Abuja Journal of Economics & Allied Fields, Vol. 7(3), June, 2018
Print ISSN: 2672-4375; Online ISSN: 2672-4324

An Empirical Assessment of the Okun's Law Postulation in Nigerian Economy: 1980 - 2015

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Abstract

Nigeria's current economic phenomenon poses far-reaching challenge to the age-old economic postulate that the growth rate of the gross domestic product (GDP) of an economy reduces unemployment. Many attempts have been made to verify this postulate otherwise known as Okun's Law. However, existing empirical studies on the Nigerian economy have generally focused attention on aggregate output thereby overlooking the disaggregation of output data into major sectors to examine their differential effect on unemployment in the economy. This study therefore, investigates whether Okun's law holds in the Nigerian economy by examining the short-run and long-run effects of aggregate output on unemployment, and by disaggregating the overall output data in to its major sectoral components to assess their effect on unemployment in Nigeria with time series data spanning 1980-2015. The econometric technique employed in the research is the Autoregressive Distributed Lag (ARDL) bound testing approach. The analysis began with pre-tests for stationarity using Augmented Dickey-Fuller (ADF) unit root tests. Two ARDL models were specified. In the first, bound testing revealed the existence of cointegration between unemployment and GDP growth, and growth of GDP is positively related to unemployment in the long run but a negative relationship was found in the short run. In the disaggregation (i.e the second ARDL model) that examines the various sectors and components of GDP, it was found that there is no long run relationship between unemployment and agriculture, industry, construction, trade, and services. The study therefore recommends among others, the need for forging a link among the primary, secondary and tertiary sectors of the economy, with the agricultural sector linked to the industrial sectors, and technological innovation to reduce reliance on imported manufactured goods, raw materials and spear parts used for industrial and agricultural production so that domestic output growth would be employment elastic.

Keywords: Economic Growth, unemployment, and Nigeria
JEL Codes: E23, E24, L60, L70, L80, L90

1. Introduction

In an attempt to tackle the menace of unemployment which is one of the major indicators for measuring the performance of any economy in the world, Arthur M. Okun in the early 1960s statistically established the relationship between change in the unemployment rate and economic growth. The empirical finding of Okun's work indicates 3:1 relationship between gross domestic product (GDP) and the unemployment rate (Babalola *et al.,* 2013; and Akeju and Olanipekun, 2015)**.** This implies that a sustained increase in the growth rate of the aggregate output of an economy increases employment and reduces unemployment (Akeju and Olanipekun, 2015)**.**

However, the problem of unemployment in Nigeria has maintained a rising trend even in

the years where the economy experienced relatively high growth rates of GDP, and the situation has been a puzzle in the minds of economists and policy makers. In general, Nigeria's unemployment figure has been growing in recent time. Unemployment in the first quarter of 2006 was 13.6 percent while the corresponding rate in 2007 was 14.6 percent. This figure increased to 19.7 percent in 2009, 21.1 percent in 2010 and 23.9 percent in 2011 respectively (Akeju and Olanipekun, 2015; Oloni, 2013). In 2014, it increased further to 25.1 per cent from 24.7 per cent in 2013 (World Bank, World Development Review 2013; Ajakaiye *et al*., 2016). Since 2000, the rate of unemployment has grown at a compound annual average of 4.8 per cent, even as it has continued to fluctuate and intensify (Ajakaiye *et al*., 2016). According to Akeju and Olanipekun (2015), the rate is higher in the rural areas (25.6 percent) than in the urban areas (17.1 percent).

On the other hand, the real Gross Domestic Product (GDP), measured in 1990 basic prices grew by 7.9 percent in 2010, compared with 7.0 percent in 2009. Growth in 2010 was attributed largely to the performance of the non-oil sector output which grew by 8.5 percent complimented by a significant increase in oil sector output. Real GDP growth stood at 7.4% in 2011, driven predominantly by crop production, wholesale and retail trade and telecommunications sectors, which accounted for 28.0%, 28.8% and 21.4% of real GDP growth respectively during the year (Akeju, and Olanipekun, 2015).

Economic growth has largely been driven by growth in the services sector without much growth in the sectors that are more employment creating such as solid minerals and agricultural sector. This 'tertiarization' of the economy has failed to deliver quality jobs hence recent growth has not translated into significant social and human development contrary to the postulates in the development literature that associate faster economic growth with poverty reduction (Ajakaiye *et al*. 2014). The phenomenon of 'jobless growth' also poses far-reaching challenges on the age-old economic assumption of growth in GDP directly resulting in reduction in unemployment (Akeju and Olanipekun, 2015).

