

Sectoral Employment and Economic Growth in Nigeria

Oluwatoyin Christianah AYENI

Department of Economics, Faculty of The Social Sciences,
Adekunle Ajasin University, Akungba-Akoko, Ondo State, Nigeria.
Email: oluwatoyin.c.ayeni@gmail.com | *Tel:* +2347062482346

David Oluwasegun AYENI

Department of Economics, Faculty of The Social Sciences,
Adekunle Ajasin University, Akungba-Akoko, Ondo State, Nigeria.
Email: david.ayeni@aaau.edu.ng | *Tel:* +2348035711678

Abstract

The Nigerian economy is characterized by a paradox of contrast between its vast sectorial resource potential and the worsening unemployment condition, highlighting the need for effective strategies to harness its resources and promote inclusive growth. This study therefore investigates the relationship between output growth and sectoral employment in Nigeria using time series data for the period of 1991 to 2020. The study explores the causal relationship and the interactive effect of agricultural and industrial sector on output growth. Autoregressive Distributed lag (ARDL) model was adopted and the findings revealed that IEMP has positive and statistically significant effect on GDPG, both in the long run and short run. AEMP was also reported to have positive and statistically significant effect on GDPG in the long run, but with weak significance in the short run. However, findings further revealed that interactive effect of AEMP_IEMP on output growth is negative and statistically significant in the short run and long run. The study finds a uni-directional causality (at 10 percent) running from AEMP to GDPG, from IEMP to AEMP and from AEMP_IEMP to AEMP. Based on these findings, we recommend that deliberate efforts should be put in place by the government to improve on the performance of the industrial sector in order to foster the inter-sectoral linkages and improve employment in agricultural sector. In addition to previous strategies adopted to revamp the agricultural sector, new strategies/policies that will make agriculture more appealing to youths should be adopted.

Keywords: Agricultural employment, Industrial employment, output growth, sectoral linkages, ARDL.

JEL classification: E24, J21, O47

1. Introduction

Sectoral employment represents the employment generated across the different sectors of an economy. It relates to the extent to which sectors such as industrial, agricultural etc. hire and use resources and/or factors¹ of production. Aggregating employment across the officially recognized productive sectors an economy gives the total employment, and serves as a basis for determining the absorptive capacity and/or state of unemployment².

Over the years, particularly from the 1990s, employment in key sectors in Nigeria is sub-optimal due majorly to poor capacity utilization. Hence, there has been a prevalence of unemployment which in addition to being a major socio-economic problem poses challenge of productivity growth and job creation sustainability (Powerhouse Water Coopers [PWC], 2018). Despite the gradual increase in economic growth³ recorded in recent years, unemployment rate continues to rise sharply, indicating

¹ Specifically labour

² A situation where able bodied and working age people who are willing to work are able to find work at the prevailing wage rate (Pata et al., 2018)

³ Also taken to mean output growth

that contrary to what is expected, such growth has not created new jobs. World bank data shows that employment rate in the key sectors of agriculture, industry and services averaged 49.88%, 12.99%, 37.13% respectively during the decade of 1991-2000. In 2001-2010 it declined to 44.68% and 11.29% in agric and industrial sector respectively, while that of services increased to 44.05%. It further declined to 37.31% in agric, increased infinitesimally to 11.65% in the industrial sector and further increased to 51.03% in the service sector in the decade of 2011-2019 (World Bank, 2020). This shows that the agricultural sector has been displaced in its share of employment, and the industrial sector's share remains almost stagnant over the 3 decades under review. The agricultural sector continues to be driven by peasant farming activities, making non attractive to the teeming youth population. Consequently, the sector has experienced a drift of labour to other sectors (Aigheyisi & Edore, 2021). Despite the decline, particularly in agricultural and industrial sector employment over the same decades, output growth continues to rise steadily. It rose from an average of 1.64% in 1990s to 7.94% in the 2000 decade, and later dropped drastically to an average of 3.17% in the 2010 decade (World Bank, 2020). The decline in the average growth rate in the later decade could be linked to the recession in 2016 and latter part of 2019.

