Johansen (1995) co-integration test (Pesaran & Shin, 1999). Therefore, the approach is considered to be very suitable for analysing the phenomena been studied. The ARDL representation are stated as follows:

In examining the impact of labour productivity on agricultural sector growth, the model is specified as:

$$lnGDPA_t = \alpha_0 + \sum_{i=1}^{p} \theta_1 \Delta lnGDPA_{t-i} + \beta_1 lnGDPLA_t + \beta_2 lnFDIA_t + \beta_3 lnINFL_t + \beta_4 lnEXR_t + \sum_{i=0}^{q-1} \beta^*_1 \Delta lnGDPLA_{t-i} + \sum_{i=0}^{q-1} \beta^*_2 \Delta lnFDIA_{t-i} + \sum_{i=0}^{q-1} \beta^*_3 \Delta lnINFL_{t-i} + \sum_{i=0}^{q-1} \beta^*_4 \Delta lnEXR_{t-i} + u_t \quad - \quad - \quad - \quad - \quad - \quad - \quad - \quad - \quad (2)$$

Where GDPA = Agricultural sector growth, GDPLA = Labour Productivity in Agricultural Sector, FDIA = Foreign Direct Investment in Agricultural Sector, INFL = Inflation rate, EXR = Official Exchange Rate, $\beta_1 - \beta_4$ are the long-run parameters to be estimated, $\beta^*_1 - \beta^*_4$ *ln* = Natural Logarithm

In examining the impact of labour productivity on manufacturing sector growth, the model is specified as:

$$lnGDPM_t = \alpha_0 + \sum_{i=1}^{p}\theta_l \Delta lnGDPM_{t-i} + \beta_1 lnGDPLM_t + \beta_2 lnFDIM_t + \beta_3 lnINFL_t + \beta_4 lnEXR_t + \sum_{i=0}^{q-1}\beta^*_1 \Delta lnGDPLM_{t-i} + \sum_{i=0}^{q-1}\beta^*_2 \Delta lnFDIM_{t-i} + \sum_{i=0}^{q-1}\beta^*_3 \Delta lnINFL_{t-i} + \sum_{i=0}^{q-1}\beta^*_4 \Delta lnEXR_{t-i} + u_t \quad (3)$$

Where
GDPM = Manufacturing sector growth, GDPLM = Labour Productivity in Manufacturing sector, FDIM = Foreign Direct Investment in Manufacturing sector, INFL = Inflation rate, EXR = Official Exchange Rate, $\beta_1 - \beta_4$ are the long-run parameters to be estimated, $\beta^*_1 - \beta^*_4$ are the short-run parameters to be estimated, *ln* = Natural Logarithm,

In examining the impact of labour productivity on oil and gas sector growth, the model is specified as:

$$lnGDPOG_t = \alpha_0 + \sum_{i=1}^{p}\theta_l \Delta lnGDPOG_{t-i} + \beta_1 lnGDPLOG_t + \beta_2 lnFDIOG_t + \beta_3 lnINFL_t + \beta_4 lnEXR_t + \sum_{i=0}^{q-1}\beta^*_1 \Delta lnGDPLOG_{t-i} + \sum_{i=0}^{q-1}\beta^*_2 \Delta lnFDIOG_{t-i} + \sum_{i=0}^{q-1}\beta^*_3 \Delta lnINFL_{t-i} + \sum_{i=0}^{q-1}\beta^*_4 \Delta lnEXR_{t-i} + u_t \quad (4)$$