The theoretical proposition relating output and unemployment as proposed by Okun (1962) has been found to hold for several countries and regions mainly, in developed countries (Christopoulos, 2004; Daniels and Ejara, 2009). However, recent evidences have shown that employment has not grown at the same rate as the gross domestic product (GDP) in developing countries particularly since the World Summit for Social Development held in Capenhagen in 1995 (Jose-Nghessan, 2006). Also, empirical findings in Nigeria have revealed that Okun's law does not hold in the economy (Babalola *et al.*, 2013, Arewa and Nwakanma, 2012; Akeju and Olanipekun, 2015). This has sparked debate on appropriate policies that could be designed to solve the problem of unemployment in Nigeria. It also implies that the prescriptions of orthodox economics that to reduce unemployment, policies should be designed to increase the GDP does not hold in all economies. Hence, new questions are being raised about the relationship between economic growth and unemployment.

It is pertinent to note that the many attempts made to verify the Okun's Law, empirical studies on the Nigerian economy (among which are; Njoku and Ihugba, 2011; Babalola, *et al.* 2013; Adudu and Ojonye, 2015; and Florence *et al.* 2015) generally focused attention on aggregate output thereby overlooking differential employment elasticity of major sectors in the economy. This could undermine policy making on employment as the studies did not reveal the relationship between sectoral growth and unemployment. Only Ajakaiye *et al.* (2016) to the best of our knowledge examined a disaggregated effect of growth on employment and their study was focused on manufacturing, services and agricultural

sectors. Also Ajakaiye *et al.* (2016) used time series variables and neither conducted unit root tests on the variables to determine the appropriate econometric technique to be employed, and their study did not examine both the short-run and long-run effects of output growth on employment.

Therefore, the objective of this study is to investigate the short-run and long-run effects of output growth on unemployment in Nigeria with time series data spanning 1980-2015. Thus the study will conduct unit roots test on the variables. Also output growth is examined in its aggregate and disaggregated components to include agriculture, industry, construction, trade, and services and investigate their respective impacts on unemployment. This is because according to Ajakaiye *et al.* (2016), the main reason for 'jobless growth' in Nigeria is that the economy is transforming from an agrarian economy to a service economy without going through the intermediate stage of industrialization. In view of the foregoing, this paper empirically examines whether Okun's law hold in the economy, and also investigates the relationship between the disaggregated components of GDP and unemployment in Nigeria based on data from 1980-2015. To achieve this, the paper is divided into five sections which includes introduction, trend of unemployment and Growth of GDP in Nigeria, literature review, research methodology, presentation of results and interpretation, and finally summary and conclusion.

2.0 Literature Review

This section examines the two key concepts that are used in this study. These are economic growth and unemployment. The section further examines the theoretical framework of the study, and lastly, review of empirical works done in the area.

The Concept of Economic Growth

Economic growth is conceived as a sustained increase in the per capita income over a period of time. Anyanwu and Oaikhenan (1995), stated that economic growth refers to the increase over time, of a country's economic capacity to produce those goods and services needed to improve the wellbeing of the citizens in increasing numbers and diversity.

It should be noted that economic growth is sometimes used interchangeably with economic development. Jhingan (2005), made a distinction of the two concepts where he defined economic development as the "non-quantifiable measure of the growing economy" i.e the economic, social and other changes that lead to growth such as changes in techniques of production, social attitudes and institutions e.t.c No matter the distinction what is important is that there is no development without growth (King and Levine, 1993).

The Concept of Unemployment

The unemployment rate in Nigeria has been very high over the years. The indicator measures the proportion of active population that is without and actively seeking work **(**Ajakaiye *et al***.**, 2016). The total labour force in the country is made up of persons between the ages of 15–64 years excluding students, retired persons, stay-at-home parents, home-keepers, and persons unable to work or not interested in work (Kale and Doguwa 2015), while the unemployment rate is the proportion of the labour force who were available for work but cannot find work.

On the other hand, employment is examined from the concept of a good job which could be defined from the perspectives of an individual and the society. From an individual's perspective, a good job is a well-paid secured job. From a societal point of view a good job is one that maximises societal welfare. This simply reinforces the argument that in most countries the wages paid do not reflect the marginal social benefits. "Good jobs for development are those that make the greatest contribution to society, taking into account the value they have to people who hold them and also their potential spillovers on others" (World Bank, World Development Review, 2013, p. 154.). Therefore, those that are employed are the

people who are within the age of 15-64 years that have good jobs.

Theoretical Framework

The economic theory that can be used in explaining the relationship between output growth and employment is Okun's law which is an empirical observation of the relationship between unemployment rate and economic growth. Though the fundamental inverse relationship between the unemployment rate and the growth of real output had been accepted by economists for many years, Arthur Okun (1962) was first to formalise the relationship into a statistical one when he measured the extent to which the unemployment rate is negatively related to real output growth. He postulated that a 1% increase in the growth rate above the trend rate of growth would lead only to 0.3% in the reduction of unemployment. This implies that a 1% increase in unemployment will mean roughly more than 3% loss in GDP growth. Hence the rate of GDP growth must be equal to its potential growth just to keep the unemployment rate constant. To reduce unemployment, therefore, the rate of GDP growth must be above the growth rate of potential output (Akeju and Olanipekun, 2015; Jose, 2006).