This situation in which sectoral employment is declining as economic growth is rising is a situation termed as jobless growth that establishes poverty in the midst of plenty. This is in sharp contradiction to the Okun's law that established a negative relationship between economic growth and unemployment (Okun, 1962). Ideally, economic growth is expected to lead to job creation and generate more employment (Ajilore & Yinusa 2011), however, it appears the reverse is the case in Nigeria over the years. This jobless growth calls for a great concern as it has far-reaching socio-economic implications¹ on the Nigerian economy. It is perplexing that despite the endowment in human and natural resources across all sectors the economy and the improvement in output growth over the years, Nigeria continues to grapple with unemployment challenges (Obodoechi & Onuoha, 2019). If Okun's law truly holds in Nigeria, then employment conditions at sectoral and aggregate level should improve over time with the steady growth in gross domestic product. This makes it imperative to re-examine the employment level in the agricultural and industrial sectors as they differ in terms of factor intensity.

Extant literatures on the relationship between economic growth and unemployment differ in their conclusions on the reason for a robust GDP accompanied with high unemployment rate or very low employment rate. Studies (see *inter alia*: Lee, 2000; Sodipe & Oluwatobi, 2012; Kargi, 2014; Apau et al., 2019; Dankumo et al., 2019; Eshun, 2020) that examined the relationship between output growth and unemployment/employment used aggregate level data and reported contradicting findings. The few sectoral level studies such as George and Ibiok (2015), Sylvester et al., (2016) and Ajakaiye et al., (2016) failed to test for causality and the combined effect of the sectors on economic growth, which is very important for a robust analysis. This study therefore examines the causal relationship between output growth and employment in the agricultural and industrial sector sectoral employment, and investigates the relationship between output growth and sectoral employment in Nigeria while accounting for the interaction between the agricultural and industrial sector in the economy. The study is timely especially at such a time when the Nigerian economy is experiencing such a high rate of unemployment rate which is accompanied by 2.21% output growth rate (World Bank, 2020).

This study is structured into six sections. The first section is the introduction which captures the study background. Section two focuses on the review of extant literature. The third section consist of the methodology of the research which include the theoretical framework, model specification and technique of analysis. Section four is on the results of data analysis and the discussion of findings. The conclusion and policy recommendations are discussed in section five.

2. Literature review

Theoretically, the link between unemployment and economic growth has been established by the prominent Okun's law developed by Okun (1962). The law specified an inverse relationship between unemployment and output growth, which means a positive relationship between employment and output growth. Specifically, the law states that a one-point increase in the cyclical unemployment rate

¹ A rise in inequality, poverty and unemployment etc.

is associated with two percentage points of negative growth in real GDP. However, this relationship varies depending on the country and time period under consideration. Generally, it provides an important insight into the sensitivity of unemployment rate to economic growth, that became known as the Okun's law. One implication of Okun's law is that an increase in labor productivity or an increase in the size of the labor force can mean that real net output grows without net unemployment rates falling (the phenomenon of jobless growth)

The interest of researchers in different countries has been drawn to the validity of Okun's law. Lee (2000) is one of the earliest studies conducted to test this validity in OECD¹ countries for the period 1955-1996. Using the Johansen cointegration test and error correction model, the study finds Okun's law to be valid. In another study on OECD countries, Kargi (2014) reveals that countries with high growth rate have decreased rate of unemployment while countries with low growth rate have increased rate of unemployment, implying that Okun's law holds. More recently, Eshun (2020) using random fixed effect and time fixed effect regression, also confirms the validity of Okun's law in West Africa. However, Lal et al. (2010) using gap model submit that Okun's law may not be valid in some Asian countries. This is buttressed by Phiri (2014) and Mazarode and Siddiq (2018) who reported that output growth may not be sufficient in dealing with unemployment in South Africa. They provided explanation for job-less growth by establishing a uni-directional causality running from unemployment to economic growth.

Furthermore, an earlier study by Zagler (2003) revealed that in selected European countries, Okun's law is not valid in the long run but in the short run, thereby establishing a positive relationship between employment and economic growth only in the long run. Meanwhile, Hussain et al. (2010) and Karikari-Apau and Abeti (2019) confirmed the validity of Okun's law in the long run and in the short run. In another study, Mojica and Tatlonghari (2017) adopted a dynamic approach in testing the validity of Okun's law. They reported that the current level of employment is significantly affected by previous employment level