Where
GDPOG = Oil and Gas sector Growth, GDPLOG = Labour Productivity in Oil and Gas sector, FDIOG = Foreign Direct Investment in Oil and Gas sector, INFL = Inflation rate, EXR = Official Exchange Rate, $\beta_1 - \beta_4$ the long-run parameters to be estimated, $\beta^*_1 - \beta^*_4$ are the short-run parameters to be estimated, *ln* = Natural Logarithm *ln* examining the impact of labour productivity on services sector growth, the model is specified as:

$$lnGDPS_t = \alpha_0 + \sum_{i=1}^{p}\theta_l \Delta lnGDPS_{t-i} + \beta_1 lnGDPLS_t + \beta_2 lnFDIS_t + \beta_3 lnINFL_t + \beta_4 lnEXR_t + \sum_{i=0}^{q-1}\beta^*_1 \Delta lnGDPLS_{t-i} + \sum_{i=0}^{q-1}\beta^*_2 \Delta lnFDIS_{t-i} + \sum_{i=0}^{q-1}\beta^*_3 \Delta lnINFL_{t-i} + \sum_{i=0}^{q-1}\beta^*_4 \Delta lnEXR_{t-i} + u_t \quad (5)$$

Where
GDPS = Service sector growth, GDPLS = Labour Productivity in Service sector, FDIS = Foreign Direct Investment in Service sector, INFL = Inflation rate, EXR = Official Exchange Rate, $\beta_1 - \beta_4$ are the long-run parameters to be estimated, $\beta^*_1 - \beta^*_4$ are the short-run parameters to be estimated, *ln* = Natural Logarithm,

4.0 RESULTS AND DISCUSSIONS

4.1 Descriptive Statistics

The descriptive statistics of the variables used in this study are presented in Table 1

Table 4.1: Descriptive Statistics

Tools	GDPA	GDPM	GDPOG	GDPS	INFL	EXR	GDPLA
Mean	5524.583	2015.334	102.2642	8215.990	19.59667	82.22196	0.001627
Skewness	0.920224	1.585555	1.023374	1.368382	1.669254	-0.11806	-0.31609
Kurtosis	2.424524	4.472053	2.859599	3.673676	4.623665	1.234840	1.618018
Jarque-Bera	4.648029	15.27860	5.261109	9.929650	17.22740	3.964430	3.464303
Probability	0.097880	0.000481	0.072039	0.006979	0.000182	0.137764	0.176903
Observations	36	36	36	36	36	36	36
Tools	**GDPLM**	**GDPLOG**	**GDPLS**	**FDIA**	**FDIM**	**FDIOG**	**FDIS**
Mean	0.003087	0.174536	0.637829	8562.01	51372.06	136992.2	214050.3
Skewness	0.03275	-0.20635	0.002443	0.315514	-0.20434	-0.32762	0.450081
Kurtosis	1.546582	1.709995	2.432972	1.891496	1.874008	2.188315	1.734315
Jarque-Bera	3.17507	2.751655	0.482317	2.440464	2.152305	1.63226	3.618372
Probability	0.204429	0.25263	0.785717	0.295162	0.340905	0.44214	0.163787
Observations	36	36	36	36	36	36	36

Source: Authors' Computation using E-views 9.5 Output

Foreign Direct Investment (FDI) in service sector has a high average of ? 214,050.3 billion, followed by ? 136,992.2 billion and ? 51,372.06 billion in oil and gas and manufacturing sector respectively. Service sector also has recorded high labour productivity unlike agriculture and manufacturing sectors. Services sector growth also recorded the highest average sector GDP of ? 8,215.9 billion. This is followed by the variable GDPA with a high mean rating of ? 5,524.6 billion. More so, GDPM has an average of ? 2015.3 billion while, GDPOG has a mean rating of ? 102.2642 billion. This implies that service sector has more output than other sectors of the economy. This may be connected to high inflows of foreign direct investment in telecommunications in the country. Exchange Rate (EXR) has an average of (82.2%) while INFL in Nigeria averaged a double digit of 19.6%.