Okun however, pointed out that changes in the unemployment rate per se cannot account for the changes in real output as the unemployment rate changes, but that there are intermediary factors, such as labour force participation and productivity linking unemployment rate and the real output in the specified relationship (Akeju and Olanipekun, 2015). This study is therefore based on the theoretical underpinning of the Okun's law.

Review of Empirical Studies

Several authors have estimated the relationship between employment and economic growth for a variety of nations. An International Labour Organization Report (1996) concluded that the positive responsiveness of employment growth to GDP growth has generally not declined in industrialized countries as a whole. However, a country-by-country analysis revealed mixed results, while those focusing on the Nigerian economy are largely based on aggregate GDP, and their findings indicated that productivity and employment relationship negates Okun's law as stated earlier. Some of these empirical studies existing in the literature both within and outside the Nigerian economy are examined below beginning with those conducted outside the country.

Seyfried (2005) examined the relationship between economic growth, as measured by both real GDP and the output gap, and employment in ten largest states of US from 1990 to 2003. Models were developed in the study to estimate the employment intensity of economic growth as well as the timing of the relationship between employment and economic growth. The results indicate that economic growth has some immediate positive impact on employment, and its effects continue for several quarters in most of the states considered.

Ahsan et al. (2010) argue that higher employment is not usually associated with higher per capita GDP. His study was carried out on poverty rates, employment, and the working-age population and observed over ten-year periods corresponding to the years 1983–1993 and 1993–2003. In their investigation of the aggregate growth profile of India, findings showed a negative relationship.

In another research, Geidenhuys and Marinkov (2007) tried to give answer to the question of how unemployment responds to changes in output in South Africa. For this reason, they estimated the relationship between economic activity and unemployment rate. The results indicated the presence of an Okun's law relationship in South Africa over the period 1970 -2005.

Villaverde and Maza (2008) analyzed Okun's law for Spanish regions using data for the period 1980- 2004. The results verified the existence of Okun's law for most of the regions and for the economy as a whole.

Among the studies carried out in Nigeria is that of Adudu and Ojonye (2015). They investigated the impact that economic growth in Nigeria had on employment generation. The Johansen vector- error correction model was used in the investigation. The findings revealed that, although economic growth had positive relationship with employment, the relationship is not significant. Foreign private investment has negative impact while Public expenditure has positive and significant impact on employment. It is concluded that the growth in Nigeria does not support employment.

In their study**,** Ajakaiye *et al.* (2016) examined the relationship between growth and employment in Nigeria. The study adopted the Shapley decomposition approach, complemented OLS technique. The findings indicate that Nigeria's growth over the last decade has been 'jobless' and sustained largely by factor reallocations rather than productivity enhancement. Labour reallocations have been mainly from agriculture and manufacturing towards the low employment generation services sector. The study further revealed that the employment elasticity of growth was positive and quite low, reflecting the country's poor overall employment generation record, especially in manufacturing.

Babalola *et al.* 2013) empirically tested the validity of Okun's law in Nigerian economy from 1980-2012. The two versions of the model approach of the Okun's law were used even though one of them is frequently used in the literature. The research utilized Var-cointegration method and examined the direction of causality using the Var Granger causality/Block Exogeneity Wald test. It was found that Okun's law does not hold in the Nigerian economy.

Arewa and Nwakanma (2012) conducted an empirical evaluation of the relationship between output and unemployment using the first difference and output-gap models of Okun's law. The study found no evidence to support the validity of Okun's law in Nigeria.

In their examination of the relationship between unemployment rate and economic growth, Aketu and Olanipekun (2015) employed Error Correction Model (ECM) and Johasen cointegration test to determine both the short run and long run relationships among the variables employed in the study. The Empirical findings showed that there is both the short and the long run relationship between unemployment rate and output growth in Nigeria. The paper found out that Okun's law is not valid in Nigeria.

In another study by Florence *et al.* (2015), within the framework of labour productivity theory, the interface between youth unemployment and labour productivity as they relate to growth of Nigerian economy was examined. The paper employed both qualitative and quantitative research methods to examine the incidence of youth unemployment as a function of labour productivity. It revealed that there is positive relationship between youth unemployment and labour productivity in Nigeria.

From the foregoing review of empirical studies conducted in Nigeria, it is observed that the authors generally focused attention on aggregate output thereby overlooking disaggregated impact of GDP growth on unemployment in Nigeria. Only Ajakaiye *et al.* (2016) examined a disaggregated effect of growth on unemployment focusing on manufacturing, services and agricultural sectors. This study first investigated the long-run and short-run effect of GDP growth on unemployment, and also employed a disaggregated technique as it examined agriculture, industry, construction, trade and services sectors and empirically investigated the effect of their growth on unemployment in order to reveal the sector(s) that is (are) more efficient in reducing unemployment.