Similar to the findings from other countries, there has been no consensus on the validity of Okun's law in Nigeria. For instance, Elohor (2019) investigates the effect of unemployment on the growth of the Nigerian economy using annual time series data and cointegration techniques. The study found a negative relationship which validates Okun's law. Similar findings were reported by Sodipe and Oluwatobi (2012), Okwori et al. (2015), Dankunmo et al. (2019). Meanwhile, earlier, Bankole and Fatai (2013) in an empirical test of Okun's law for the period 1980-2008 reported that Okun's law is not applicable to the Nigeria economy. This corroborates the findings of Adelowokan and Okuntimerin (2019), and Obodoechi and Onuoha (2019). More recently, Olamide (2020) investigates the employment generating capacity of Nigerian economy, and reports that employment elasticity of GDP growth is too small to generate discernible growth in employment. It was estimated that GDP growth should be 2 percent over the long run for the economy to keep a steady growth in employment.

The relationship between sectoral employment and economic growth has also been examined in the literature. Anusionwu (1983) constitute a pioneering work in this area. The study examined sectoral shifts in output, employment and productivity in Nigeria and established that various sectors of the economy are complementary, and that the neglect of any one of them will jeopardize the prospect of the economy as a whole. Furthermore a few recent studies have also analyzed the sectoral linkages and growth prospects of Nigerian. For instance, George and Ibiok (2015) argued that the economy is grossly dependent on sectoral contributions of industry to GDP. Meanwhile, Antai et al. (2016) reported that service sectors and agricultural sector are key productive sectors of the economy in terms of employment generation. Furthermore, Ajakaiye et al. (2016) using shapley decomposition approach posits that foremost growth is driven by sectoral variations in unemployment, sectoral development and sectoral value added.

In summary, the review of the literature shows that both studies on aggregate unemployment and output growth as well as those on sectoral employment and growth hold different views and couldn't reach a consensus. At the aggregate level, Lee (2000), Hussain et al. (2010), Sodipe and Oluwatobi (2012), Kargi (2014), Okwori et al. (2015), Dankunmo et al. (2019), Karikari-Apau and Abeti (2019), Elohor (2019), and Eshun (2020) concluded that Okun's law is valid, while Bankole and Fatai (2013), Phiri (2014), Mazarode and Siddiq (2018), Adelowokan and Okuntimerin (2019), Obodoechi and Onuoha (2019) and Olamide (2020) argued that Okun's law is not valid. Moreover, studies (see inter alia; Lal et al. (2010), Mojica and Tatlonghari (2017)) finds Okun's law to be neither valid nor invalid. At the sectoral level, Antai et al. (2016) posit that services and agricultural sector contributes majorly

¹ Organization of Economic Cooperation and Development

to growth while George and Ibiok (2015) concludes that output growth is driven majorly by the industrial sector.

To this end, it can be established that the literature on employment and economic growth is inconclusive and therefore justifies the need for further research in this area. In addition, we found no empirical evidence in the literature that specifically explores the impact of agricultural and industrial sector employment on output growth in Nigeria, despite being key sectors expected to drive growth in the real sector. More so, available studies failed to test for causality or to account for the impact of sectoral interaction on output growth. This study fills this gap.

3. Methodology

3.1. Theoretical Framework

To examine the relationship between sectoral employment and output growth, this study adopts the Okun's law as a theoretical framework. The Okun's law specified in difference or growth rate form relates changes in output to changes in unemployment as follows:

$$\frac{\Delta Y}{Y} = k - c\Delta U \quad (1)$$

Where: Y is actual output growth, ΔY is the change in actual output from one year to the next, k is the average annual growth rate of full-employment output, c is a constant relating changes in unemployment to changes in output and U is the change in actual unemployment from one year to the next. Using a quarterly US data from 1947:2 to 1960:2, Okun (1962) developed an empirical relationship between changes in the state of the economy (captured by changes in GNP¹) and changes in employment rate. The basic relationship is that of growth rate of unemployment (UNEMP) (which constitute the dependent variable) to a constant and the growth rate of GNP (the independent variable) specified as follows:

$$\Delta UNEMP_t = a + b\Delta GNP_t + \mu_t \quad (2)$$

From the US data, Okun (1962) obtained the following estimated equation:

$$\Delta UNEMP_t = 0.3 - 0.3\Delta GNP_t + \mu_t \quad (3)$$

Where $a = 0.3$ is the intercept of the equation that gives the mean change in UNEMP when growth rate of the economy is zero i.e. UNEMP rises by 0.3 percent when the economy does not grow. The coefficient $b = -0.3$ implies that UNEMP is falling when the economy is growing. This shows that a one percent increase in output will reduce unemployment by 0.3 percent. Reversing this relationship Okun (1962) argued that a one percent increase in unemployment will cause a loss of 3 percent in or more on output.