The estimates were also fortified withthe values of skewness and kurtosis of all the variables involved in the model. The skewness is a measure of asymmetry of the distribution of the series around its mean, the skewness of a normal distribution is zero. It is positively skewed when the distribution has a

long right tail and it is negatively skewed when the distribution has a long left tail. The variables GDPA, GDPM, GDPOG, GDPS, INFL, GDPLA, GDPLM, GDPLS, FDIA and FDIS are skewed to the right (positively skewed), while the EXR, GDPLOG, FDIM and FDIOGare skewed to the left (negatively skewed). The variables: GDPA, EXR, GDPLA, GDPLM, GDPLOG, GDPLS, FDIA, FDIM, FDIOG and FDIS are platykurtic, which implies the variables are spread far from the mean, while the variables GDPM, GDPS and INFL are leptokurtic which implies the variables are concentrated. Only GDPOG has mesokurtic shape.

The Jarque-Bera statistics is used to measure the normality of the variable used in the estimation.It shows thatGDPM, GDPS and INFL are not normally distributed but exhibited a distribution which is considered normal after transformation of the data.

4.2 Unit Root Test

The unit root test was carried out using Augmented Dickey-Fuller (ADF) for all variables in the study. The results of the stationary test are presented in Table 2.

Table 2: Unit Root Test Results

	Augmented Dickey-Fuller statistics of the variables						**Order of Integration**
			Critical Values				
Variables	**At Level**	**First Difference**	**0.01%**	**0.05%**	**0.1%**	**Prob. value**	
LnGDPA	-1.409376	-3.871826	-3.639407	-2.951125	-2.614300	0.0055	1(1)
LnGDPM	0.432399	-4.745856	-3.639407	-2.951125	-2.614300	0.0005	1(I)
lnGDPOG	-0.934445	-6.582281	-3.639407	-2.951125	-2.614300	0.0000	1(I)
LnGDPS	0.013074	-3.374879	-3.639407	-2.951125	-2.614300	0.0191	1(1)
lnGDPLA	-1.458928	-7.004130	-3.639407	-2.951125	-2.614300	0.0000	1(1)
lnGDPLM	-0.172493	-5.254958	-3.639407	-2.951125	-2.614300	0.0001	1(I)
lnGDPLOG	-1.210192	-6.018981	-3.639407	-2.951125	-2.614300	0.0000	1(I)
lnGDPLS	-3.047243		-3.689194	-2.971853	-2.625121	0.0402	1(0)
LnFDIA	-0.105077	-5.680290	-3.639407	-2.951125	-2.614300	0.0000	1(I)
lnFDIM	-2.256935	-7.932361	-3.639407	-2.951125	-2.614300	0.0000	1(I)
lnFDIOG	-1.450911	-8.391516	-3.639407	-2.951125	-2.614300	0.0000	1(I)
lnFDIS	-3.976485		-3.689194	-2.971853	-2.625121	0.0000	1(0)
lnEXR	-0.201985	-5.520086	-3.639407	-2.951125	-2.614300	0.0001	1(I)
lnINFL	-2.460897	-5.685618	-3.646342	-2.954021	-2.615817	0.0000	1(I)

Source: Authors' Computation Using E-views 9.5 Output

The unit root test results in Table 2 have revealed that, the labour productivity in agricultural sector, manufacturing sector and oil and gas sector, agricultural growth, manufacturing sector growth, oil and gas sector growth and service sector growth, foreign direct investment in agricultural sector, manufacturing sector and oil and gas sector, exchange rate and inflation rateare not stationary at level but have become stationary at first difference, that is, I(1). While, labour productivity in the service sector and foreign direct investment in the service sector are stationary at level, that is, I(0). Therefore, the null hypotheses that the variables have unit root are not rejected for all the series implying that the variables have a mean reverting ability.

4.3 Analyzing the impact of Labour Productivity on Economic Growth inNigeria

In analyzing the impact of labour productivity on economic growth, the GDP which is commonly used as a measure of economic growth was decomposed into the GDP in agriculture(agricultural sector growth), GDP in manufacturing (manufacturing sector growth), GDP in oil and gas (oil and gas sector growth) and GDP in services (services sector growth).