3. Methodology

The method employed in carrying out the study is presented here as follows:

Data

This research, in view of its nature made use of secondary data. Annual data were employed and were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin and National Bureau of Statistics (NBS) financial and external sector statistics for the period 1980-2015. The 36-year period is selected to meet the requirement of the Central Limit Theorem that sample size must not be less than thirty years for normality purpose, and the fact that the larger the sample, the greater the reliability or validity of time series research findings (Gujarati, 2005).

Variables

Unemployment rate is used as the dependent variable as it best reveals the labour force engagement; the data on it are easily accessible, and it is also considered appropriate in view of the theoretical underpinning of the study.

The independent variables are the GDP, agricultural output, industrial output, construction, services sector, and trade.

Model Specification

The econometric models used for the study is adapted from Ajakaiye *et al.* (2016) and are specified as follows:

$$UNEMP_t = \beta_o + \beta_1 InGDP_t + U_t \text{.....1}$$

$$UNEMP_t = \beta_0 + \beta_1 InAGR_t + \beta_2 InIND_t + \beta_3 InCONS_t + \beta_4 InTRADE_t + \beta_5 InSERVS_t\ U_t \quad .2$$

Where

UNEMP = Unemployment rate

β_o = Constant parameter

β_i = Coefficients of the explanatory variables

$\ln GDP_t$ = log of gross domestic product

$\ln AGR_t$ = log of agricultural output

$\ln IND_t$ = log of industrial output

$\ln CONS_t$ = log of construction sector's output

$\ln TRADE_t$ = log of trade

$\ln SERVS_t$ = log of services sector's output

U_t = Stochastic disturbance term

t = Time subscript

Therefore, equation 1 and 2 were employed as models for this research.

Method of Data Analysis

The data collected for this research were analysed using Autoregressive Distributed Lag (ARDL) model along with error correction model. The ARDL model is an innovation in time series econometrics developed by Pesaran and Shin (1996); Pesaran and Pesaran (2001); for testing the existence of co-integration among variables. One of the advantages of using the ARDL approach to testing for the existence of a long-run relationship between variables is that it is applicable irrespective of whether the underlying variables are purely I(0) or I(1), or a mixture of both (Khosravi and Karimi, 2010). However, in the presence of I(2) variables, the computed F-statistics provided by Pesaran *et al.*(2001) will become invalid.

Therefore, the use of unit root tests in the ARDL approach is inevitable to ensure that none of the variable is integrated of order I(2) or beyond. Therefore, unit root test was conducted using the Augmented Dickey-Fuller (ADF) technique based on the model expressed below:

$$\Delta Y_t = \beta_0 + \beta_1 Y_{t-1} + \alpha_i \sum \Delta Y_{t-i} + \mu_t \text{.3 ..3}$$

Where:

ΔY_t = Differenced value of a given time series variable

β_0 = Constant Parameter

β_1 = Coefficient of the first lag value of the series variable

Y_{t-1} = First lag value of a series variable

α_i = Coefficient of the lag values of the differenced time series variable

ΔY_{t-i} = Lag values of the differenced series variable

u_t = Error term.

The two Autoregressive Distributed Lag (ARDL) models used in this study are expressed as follows:

ARDL I

$$\triangle \text{InUNEMP} = \delta_0 + \delta_1 \text{InUNEMP}_{t-1} + \delta_2 \text{InGDP}_{t-1} + \sum \lambda_1 \Delta \text{InUNEMP}_{t-i} + \sum \lambda_2 \Delta \text{InGDP}_{t-i} + \lambda_3 \text{ECM}_{t-1} + u_t \ldots\ldots\ldots\ldots\ldots 4$$

ARDL II

$$\triangle \text{InUNEMP} = \delta_0 + \delta_1 \text{InUNEMP}_{t-1} + \delta_2 \text{InAGR}_{t-1} + \delta_3 \text{InIND}_{t-1} + \delta_4 \text{InCONS}_{t-1} + \delta_5 \text{InTRADE}_{t-1} + \delta_6 \text{InSERVS}_{t-1} + \sum \lambda_1 \Delta \text{InUNEMP}_{t-i} + \sum \lambda_2 \Delta \text{InAGR}_{t-i} + \sum \lambda_3 \Delta \text{InIND}_{t-i} + \sum \lambda_4 \Delta \text{InCONS}_{t-i} + \sum \lambda_5 \Delta \text{InTRADE}_{t-1} + \sum \lambda_6 \Delta \text{InSERVS}_{t-i} + \lambda_7 \text{ECM}_{t-1} + u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 5$$

Where δ_0 = Constant Parameter
Δ = First difference operator
δ_i, λ_i = Vector of the parameter of the lagged values of the natural logarithmic values of the explanatory variables.
ECM_{t-1} = Error correction term
u_t = Error term

The terms with the summation signs ($\sum$) in the equations above represent the error correction dynamics while the second part of the equation with δ_i correspond to the long-run relationship. The null hypothesis in the four ARDL equations is $H_0 = a_1 = a_2 = a_3 = 0$. This denotes the absence of long-run relationship while the alternative hypothesis is H_1: $a_1 \neq a_2 \neq a_3 = 0$. The calculated F-statistic is compared with two sets of critical values. One set assumes that all the variables are I(0) and the other assumes they are I(1). If the calculated F – statistic exceed the lower and upper critical value, the null hypothesis of no co-integration will be rejected irrespective of whether the variables are I(0) or I(1). If it is below the upper value bound, there is no cointegration.