Hence, equation (2) is re-specified as follows:

$$\Delta OUTPUT_t = -3.0\Delta UNEMP_t + \mu_t \quad (4)$$

3.2. Model Specification

Although Okun (1962) analyzed the labour market by specifying unemployment rate as a function of output growth, however, Akerlof and Shiller (2009, p.2) proposed evaluating the labour market with employment rather than unemployment rates. Therefore, eq (4) can be specified as:

$$\Delta OUTPUT_t = a + b\Delta EMP_t + \mu_t \quad (5)$$

Where: ΔEMP_t is the change in employment. In this case, the estimated coefficient b is positive. For the purpose of this study, equation (5) is modified as follows:

$$GDPG_t = \beta_0 + \beta_1 AEMP_t + \beta_2 IEMP_t + \beta_3 AEMP_IEMP + \mu_t \quad (6)$$

Where: GDPG represents gross domestic product growth rate, AEMP represents employment in the agricultural sector, IEMP represents employment in the industrial sector, AEMP_IEMP represents the interaction between employment in agricultural and industrial sector, $\beta_0, \beta_1, \beta_2$ and β_3 are the parameters to be estimated, and μ_t is the stochastic term/white noise. These variables are included in the model following the Okun's law specification of Okun (1962).

3.2.1 A priori Expectation

Based on economic theory, it is expected that employment in these sectors of the economy being considered (AEMP, IEMP) will have a positive effect on Gross Domestic Product Growth Rate (GDPG).

¹ Gross National Product

The interaction term (AEMP_IEMP) may be negative or positive depending on the strength of interconnection between sectors. This is parameterized as follows:

$$\beta_1 > 0, \beta_2 > 0 \text{ and } \beta_3 \geq 0$$

3.2.2. Data Source and Description

This study uses secondary time series data sourced from World Development Indicator (WDI). Specifically, annual time series on employment rate of agricultural and industrial sector and also the GDP growth rate of the Nigerian economy covering a 30-year period of 1991-2020. The Okun's law validity debate was heated up in this period.

Table 1: Measurement of Variables

Variable	Description	Measurement	Source
GDPG	Growth rate of the gross domestic product	Rate	WDI
IEMP	Industrial employment/share of industry in total employment	Percentage	WDI
AEMP	Agricultural employment/share of agriculture in total employment	Percentage	WDI

Source: Author's Computation (2020)

4. Empirical Results

4.1. Descriptive Statistics

Table 2 shows that the mean of the variables fall within their minimum and maximum values, indicating that the series have some levels of consistency. It also shows that the skewness is approximately close to zero, while the kurtosis can be taken to be close to three, especially for GDPG and IEMP. This implies that the distribution of the variables is symmetrical. The Jarque-Bera statistic also reveals that the variables are normally distributed.

Table 2: Descriptive Statistics Result

	GDPG	AEMP	IEMP	AEMP_IEMP
Mean	4.193461	43.90767	11.98667	529.0386
Median	4.430627	44.64500	12.01000	503.6444
Maximum	15.32916	50.57000	13.42000	678.6494
Minimum	-2.035119	34.97000	10.15000	411.8870
Skewness	0.518138	-0.267295	-0.325110	0.291474
Kurtosis	3.755225	1.572338	2.300208	1.437067
Jarque-Bera	2.055289	2.905006	1.140618	3.478237
Probability	0.357849	0.233984	0.565351	0.175675
Observations	30	30	30	30

Source: Author's computation using Eviews

4.2. Unit Root Test

The unit root result presented in Table 3 shows that the series have ¹mixed order of integration. Using 5 percent level of significance, the Phillip Perron result shows that AEMP and AEMP_IEMP are stationary at levels, while GDPG and IEMP become stationary after first difference. This justifies the estimation of autoregressive distributed lag (ARDL) bounds cointegration test. Unlike other conventional approaches to cointegration that require the variables to be integrated of the same order, the ARDL bounds cointegration is adopted to examine the long run relationship between series that have mixed order of integration (Pesaran et al., 2001).