4.3.1 Impact of Labour Productivity on Agricultural Sector Growth

In analyzing the impact of labour productivity on GDP growth in agriculture using the ARDL, first, the bounds cointegration was used to test for the existence of long-run relationship between labour productivity and agriculturalsector growth in Nigeria and the results are presented in Table 3.

Table 3: Bounds Test Results for Labour Productivity-Agricultural Sector Growth

ARDL Bounds Test	**F-Statistic**	**Critical Value Bounds @ 5%**
	5.443768	Lower Bound (I0)
		3.47
		Upper Bound (I1)
		4.57

Source: Authors' Computation using E-views 9.5 Output

The results of the bounds test showed that F-statistic value of 5.443768 is greater than the upper bound critical value of 4.57 at 5% level of significance. This led to the rejection of the null hypothesis of no long-run relationship between labour productivity and growth in agriculture GDP in Nigeria; and the alternative hypothesis was accepted, implying that there is the existence of

long-run relationship between labour productivity and growth in agriculture GDP in Nigeria.

Having ascertained the existence of the long-run equilibrium, the long-run and short-run estimates were computed and results are presented in Tables 4 and 5.

Table 4: Long-Run Estimates of ARDL (1,0,0,0,0) for Labour Productivity-Agricultural Sector Growth (GDPA) relationship

Variable	Coefficient	Std. Error	t-Statistic	Prob.
lnGDPLA	3.651829	3.879814	0.941238	0.3546
lnFDIA	0.307165	0.458540	0.669876	0.5084
lnINFL	-0.028658	0.038874	-0.737202	0.4671
lnEXR	-0.004877	0.008697	-0.560718	0.5794
C	1.096553	1.143417	0.959014	0.3458
@TREND	0.032958	0.095279	0.345913	0.7320

Source: Author's Computation using E-views 9.5 Output

The long-run coefficients of the ARDL (1,0,0,0,0) showed that labour productivity in agricultural sector, and foreign direct investment in agricultural sector have positive but insignificant relationship with GDP growth in agriculture in the long-run in Nigeria; while inflation and exchange rate have negative but also insignificant relationship with GDP growth in agriculture in the long-run.

Table 5: Short-Run Estimates of ARDL (1,0,0,0,0) for Labour Productivity-Agricultural Sector Growth Relationship

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(lnGDPA(-1))	0.246782	0.423947	0.582105	0.6242
D(lnGDPLA)	0.302990	0.408152	0.742346	0.4641
D(lnFDIA)	0.125485	0.038871	3.228242	0.0174
D(lnINFL)	-0.002378	0.000833	-2.855063	0.0080
D(lnEXR)	-0.000405	0.000544	-0.744367	0.4629
D(@TREND)	0.002735	0.010297	0.265557	0.7925
CointEq(-1)	-0.282969	0.097861	-2.891545	0.0077

Source: Author's Computation using E-views 9.5 Output

The short-run estimates have shown that labour productivity in agriculture (GDPLA) has positive but insignificant relationship with GDP growth in agriculture in Nigeria. This implies that labour productivity has the potential of impacting positively on GDP growth in agriculture but has not being fully utilized to achieve GDP growth in agriculture. FDI in agriculture (FDIA) has

positive and significant relationship with GDP growth in agriculture in Nigeria. This implies that inflows of FDI in the country lead increases in GDP growth in agriculture. Inflation and exchange rate are negatively related with GDP growth in agriculture. The speed of adjustment is negative and is statistically significant at 5% level of significance; implying that if there is any deviation from the equilibrium in the long-run it will be adjusted to equilibrium annually by 28.3%.

Hence, the study found that there is a long-run relationship between labour productivity and growth in agriculture GDP. This relationship is though positive but statistically insignificant both in the short and long-run. This implies that labour productivity has the potential of impacting positively on GDP growth in agriculture but has not being fully utilized to achieve GDP growth in agriculture. The policy implication is that government should make agriculture lucrative for graduates to embrace agriculture as business.