Once a co-integration relationship has been ascertained the long-run and short run parameters of the relationship are then estimated.

4. Presentation of Results and Interpretation

The findings of the study are presented as follows.

Unit Root Test Results

As a precondition for applying the ARDL bound testing technique to cointegration, the need to ensure that none of the variables is beyond being integrated of the first order i.e. I(1) requires unit root tests of each of the variables in the model. The outcome of the unit root tests using the Augmented Dickey Fuller (ADF) test reveal that all the variables satisfy this condition. The results are presented in the Table 1.

As a first step in the analysis, the explanatory variables were transformed into natural logarithm form. Tests for unit roots in the variables at both level and first difference values were conducted using the augmented Dickey-Fuller (ADF) test.

Table 1 shows that services and construction industries' output were stationary at level I(0) while unemployment, gross domestic product (GDP), and the outputs of agriculture, industry, and trade, were stationary after first difference. Therefore, it was found that the null hypotheses of a unit root at level and first difference values were rejected in the ADF test. This is because in absolute term, the t-test statistic values of the variables examined were found to be statistically significantly greater than their critical values.

Table 1: Unit Root Tests Results

ADF Unit Root Test				
Variables	Critical Values	At level I(0)	Critical Values	At First Difference I(1)
UNEMP			-4.309824	-6.63094***
InGDP			-4.252879	-8.566993***
InAGR			-4.252879	-4.447399***
InIND			-4.252879	-5.681937***
InSERVS	-3.207094	-3.347718*		
InCONS	-4.252879	-6.074624***		
InTRADE			-3.548490	-3.701722**

*Note: *** Statistical significance at 1% level; ** statistical significance at 5%; * Statistical significance at 10%; Source: Authors' estimation using E-views 9*

While the test statistic values of the variables were either significant at 1%, 5%, or 10% as the case may be. This implies that none of the series is I(2) and could all be included in the ARDL estimation.

Regression Results

The ARDL estimation was done using two different models specified above. It begins by examining the relationship between unemployment and GDP (i.e. ARDL I), followed by the relationship between unemployment, agriculture, industry, construction, trade, and services (ARDL II). The two different models were used in order to test the Okun's law on the relationship between economic growth and unemployment and see how the relationship differ from that of the main disaggregated GDP data in Nigerian context Also, maximum of two lag lengths were considered to reduce the problem of degree of freedom in the time series analysis.

In each of the ARDL procedure examined, the optimum lag length selection criteria was carried out in order to determine the number of lag(s) to be included in the ARDL models prior to the bound test. The results are presented in Table 2, and Table 6.

Table 2: Lag Length Selection for ARDL I Model

Lag	AIC	SC	HQ
0	5.962659	6.054267	5.993024
1	5.043673	5.279414	4.984641
2	4.882824	5.215875	4.984641

Source: Authors' computation using E-views 9

From Table 2, the Akaike Information Criterion (AIC), and Shwarz Criterion (SC) indicate that two maximum lags are to be included in the ARDL I model. The results of the ARDL bounds testing approach are shown in Table 3.

Table 3: ARDL Bounds Test for Cointegration (ARDL I Model)

Dependent Variable: ΔUNEMP

Function		F-Statistics
F(UNEMP/InGDP		8.454559***
	Lower	Upper
Critical Value	Bound	Bound
1%	3.17	4.14
5%	3.79	4.85
10%	5.15	6.36

*Note: *** Statistical significance at 1% level; ** statistical significance at 5%; * Statistical significance at 10%. Critical values are obtained from Pesaran et al. (2001).*
Source: Authors' computation using E-views 9

Having conducted the unit root test and the optimum lag selection, F-statistic test for cointegration is required to determine whether there is cointegration among the variables captured in the unrestricted error correction version of the ARDL model. This has been estimated using the bound testing approach and the results presented in Table 3 above.

From Table 3, the bound test results reveal the existence of a long run relationship between unemployment and GDP. In the function F(UNEMP/lnGDP), the null hypothesis that there is no cointegration is rejected at 1% level as the F-statistic, 8.454559 is greater than the critical value, 4.14, at the upper bound indicating that there is cointegration between unemployment and GDP. Next step is to examine the long run impacts of GDP growth on unemployment in Nigeria using OLS technique.