Table 3: Phillip- Perron Unit Root Test Result

Variable	Level		First Difference		Order of integration
	T-Stat	C- Value	T-Stat	C- Value	
GDPG	-1.662580	-1.952910	-12.20195	-1.953381	1(1)
AEMP	-3.866895	-1.952910	-----†		1(0)
IEMP	-0.801182	-1.952910	-2.477085	-1.953381	1(1)
AEMP_IEMP	-3.186363	-1.952910	-----†		1(0)

¹ A combination of I(0) and I(1) series i.e. while some are stationary in their level form, some became stationary after first differencing

Source: Author's computation using Eviews

Note: the unit root was accessed at 5% level of significance. † Implies that a series that is stationary at levels does not require its first difference being reported.

4.3. ARDL Results

4.3.1. ARDL Bounds Cointegration Test

Table 4 presents the ARDL bounds cointegration result in which the computed F-statistics of joint significance is 7.197061. Given that this value exceeds the upper and lower bound critical values provided by Pesaran et al. (2001), the null hypothesis of no long run relationship is rejected at (1, 2.5, 5 and 10) percent respectively. Hence, a long run relationship exists between the variables and as a result, the short run and long run ARDL model is estimated.

Table 4. ARDL Bounds cointegration result

Estimated equation	GDPG= f(AEMP, IEMP, AEMP_IEMP)	
F-statistics	7.197061	
Significance level	I(0) bound	I(1) bound
10 percent	2.72	3.77
5 percent	3.23	4.35
2.5 percent	3.69	4.89
1 percent	4.29	5.61
No of observation	28	
Optimal lag	2	
Decision	Cointegrated	

Source:
Researcher's
computation

using Eviews

4.3.2. ARDL Long run Result

Having established a long run relationship from the bounds cointegration test, the long run result is presented in Table 5. The results revealed that both AEMP and IEMP are positive and statistically significant at 5 percent level, thereby establishing a long run effect of sectoral employment on output growth in Nigeria. Hussain et al. (2010) and KariKari-Apau and Abeti (2019) corroborates this finding. Specifically, AEMP has a long run coefficient of 5.813545, implying that a 1unit increase in AEMP will result in a long run increase of about 5.81units in GDPG. This shows that agricultural employment increased productivity, improve crop yields and enhance food security in the long run. Similar findings were reported by Antai et al. (2016). With a coefficient of 18.097103, a unit increase in industrial sector employment will lead to approximately 18.1 units increase in output growth. By implication, the growth of industrial employment contributes directly to economic expansion, as it fuels the production of goods and services that further creates multiplier effects benefiting other sectors of the economy. This is in line with the findings of George & Ibiok (2015). The result further reveals that the combine effect of agricultural employment and industrial employment (AEMP_IEMP) is negative and statistically significant at 5 percent level. With a coefficient of (-0.445784) a unit increase in AEMP_IEMP will reduce GDPG by 0.45 unit. The negative interactive effect reflects weak or poor intersectoral linkages between the two sectors.

Table 5. ARDL long-run result

<i>Dependent Variables: GDPG</i>			
Variables	Coefficients	t-stat	p-values
Intercept	-236.223893	-2.657716	0.0147
AEMP	5.813545	2.822815	0.0102
IEMP	18.097103	2.454794	0.0229
AEMP_IEMP	-0.445784	-2.634030	0.0155

Source: Author's computation using E-views

4.3.3. ARDL Short run Result

The short run results presented in Table 6 revealed similar findings with the long run results. From the result AEMP and IEMP are both positive and statistically significant at 5 percent and 10 percent respectively, while AEMP_IEMP is negative and statistically significant at 5 percent level. Similar to Zaglar (2003), Hussain et al. (2010) and KariKari-Apau and Abeti (2019), this result establishes a

short run relationship between sectoral employment in the two sectors in consideration and output growth in Nigeria. The coefficient of AEMP is 5.277670, meaning that a unit increase in agricultural sector employment will lead to approximately 5.28 units increase in output growth in the short run. This further buttress the long run result earlier reported, and corroborates the findings of Antai et al. (2016). It shows that employment in the agricultural sector is important as it drives economic growth in the short run through increased productivity. Although, the weak significance (10 percent) is an indication that agricultural employment may not lead to immediate increase in output growth, as agricultural production is often subjects to time lag between planting and harvesting. The result further shows that IEMP has a coefficient of 22.79180. Consequently, a unit increase in industrial sector employment will lead to approximately 22.80 units increase in output growth in the short run. This equally confirms that the industrial sector contributes greatly to productivity growth, and lends support to the findings of George & Ibiok (2015). The combined effect of agricultural employment and industrial employment (AEMP_IEMP) is negative and statistically significant at 5 percent level. With a coefficient of (-0.561428), a unit increase in AEMP_IEMP will reduce GDPG by 0.56 unit. The negative interactive effect of the two sectors reflects weak inter-sectoral forward and backward linkage.