Diagnostic Tests for Labour Productivity-GDP Growth in Agriculture Relationship

In order to validate the performance of the model, the following diagnostic tests, Ramsey RESET test, Breusch-Godfrey LM test, and Breusch-Pagan-Godfrey heteroscedasticity test were performed.

Table 6: Diagnostic Tests for Labour Productivity-GDP growth in Agriculture Relationship

Tests	Statistics	Probability values
Ramsey RESET test (F-statistic)	2.06674	0.3419
Autocorrelation (Breusch-Godfrey LM test)	1.89937	0.1730
Heteroskedasticity (Breusch-Pagan-Godfrey)	0.946053	0.4786

Source: Author's computation using E-views 9.5 Output

All the diagnostic tests have revealed that the null hypotheses should be accepted implying that the model is free from misspecification problem, and that the successive errors are not correlated with each other and there is equal variance among the errors of the model.

4.3.2 Impact of Labour Productivity on Manufacturing Sector Growth

In analyzing the impact of labour productivity on manufacturing sector growth using the ARDL, first, the bounds cointegration was used to test for the

existence of long-run relationship between labour productivity and manufacturing sector growth in Nigeria and the results are presented in Table 8.

Table 8: Bounds Test Results for Labour Productivity-Manufacturing Sector Growth Relationship

ARDL Bounds Test	F-Statistic	Critical Value Bounds @ 5%	
	3.306467	Lower Bound (I0)	Upper Bound (I1)
		3.47	4.57

Source: Authors' Computation using E-views 9.5 Output

The results of the bounds test showed that F-statistic value of 3.306 is less than the lower bound critical value of 3.47 at 5% level of significance. This led to the acceptance of the null hypothesis of no long-run relationship between labour productivity and growth in manufacturing GDP in Nigeria; implying that there is non-existence of long-run relationship between labour productivity and manufacturing sector growth in Nigeria. Having ascertained the non-existence of the long-run equilibrium, only the short-run estimates were computed and results are presented in Table 9.

Table 9: Short-Run Estimates of ARDL (2,2,0,0,0) for Labour Productivity-Manufacturing Sector Growth relationship

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
D(lnGDPM(-1))	0.344820	0.161344	2.137173	0.0430
D(lnGDPM(-2))	0.325096	0.149336	2.176939	0.0395
D(lnGDPLM)	-0.252416	0.255050	-0.989673	0.3322
D(lnGDPLM(-1))	0.753606	0.364623	2.066809	0.0497
D(lnGDPLM(-2))	-1.068410	0.345439	-3.092901	0.0050
D(lnFDIM)	0.076860	0.020680	3.716662	0.0011
D(lnINFL)	0.001433	0.000479	2.994308	0.0063
D(lnEXR)	-0.000101	0.000276	-0.364914	0.7184
C	0.229606	0.064611	3.553636	0.0016
D(@TREND)	0.019610	0.004873	4.024541	0.0005
R-squared	0.999140	Mean dependent var		2.718786
Adjusted R-squared	0.998818	S.D. dependent var		0.805373
F-statistic	3098.654	Durbin-Watson stat		2.369956
Prob(F-statistic)	0.000000			

Source: Authors' Computation using E-views 9.5 Output

The short-run estimates of ARDL (2,2,0,0,0) have revealed that the lagged estimates of manufacturing sector growth have positive and significant relationship with the growth in the manufacturing GDP in the current period.