Table 4: Estimated Long Run Coefficients of ARDL I Model

Dependent Variable: UNEMP		
Independent Variables	Coefficients	P-values
C	-16.68093***	0.0000
InGDP	3.281959***	0.0000

R2 = 0.695924 F-Statistic = 68.65963 (0.000000)

Durbin-Watson Statistic = 1.943290

*Note: *** Statistical significance at 1% level; ** statistical significance at 5%; * Statistical significance at 10%' Source: Authors' computation using E-views 9*

We estimate the long run equilibrium relationship between the variables using OLS. From the results as reported in Table 4, it reveals that GDP growth is positively related to unemployment in Nigeria in the long-run, and the result is statistically significant at 1%. This negates the postulation of the Okun's law which states that there is negative relationship between economic growth and unemployment. The coefficient of determination (R^2) is 0.695924. The result shows that 70% of variation in unemployment rate is caused by variation in the explanatory variable. The Durbin Watson statistics is 1.943290 which shows the absence of serial correlation as it is close to 2. The F-statistic (68.65963) is significant at 1% which means that the model is adequate.

Table 5: Results of Estimated Short Run Coefficients of the Selected ARDL I Model

Dependent Variable: ΔUNEMP		
Independent Variables	Coefficients	P-values
C	6.375586***	0.0006
ΔInUNEMP(-1)	-0.146975	0.3981
ΔInUNEMP(-2)	0.001895	0.9908
ΔInGDP(-1)	-10.19356*	0.0758
ΔInGDP(-2)	-17.38017***	0.0081
ECT(-1)	-0.567536***	0.0005

*Note: *** Statistical significance at 1% level; ** statistical significance at 5%; * Statistical significance at 10%; Source: Authors' computation using E-views 9*

The results of the short run relationship is estimated and reported in Table 5. The error correction coefficient (ECT(-1)) which is approximately -0.57 not only has the expected negative sign but it is also statistically significant at 1% considering the probability value which is 0.0005. The value of the ECT(-1) implies a fairly high speed of adjustment to equilibrium after a shock. Approximately 57% of disequilibria from the previous year's shock converge back to the long-run equilibrium in the current year. For the explanatory variable, the differenced one period and two period lag values of GDP show the existence of significant negative relationship between economic growth and unemployment at 10% and 1% levels respectively. This means that economic growth and unemployment relationship in the short run follows the Okun's law in Nigeria.

Table 6: Lag Length Selection for ARDL II Model

Lag	AIC	SC	HQ
0	5.171571	5.446397	5.262668
1	5.189700	5.802626	5.381661
2	5.209209	6.113205	5.485569

Source: Authors' computation using E-views 9

We estimated the ARDL II model to investigate whether there is long run relationship between unemployment, agriculture, industry, construction, trade, and services. The procedure starts with the optimum lag length selection criteria as reported in Table 6. Based on Akaike Information Criterion (AIC) Shwarz Criterion (SC), and Hanna-Quinn Criterion (HQ), one lag length was selected.

Table 7: ARDL Bounds Test for Cointegration (ARDL II Model)

Dependent Variable: ΔUNEMP		
Function		**F-Statistics**
F(UNEMP/InAGR,InIND, InCONS, InTRADE,InSERVS)		1.283452
Critical Value	Lower Bound	Upper Bound
1%	3.41	4.68
5%	2.62	3.79
10%	2.26	3.35

*Note: *** Statistical significance at 1% level; ** statistical significance at 5%; * Statistical significance at 10%. Critical values are obtained from Pesaran et al. (2001). Source: Authors' computation using E-views 9*

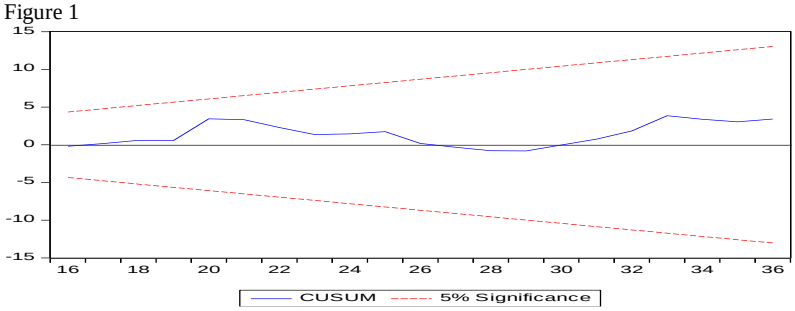
From Table 7, the bound test results reveal that there is no long run relationship between unemployment, agriculture, industry, construction, trade, and services sectors

growth as the F-statistic, 1.283458 is less than all the critical values at the upper and lower bounds. Hence, we could not go further to estimate the long run coefficients and speed of adjustment of the variables to long run equilibrium. Since there is no long-run relationship among the variables in the system above, we then stop here as further regression will present spurious results.

Stability Test

The study examined the stability tests for the first ARDL model that indicate long run relationship among the variables used (i.e. ARDL I). We relied on cumulative sum (CUSUM) test and the results are presented below.