In the short run result, the coefficient of ECM measures the speed of adjustment to long run equilibrium resulting from shock(s) in the system. It is negative as expected and statistically significant, therefore confirming a long run relationship among the series as established by the bounds cointegration test. The coefficient (-0.6) of the ECM is also less than 1 in absolute term which satisfies the underlying conditions of between 0 and 2 (Jawaid, 2020; Belfqih, 2020; Ayeni & Oladepo, 2020). This shows that it will take more than half a year to adjust from a short run disequilibrium to a long run equilibrium. The short run result further revealed that the R-squared (R^2) is 0.72. This shows that the model has a good fit i.e. about 72 per cent of the total variation in output is jointly explained by the regressors (AEMP, IEMP and AEMP_IEMP), while the remaining 28 percent variation is explained by other random factors captured by the error term. In addition, the F-statistics with a probability value of (0.000044) is statistically significant at 1 percent level of significance. This affirms that the parameters of the model are jointly significant.

Table 6. ARDL short-run result

<i>Dependent Variables: GDPG</i>			
Variables	Coefficients	t-stat	p-values
Intercept	-297.5043	-2.808181	0.0105
AEMP	5.277670	1.785162	0.0887
IEMP	22.79180	2.628097	0.0157
AEMP_IEMP	-0.561428	-2.806092	0.0106
<i>ecm</i> (-1)	-0.629417	-4.835174	0.0001
R-Squared	0.729562	S.D dependent Var	3.853024
S.E of regression	2.271997	Akaike info criterion	4.691513
F-statistics	9.441977	Scwartz criterion	5.024564
Prob (F-statistics)	0.000044		

Source: Author's computation using E-views

4.4. Granger Causality Result

Table 7 presents the result of the pairwise granger causality. At a significance level of 5 percent, the result shows no causality between the variables. However, at 10 percent level of significance, a uni-directional causality is established running from AEMP to GDPG, IEMP to AEMP and from AEMP_IEMP to AEMP. This implies that agricultural sector employment granger causes economic growth, industrial sector employment granger causes agricultural sector employment and the interaction or combined effect of agricultural and industrial sector employment granger causes employment in the agricultural sector. This further affirms submission of Phiri (2014), Ajakaiye et al. (2016), and Mazarode and Siddiq (2018) that the agricultural and industrial sector employment has strong implications on output growth in Nigeria

Table 7: Pairwise Granger Causality Tests

Null Hypothesis	F-Statistics	Prob
AEMP does not granger cause GDPG	3.41352	0.0503

GDPG does not granger cause AEMP	1.11247	0.3458
IEMP does not granger cause GDPG	0.35324	0.7062
GDPG does not granger cause IEMP	0.99918	0.3836
AEMP_IEMP does not granger cause GDPG	0.01278	0.9873
GDPG does not granger cause AEMP_IEMP	0.53326	0.5938
IEMP does not granger cause AEMP	3.01450	0.0688
AEMP does not granger cause IEMP	1.63227	0.2173
AEMP_IEMP does not granger cause AEMP	3.25663	0.0568
AEMP does not granger cause AEMP_IEMP	1.03092	0.3726
AEMP_IEMP does not granger cause IEMP	2.35456	0.1174
IEMP does not granger cause AEMP_IEMP	1.80420	0.1871
Number of observation: 28		
Lags: 2		

Source: Researcher's computation using Eviews

4.4 Diagnostic Test Results

Table 8 presents the result of heteroskedasticity, Serial Correlation LM test, Ramsey reset test and Jarque-Bera normality test for the ARDL model. The null hypotheses for the tests state that there is no heteroskedasticity, no serial correlation, model is correctly specified and the variables in the model are normally distributed. The results show that the probability values are not statistically significant at 5 percent level, therefore the null hypotheses are not rejected. Hence, there is no problem of heteroskedasticity, serial correlation, the model is correctly specified and the variables are normally distributed. The estimated result is subjected to diagnostic tests to ensures the correct specification of the model and to check the validity of the estimated results before using it for forecasting and policy formulation purpose.