This means that increases in the manufacturing sector growth in the previous years lead to increases in the growth of the manufacturing sector in the current time. Conversely, labour productivity in manufacturing sector in the current year has a negative but insignificant relationship with the growth in the manufacturing in Nigeria. In the first lag, it becomes positive and significant and again it becomes negative in the second lag. This may be as a result of low capacity utilization in the manufacturing sub-sector coupled with relatively fewer manufacturing outfits that are faced with a lot of structural rigidities that have over time impeded industrialization in the country. FDI in manufacturing sector has a positive and significant relationship with growth in manufacturing sector while exchange rate has negative but insignificant relationship with manufacturing sector growth in Nigeria. This explains the fact that when the value of the naira depreciates, given the fact that the manufacturing sector largely depends on importation of both raw and capital goods for domestic production with just little local contents, it adversely affects the manufacturing sector growth. The R-square value of 0.999 shows that 99.9% variation in the growth of manufacturing sector (GDPM) is explained by the variation in the explanatory variables included in the model; and the F-statistic value of 3098.65 with prob (0.0000) shows the joint effect of the explanatory variables on the growth in the manufacturing GDP in Nigeria.

Diagnostic Tests for Labour Productivity-GDP Growth in Manufacturing Relationship

In order to validate the performance of the model, the following diagnostic tests, Ramsey RESET test, Breusch-Godfrey LM test, and Breusch-Pagan-Godfrey heteroscedasticity test were performed and presented in Table 10.

Table 10: Diagnostic Tests for Labour Productivity-Manufacturing Sector Growth

Tests	Statistics	Probability values
Ramsey RESETtest (F-statistic)	0.165040	0.8489
Autocorrelation (Breusch-Godfrey LMtest)	1.40078	0.1517
Heteroskedasticity (Breusch-Pagan-Godfrey)	1.54399	0.1328

Source: Author's computation using E-views 9.5 Output

All the diagnostic tests have revealed that the null hypotheses should be accepted implying that the model is free from misspecification problem, and that the successive errors are not correlated with each other and there is equal variance among the errors of the model.

433 Impact of Labour Productivity on Oil and Gas Sector Growth

In analyzing the impact of labour productivity on oil and gas sector growth using the ARDL, first, the bounds cointegration was used to test for the existence of long-run relationship between labour productivity and oil and gas sector growth in Nigeria and the results are presented in Table 11.

Table 11: Bounds Test Results for Labour Productivity-GDP Growth in Oil and Gas Relationship

ARDL Bounds Test	F-Statistic	Critical Value Bounds @5%	
	2.986984	Lower Bound (I0)	Upper Bound (I1)
		3.47	4.57

Source: Authors' Computation using E-views 9.5 Output

The results of the bounds test showed that F-statistic value of 2.98 is less than the lower bound critical value of 3.47 at 5% level of significance. This led to the acceptance of the null hypothesis of no long-run relationship between labour productivity and oil and gas sector growth in Nigeria; and the alternative hypothesis was rejected, implying that there is non-existence of long-run relationship between labour productivity and growth in oil and gas sector in Nigeria.

Having ascertained the non-existence of the long-run equilibrium, only the short-run estimates were computed and the results are presented in Table 12.

Table 12: Short-Run Estimates of ARDL (1,0,2,0,1) for Labour Productivity-Oil and Gas Sector Growth relationship

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
D(lnGDPOG(-1))	0.123963	0.179864	0.689207	0.4973
D(lnGDPLOG)	-4.047464	1.174639	-3.445707	0.0021
D(lnFDIOG)	0.340750	0.114088	2.986780	0.0241
D(lnFDIOG(-1))	0.036413	0.108539	0.335483	0.7402
D(lnFDIOG(-2))	0.412014	0.114797	3.589059	0.0015
D(lnINFL)	0.004206	0.002199	1.912287	0.0678
D(lnEXR)	0.001249	0.002300	0.542903	0.5922
D(lnEXR(-1))	0.004732	0.002430	1.947208	0.0633
C	-2.097044	0.480011	-4.368739	0.0002
D(@TREND)	0.037406	0.023509	1.591139	0.1247
R-squared	0.990574	Mean dependent var		0.960064
Adjusted R-squared	0.987039	S.D. dependent var		1.322103
F-statistic	280.2317	Durbin-Watson stat		2.022886
Prob(F-statistic)	0.000000			