Figure 1



Source: Authors computation using E-views 9 software

Figure 1 plots the CUSUM statistics for the first ARDL equation used in the study that revealed the existence of cointegration. It can be seen in the figure that the plot of the CUSUM stays within the critical 5% bounds which confirms the long run relationship among the variables and thus shows the stability of the ARDL I model.

5. Summary and Conclusion

This paper investigates whether Okun's law holds in the Nigerian economy by first examining the relationship between aggregate GDP and unemployment, and further investigating the relationship between disaggregated component of GDP and unemployment in Nigeria. We applied ARDL bound testing, OLS and error correction model (ECM) in the analysis and also used CUSUM to test the stability of the model used, and it was found that the ARDL I was stable. The results of the unit root tests indicated that the variables are of mixed stationary properties i.e. I(0) and I(1). The cointegration results show that there is long-run relationship between GDP and unemployment but no long-run relationship among the disaggregated component of GDP and unemployment in Nigeria. The error correction model for ARDL I examined revealed a relatively high speed of adjustment to equilibrium. From the OLS results on GDP and unemployment, it was revealed that Nigeria's economic growth is positively related to unemployment in the long-run, while growth in the short-run is unemployment reducing. This implies that economic growth in the long run negates the postulations of Okun's law while that of the short run is in line with the theory.

The result underscores the fact that economic growth in recent times is accounted for largely by factor reallocation from manufacturing and agriculture to trading largely in imported goods and other services which do not create sustainable job that can endure into the long run. This is consistent with the tertiarisation of the economy alluded to by Ajakaiye et al (2016). Hence the findings of the long run growth-unemployment relationship is consistent with

other studies in Nigeria conducted by Babalola *et al.,* 2013; Arewa and Nwakanma, 2012; Akeju and Olanipekun, 2015.

On the disaggregated component of GDP, the findings revealed no long-run relationship as earlier stated. This could be because there is no inter-sectoral linkage in the Nigerian economy in line with input-output framework that could result in high labour force participation rate. The agricultural sector suffers from neglect; the services sector is not employment elastic as the growth of the sector does not absorb much labour, and the industrial sector on the other hand is faced with competition from foreign goods and reliance on imported raw materials, while construction sector relies on foreign technology. The trade sector is dominated by importation which implies labour input from outside the Nigerian economy. All these reduce the labour participation rate in the economy. Hence, the growth of the economy is generally not unemployment reducing, and not in line with Okun's law.

However, Okun also pointed out that the relationship between output and unemployment is hinged on the linkage between productivity of real output and unemployment. Where this linkage does not exist, Okun's law may not hold. Thus the lack of proper linkage between primary, secondary and tertiary sectors of the Nigerian economy is the reason for jobless growth. Hence, policy should be directed at forging enduring links between the sectors in Nigeria to reduce unemployment.

References

Adudu, S. A. & Ojonye, S. M. (2015), "Employment-Real Wage Relationship and Economic Growth in Nigeria", *Journal of Economics and Sustainable Development*, 6(2), pp. 179-188.

Ahsan, A., Gutiérrez, C., Paci, P. & Ranzani, M. (2010). *Growth, Employment, and Poverty Trends in India: Unbundling the Links*. Paper presented at IZA/World Bank Conference, May. Available at: http://www.iza.org/conference_files/worldb2010/paci_p2857.pdf (accessed on 9th March, 2017).

Ajakaiye, O., A. Jerome, O. Olaniyan, K. Mahrt, & O. Alaba (2014). "Multidimensional Poverty in Nigeria: First Order Dominance Approach". *WIDER Working Paper* WP2014/143. Helsinki: UNU-WIDER.

Ajakaiye, O., Jerome, A. T., Nabena, D. & Alaba, O. A. (2016) "Understanding the Relationship between Growth and Employment in Nigeria", Available at https://www.brookings.edu/wp-content/uploads/2016/07/growth-employment-nigeria-ajakaiye-jerome-nabena-alaba.pdf (Accessed: 24th February, 2017).

Akeju, K. F. & Olanipekun, D. B. (2015), "Unemployment and Economic Growth in Nigeria", *International Journal of African and Asian Studies*, 11, pp. 92-98.

Anyanwu, J.C & Oaikhenan, H.E. (1995); "Modern Macroeconomics": Theory and Applications in Nigeria", Joanie Educational Publisher Ltd, Onitsha, Nigeria.

Arewa A. & Nwakanma P. (2012), "Potential-real GDP and Growth Process of Nigerian economy, An Empirical Re-evaluation of Okun's Law", *European Scientific Journal, 8(9): 25-33.*

Ayoyinka, S. O. (2008), "Employment and Economic Growth in Nigeria, An Unpublished Research Project Submitted to the Department of Economics and Development Studies, College of Business and Social Sciences, Covenant University, Ota, Ogun State.