Table 8: Diagnostic Test

	F-Stat	Df	Prob
Heteroskedasticity test	0.412684	(6,21)	0.8623
Serial Correlation LM test	0.154707	(2,19)	0.8577
Ramsey Test	1.303827	(1,20)	0.267
Jacque Bera test	Coefficient		Prob
	2.84221		0.84823

Source: Researcher's computation using Eviews

5. Conclusion and Policy Recommendations

This study investigates the relationship between sectoral employment and output growth in Nigeria using time series data from 1991 to 2020. The study estimates the ARDL model in order to determine the long run and short run effects, and uses the Granger causality test to examine the direction of causality among the variables. The ARDL bounds cointegration test was carried out, and it established a long run relationship among the variables. The results show that industrial sector employment has positive and statistically significant relationship with gross domestic product (GDP) growth rate, both in the long run and short run. Also, we find that agricultural sector employment has a positive and statistically significant effect on GDP growth rate in the long run, and was significant at 10 percent level in the short run. More so, the results further revealed that the interaction between agricultural and industrial sector employment has a negative effect on GDP growth rate. On causality, our result shows a uni-directional causality running from AEMP to GDPG, from IEMP to AEMP and from AEMP_IEMP to AEMP.

Based on these findings, it can be concluded that agricultural and industrial sectors independently contribute significantly to economic growth in Nigeria. It is also concluded that there is weak forward and backward intersectoral linkage between the two sectors, making their interaction to yield a negative result. Therefore, this study recommends among other things that deliberate efforts should be made to promote greater integration and coordination between agricultural and industrial sectors, by investing in agro-processing industries and promoting rural industrialization. Also, in addition to previous strategies adopted to revamp the agricultural sector, new strategies/policies that will make agriculture more appealing to youths should be adopted.