Source: Author's Computation using E-views 9.5 Output

The short-run estimates of ARDL (1,0,2,0,1) have revealed that the lagged estimates of oil and gas sector growth have positive but insignificant relationship with the growth in the oil and gas sector in the current period. Conversely, labour productivity in oil and gas sector has a negative significant relationship with the growth in GDP oil and gas in Nigeria. This may be as a result of the fact that the oil sector is dominated by foreigners who in most instances engage the services of foreign expatriates coupled with the fact that production processes in the sector is capital intensive than labour intensive. FDI has positive and significant relationship with GDP growth in the oil and gas industry. This explains the fact that FDI inflows are dominant in the oil and gas sector. The R-square value of 0.9906 shows that 99.1% variation in the growth of oil and gas sector is explained the variation in the explanatory variables included in the model; and the F-statistic value of 280.23 with prob (0.0000) shows the joint effect of the explanatory variables on the growth in the oil and gas sector in Nigeria.

Diagnostic Tests

In order to validate the performance of the model, the following diagnostic tests, Ramsey RESET test, Breusch-Godfrey LM test, and Breusch-Pagan-Godfrey heteroscedasticity test were performed and presented in Table 13.

Table 13: Diagnostic Tests for Labour productivity-GDP growth in Oil and Gas

Tests	Statistics	Probability values
Ramsey RESET test (F-statistic)	0.194542	0.8246
Autocorrelation (Breusch-Godfrey LM test)	1.178386	0.1613
Heteroskedasticity (Breusch-Pagan-Godfrey)	0.845082	0.5836

Source: Author's computation using E-views 9.5 Output

All the diagnostic tests have revealed that there is absence of serial correlation and homoscedasticity. The model is also free from misspecification problem.

4.3.4 Impact of Labour Productivity on Services Sector Growt

In analyzing the impact of labour productivity on services sector growth using the ARDL, first, the bounds cointegration was used to test for the existence of long-run relationship between labour productivity and services sector growth (GDP growth in services sector) in Nigeria and the results are presented in Table 14.

Table 14: Bounds Test Results Labour Productivity-GDP Growth in Services Relationship

AR DL Bounds Test	F-Statistic	Critical Value Bounds @ 5%	
	7.987538	Lower Bound (I0)	Upper Bound (I1)
		3.47	4.57

Source : Authors' Computation using E-views 9.5 Output

The results of the bounds test showed that F-statistic value of 7.987 is greater than the upper bound critical value of 4.57 at 5% level of significance. This led to the rejection of the null hypothesis of no long-run relationship between labour productivity and growth in services sector in Nigeria; and the alternative hypothesis was accepted, implying that there is the existence of long-run relationship between labour productivity and growth in services sector in Nigeria.

Having ascertained the existence of the long-run equilibrium, the long-run and short-run estimates were computed and results are presented in Table 15 and Table 16respectively.

Table 15 Long- Run Estimates of ARDL (1,0, 2,1, 0) for Labour Productivity-GDP Growth in Services Relationship

Variable	Coefficient	Std. Error	t-Statistic	Prob.
lnGDPLS	4.944125	3.060102	1.615673	0.1204
lnFDIS	0.869399	0.602402	1.443220	0.1630
lnINFL	-0.009887	0.009806	-1.008246	0.3243
lnEXR	-0.000472	0.003985	-0.118322	0.9069
C	-0.012905	1.133217	-0.011388	0.9910
@TREND	0.012016	0.051989	0.231131	0.8193

Source: Author's Computation using E-views 9.5 Output

The long-run coefficients of the ARDL (1,0,2,1,0) shows that labour productivity in the service sector and foreign direct investment in the service sector have positive but insignificant relationship with GDP growth ofthe services sector in the long-run in Nigeria; while inflation and exchange rate have negative but also insignificant relationship with GDP growth in services sector in the long-run.