Babalola, S. J., Saka, J. O. & Adenuga, I. A. (2013). "The Validity of Okun's Law in Nigeria: A Difference Model Approach", *Asian Economic and Financial Review*, 3(12); pp. 1598-1608.

Barungi, B, E. Ogunleye, & C. Zamba (2015). *'Nigeria'. African Economic Outlook*. Available at http://www.africaneconomicoutlook.org/en/country-notes/west-africa/nigeria/ (accessed on 15 November 2015).

Christopoulos D. (2004), "The Relationship Between Output and Unemployment: Evidence from Greek Regions Study", *Regional Science*, 83: pp. 611-620.

Daniel, K. and Ejara D. (2009), "Impact of information asymmetry on municipal bond yields: An empirical analysis". *Am. J. Econ. Bus. Admin., 1: 11-20.*

Florence, A. C., Justine, I. C. & Uchenna, U. (2015) "Youth Unemployment and Labour Productivity in Nigeria: The Nexus, *Journal of Research and Development,* 2(8); pp. 14-28.

Geidenhuys, J. & Marinkov, M. (2007), "Robust Estimates of Okun's Coefficient for South Africa", Working Paper.

Gujarati, D. N. (2005). *Basic Econometrics* (Fifth Reprint). Tata MacGraw Hill, New Delhi.

International Labour Organization (1996). *World Employment 1996/97: National Policies in a Global Context*, International Labour Office.

Junankar, P. N. R. (2013). "is there a Trade-off between Employment and Productivity?" *Discussion Paper No 7717,* November.

Jhingan, M.L. (2005): "The Economics of Development And Planning ", New Delhi; Vrinda publishing

Jose, N. C. F. (2006). "Testing for Asymmetry in the Relationship between Employment and Output: Empirical Evidence from the Industrial Sector of Coted'ivoire (1970-1996)". *The Nigerian Journal of Economic and Social Studies,* 48(3): pp. 297-312.

Kale Y, & S.I. Doguwa (2015). "On the Compilation of Labour Force Statistics for Nigeria". *CBN Journal of Applied Statistics*, 6(1): pp. 183–198. Available at: http://www.nigerianstat.gov.ng/pages/download/298 (accessed on 26 November 2015).

Khosravi, A. & Karimi, M. S. (2010). "To investigation the Relationship Between Monetary, Fiscal Policy and Economic Growth in Iran: Autoregressive Distributed Lag Approach to Cointegration." *American Journal of Applied Science*. 7(3), pp. 415-419.

King, R.S & Levine R. (1993); "Finance, Entrepreneurship and Growth", Paper Presented at World Bank Conference on "How do National Polices Affect Long-term Growth". Washington D.C, February.

NBS (2015). *Presentation of Labour Statistics Based on Revised Concepts and Methodology for Computing Labour Statistics in Nigeria.* Available at www.nigerianstat.gov.ng/pages/download/285 (accessed on 28th February, 2017).

Njoku, A. & Ihugba, O. A. (2011) "Unemployment and Nigerian Economic Growth (1985-2009)", *Proceedings of the 2011 International Conference on Teaching, Learning and Change,* International Association for Teaching and Learning (IATEL).

Okun A. M. (1962), "Potential GNP: Its Measurement and Significance", *American Statistical Association, Proceedings of the Business and Economics Statistics Section, pp. 98–104.*

Oloni, E. F. (2013) "The Impact of Economic Growth on Employment in Nigeria", *International Business and Management,* 6(1), pp. 113-119.

Pesaran, H. M. & Pesaran, B. (2001). "Bound Testing Approach to the Analysis of Level Relationships." *Journal of Applied Econometrics.* Vol. 16, pp. 284 – 326.

Pesaran, H. M. & Shin, Y. (1996). "Autogressive Distributed lag Modeling to Cointegration Analysis." *DAE Working Paper Series, no 9514,* Department of Applied Economics, University of Cambridge. Retrieved on 2/03/2017 from www.epry .org.uk/faculty/pesaran/ardl.pdf.

Pesaran, H. Shin, Y. & Smith, R .J. (2001). "Bound Testing Approach to the Analysis of Level Relationships." *Journal of Applied Econometrics.* vol. 16; 289-326.

Seyfried, W. (2005), "Examining the Relationship between Employment and Economic Growth in the Ten Largest States, *Southwestern Economic Review,* Available at https://pdfs.semanticscholar.org/71b7/3bcd2ca3bd8f70b2b38f54180aecc9964d7a.pdf (Accessed: 24th February, 2017).

Villaverde J. & Maza A. (2008), "The Robustness of Okun's law in Spain, 1980–2004 Regional evidence", *Journal of Policy Modelling,* 31, pp. 289–297.

World Bank (2015). *World Development Indicators.* Available at: http://data.worldbank.org/news/release-of-world-development-indicators-2015 (accessed on 27th February 2017).

World_Bank **(**2013). "World Development Review 2013," Washington: World Bank.