References

- Adelowokan, O.A., & Okuntimerin, A.O. (2019). Unemployment and economic growth in Nigeria: does okun's law matters? *Periodyk naukowy akademii polonijnej* 32 (2019) <http://dx.doi.org/10.23856/3203>.
- Aigheyisi, O.S. & Edore, J.O. (2021). Economic growth and employment in Nigeria's services sector. *Journal of Economics and Allied Research*, 6(1).
- Ajakaiye, O., Jerome, A.T., Nabena, D. & Alaba, O.A. (2016). Understanding the relationship between growth and employment in Nigeria. *Understanding the African Loins- Growth Traps and Opportunities in Six Dominant African Economies*.
- Ajilore, T., & Yinusa, O. (2011). An Analysis of Employment Intensity of Sectoral Output Growth in Botswana. *Southern African Business Review* 15 (2), page 26–42.
- Akerlof, G. A. & Shiller, R. J. (2009). Animal Spirits, How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism. *Princeton University Press, Princeton*.
- Jawaid, 2020;
- Belfqih, 2020
- Antai, A.S., Udo, A.B., & Effiong, C.E. (2016). Analysis of the Sectoral Linkages and Growth Prospects in the Nigerian Economy. *IOSR Journal of Economics and Finance*, 7(6), 73-80, www.iosrjournals.org.
- Anusionwu, E.C. (1983). Sectoral shifts in output, employment and productivity in the Nigerian economy, <http://www.jstor.org>.
- Arewa A. & Nwakanma P. C. (2012). Potential-Real Gdp Relationship and Growth Process of Nigerian Economy: An Empirical Re-Evaluation of Okun's Law. *European Scientific Journal*. 8(9), 25-33.
- Bankole, A.S. & Fatai, B.O. (2013). Empirical Test of Okun's Law in Nigeria. *International Journal of Economic Practices and Theories*, 3(3), 227-231.
- Dankumo, A.M., Ishak, S., Bani, Y. & Hamza, H. Z. (2019). The Relationship between Public Expenditure, Corruption and Poverty in Nigeria. *Jurnal Ekonomi Study dan Pembangunan*, 10(4), <http://journal2.um.ac.id/index.php/JESP/issue/view/521>
- Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root, *Econometrica*, 49, 1057-72.
- Elorhor, O.T. (2019). Unemployment and its Effect on the Growth of Nigeria Economy. *Journal of Economics, Management and Trade*, 23(2),1-9.
- Eshun, J. (2020). Economic Growth and Unemployment Issues in Ten (10) Selected West African Countries: A Panel Data Analysis. *Journal of Economics, Management and Trade* 25(5),1-12.
- George, U. & Ibiok, E.U (2015). Sectoral contributions to Nigerian gross domestic product using a VAR approach. *Global journal of pure and applied sciences*. 21,137-143.
- Hussain, T., Siddiqi, M. W., & Iqbal, A. (2010). A Coherent Relationship between Economic Growth and Unemployment: An Empirical Evidence from Pakistan. *International Journal of Human and Social Sciences*, 5(5), 332-339.
- Johansen, S., & Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand for Money. *Oxford Bulletin of Economics and Statistics*, 52 (2), 169-210.
- Kargi, B. (2014). Okun's Law and Long Term Co-Integration Analysis for OECD Countries (1987-2012). *International Research Journal of Finance and Economics, FRDN Incorporated, Mahé, Seychelles*, 119, 77-85.
- Karikari-Apau, E. & Abeti, W. (2019). The Impact of Unemployment on Economic Growth in China. *Munich Personal RePEc Archive*, <https://mpra.ub.uni-muenchen.de/96228/>
- Lal, I., Sulaiman, D., Jalil, M. A. & Hussain, A. (2010). Test of Okun's Law in some Asian countries co-integration approach. *European Journal of Scientific Research*, 40(1), 73-80.
- Lee, J. (2000). The Robustness of Okun's Law. Evidence from OECD Countries. *Journal of Macroeconomics*, 22, 331-56. [http://dx.doi.org/10.1016/S0164-0704\(00\)00135-X](http://dx.doi.org/10.1016/S0164-0704(00)00135-X)
- Mazarode, B. T. & Siddiq, N. (2018). On the Unemployment–Output Relation in South Africa: A Non-Linear ARDL Approach. *Journal of Economics and Behavioral Studies*, 10(5), 167-178.
- Mojica, M.A. & Tatlonghari, V.M. (2017). The relationship between output growth and unemployment in the Philippines economy (1990-2014): An empirical analysis of variants of Okun's Law. *Journal of Emerging Economies and Islamic Research*, www.jeeir.com.
- Obodoechi, D. & Onuoha, C. (2019). The Validity of Okun's Law: An Empirical Evidence for Nigeria. *American International Journal of Social Science Research*, 4(2), 136-142. <https://doi.org/10.46281/aijssr.v4i2.376>.
- Okun, A. (1962). Potential GNP: Its measurement and significance. *American Statistical Association, Proceedings of the Business and Economic Statistics Section*, 98–104.
- Okwori, J., Ochinyelo, S., & Sule, A. (2015). Paradox of high unemployment amidst economic growth: An investigation of the Nigerian situation (1980-2013). *Nigerian Journal of Management Science (NJMS)*, 4(2), 248-262.
- Olamade, O. O. (2018). Structure, characteristics, and determinants of services export in Nigeria. *Journal of Economics and Business*, 1(3), 299-311.

- Pata, U.K., Yurtkuran, S., & Kalca, A. (2018). A revisited causality analysis of Okun's Law: The case of Turkey. *Theoretical and Applied Economics*, 12(4), 121-134B.
- Phillip, P.C.B., & Perron, P. (1988). Testing for a Unit Root in Time Series Regression. *Biometrika*, 75(2), 335-346.
- Phiri, A. (2014). Re-evaluating Okun's law in South Africa: A nonlinear co-integration Approach, *Munich Personal RePEc Archive*, <https://mpra.ub.uni-muenchen.de/57398/>
- Sims, C.A. (1980). Macroeconomics and reality. *Econometrica: Journal of the Econometric Society*, 48(1), 1-48.
- Sodipe, O. A., & Oluwatobi, S. (2012). Output and Unemployment Relationship: How Applicable is the Okun's Law to Nigeria? *mimeo*.
- World Development Indicators (WDI) 2019.
- Zagler, M. (2003). A Vector Error Correction Model of Economic Growth and Unemployment in Major European Countries and an Analysis of Okun's Law. *Applied Econometrics and International Development*, 3(3), 93-118.