Table 16: Short-Run Estimates of ARDL (1,0,2,1,0) for Labour Productivity-GDP Growth in Services

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(lnGDPS(-1))	0.514485	0.147528	3.487370	0.0021
D(lnGDPLS)	0.514485	0.147528	3.487370	0.0021
D(lnFDIS)	0.006624	0.020923	0.316588	0.7545
D(lnFDIS(-1))	0.044312	0.018059	2.453728	0.0225
D(INFL)	0.000727	0.000463	1.571186	0.1304
D(INFL(-1))	0.001465	0.000621	2.358060	0.0277
D(EXR)	-0.000680	0.000513	-1.326260	0.1984
D(@TREND)	0.001250	0.005983	0.208979	0.8364
CointEq(-1)	-0.104060	0.059620	-1.745386	0.0949

Source: Author's Computation using E-views 9.5 Output

The short-run estimates have shown that labour productivity in service sector has positive and significant relationship with GDP growth in services sector in Nigeria. This implies that labour productivity has the potential of impacting positively on the growth in services sector. FDI has positive and significant relationship with growth in the services sector in Nigeria. This implies that inflows inof FDI in services sector in Nigeria lead increases the growth of the sector (GDP of services sector). This justifies the huge investment in the services sector by the foreign investors and multinational companies. Exchange rate is negatively related with GDP growth in services sector, while inflation is positively related with growth in the sector.The speed of adjustment is negative and is statistically significant at 10% level of significance; implying that if there is any deviation from the equilibrium in the long-run it will be adjusted to equilibrium annually by 10.4%.

In essence, the study found that there is a long-run relationship between labour productivity and growth in services sector. In the short-run, the relationship was positive and significant; while in the long-run, the relationship was positive but not significant. This positive relationship justifies the picking up of the services industry in the country where the industry is absorbing graduates in the country who have acquired the requisite skills.

Diagnostic Tests

In order to validate the performance of the model, the following diagnostic tests, Ramsey RESET test, Breusch-Godfrey LM test, and Breusch-Pagan-Godfrey heteroscedasticity test were performed.

Table 17: Diagnostic Tests for Labour Productivity-GDP Growth in Services Relationship

Tests	Statistics	Probability values
Ramsey RESET test (F-statistic)	0.146898	0.8643
Autocorrelation (Breusch-Godfrey LM test)	0.299578	0.7444
Heteroskedasticity (Breusch-Pagan-Godfrey)	1.183709	0.3523

Source: Author's computation using E-views 9.5 Output

All the diagnostic tests have revealed that the null hypotheses should be accepted implying that the model is free from misspecification problem, and that the successive errors are not correlated with each other and there is equal variance among the errors of the model.

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5.0 CONCLUSION/RECOMMENDATIONS

The study concludes that labour productivity weak relationship with the agricultural sector growth in the short-run unlike manufacturing sector, service sector and oil and gas sectors in the short-run where labour productivity strongly influenced the sectorial growth. The study found no long-run relationship between labour productivity and manufacturing sectorial growth likewise the oil and gas sectorial growth. However, there was also a weak influence of labour productivity on agricultural and service sectors in the long-run in Nigeria. Following the study findings, this study recommends that:

Firstly, even though there is often replacement of capital with labour as productive activities expand, the Nigerian government should continue to investment in human resource development that could improve labour productivity in all the sectors in the recent changing world towards highly technological growth oriented economy.

Secondly, the Nigerian government should create an enabling environment for the agricultural sector so that it will be attractive to accommodate all classes of the Nigerian work force. This will increase the capacity utilization and maximize labour productivity in the agriculture sub-sector.

Thirdly, the government through the Bank of Industry (BOI) should advance loans to manufacturers to increase their capacity utilization in order to maximize labour productivity in the sector.

Lastly, since Foreign Direct Investment is a major determinant of the growth in GDP in the agriculture, manufacturing, oil and gas as well as services, the Nigerian government should attract more FDI inflows in those sectors through

incentives and favourable investment policies such as tax negotiations, and flexible foreign exchange policies.

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