

# THE INTERNATIONAL JOURNAL OF BUSINESS & MANAGEMENT

## Employment Elasticity of Output: Empirical Evidence from Nigerian Real Sector

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### Abstract:

*This paper presents an empirical analysis of the responsiveness of unemployment to variability of real sector output in Nigeria over the period 1980-2016. The real sector output is captured by the productivity of the agricultural, industrial and service sectors while national unemployment rate is used to measure the level of unemployment in Nigeria. While national unemployment data was obtained from the National Bureau Statistics, data on the key indicators of real sector productivity was sourced from the Central Bank of Nigeria Statistical Bulletin. The Stock-Watson Dynamic Least Squares (DOLS) technique was utilized for the cointegrating regression analysis. The Phillips-Perron unit root test results reveal that the variables are non-stationary at levels, but became stationary upon differencing. The Johansen-Juselius cointegration test result shows that the variables have long run relationship. Evidence from the cointegrating regression analysis indicates that the industrial and service sectors outputs are negatively related to the unemployment while agricultural sector output has a positive relationship with unemployment rate. These findings demonstrate that there exist structural changes in sectoral employment in the Nigerian economy with the industrial and service sectors playing leading roles in absorbing the abundant labour resources in Nigeria. The Wald test result for coefficient restriction shows that coefficients of the regressors are significantly different from zero at 5 percent level, indicating that the regressors are jointly significant in explaining changes in unemployment rate. Based on the findings, the paper recommends among others that policy actions for growth and sustainability of industrial output should be put in place, properly executed and continuously monitored with a view to enhancing the employment elasticity of output in the industrial sector.*

### 1. Introduction

The labour absorption capacity of developing and emerging economies globally to a large extent depends on the productivity of the real sector. This is because increase in real sector output provides opportunities for reduction in rural and urban unemployment as well as enhances socio-economic turnaround. Ewubari and Obayori (2015) argue that promoting real sector performance provides the roadmap for achieving sustaining growth. Recent trends in the global economic outlook also demonstrate that countries with high productivity are not only at the forefront of determining global balance of power but serve as centers of attraction, where human and other resources worldwide are redirected to. Obadan and Odusola (2005) argue that an economy with high real sector productivity often provides opportunity for high capacity utilization, high standard of living, low unemployment and social progress.

It is noteworthy that unemployment has remained a serious impediment to social progress and peaceful coexistence in many developing economies. Thus, development objectives in these countries often prioritized unemployment problem with a view to significantly reducing it and averting its negative implications on welfare maximization. Despite deliberate actions taken by these developing economies including Nigeria to reduce unemployment, it has continued to reoccur with majority of the populations, especially youths being excluded from driving the process of growth. This has generated far reaching controversies on the effectiveness of the real sector in absorbing the abundant human resources in these countries. Undoubtedly, Nigeria's growing unemployment has remained a major concern to policymakers and stakeholders in the economy as the continuous rise in the population of the unemployed indicates dwindling economic potentials. The unemployment rate increased from 23.9 percent in 2011 to a record high of 25 percent in 2014 (Ajakaiye et al, 2016). The World Bank (2009) report also indicates that 40 million of Nigerian youths are unemployed. This tends to constitute a major threat to national development and security following the incidence in the Middle East where unemployment played a major role in the Arab spring.

The unemployment rate in Nigeria has continued to surge in the past two decades despite governments' effort at containing it. Akakaiye et al. (2016) posit that the rate of unemployment since 2000 has risen to a compound annual average of 4.8 percent, even as it has continued to fluctuate and intensify. More so, the proportion of the population that are unemployed has continued to vary across the states and geo-political zones in Nigeria due to variability of real sector productivity and other economic opportunities in these locations. According to the World Bank (2015), the rate of unemployment is much higher in the northern region where two-thirds of the population engages in subsistence farming than in the Southern part of Nigerian, where it maintains a relatively low rate given that more than half of the population are self-employed. This is consistent with the Labour force survey of the National Bureau of Statistics, NBS (2011), which identifies Zamfara, Bauchi, Niger, Gombe, Nasarawa, Jigawa, Yobe, Adamawa and Kaduna States as the bottom ten in the unemployment list in Nigeria.

Furthermore, the NBS (2015) report shows high incidence of unemployment for women than men in Nigeria with the number of unemployed men hovering around 7-8 million while the unemployed female population increased to over 10 million in 2014 from its previous value of 6.7 million in 2010. Regardless of rising rate of unemployment, the GDP growth rate in Nigeria has maintained a positive trend between 2005 and 2014, with an outstanding increase in 2014. Real GDP growth rate was estimated at 6.23 percent in 2014 compared to 5.49 percent in 2013 (Ajakaiye et al., 2016). Similarly, Kale and Doguwa (2015) remark that Nigeria became the largest economy in Africa following the rebasing of its GDP in 2014 by the NBS with a rebased GDP estimate of US\$454 billion in 2012 and US\$510 billion in 2013. However, Ewubari and Obayori (2015) describe this as an intriguing paradox, arguing that the GDP growth rates are associated with high and rising rate of unemployment.

Unarguably, the contributions of the real sector' especially agriculture, manufacturing and service sectors in reducing unemployment rate in Nigeria have varied overtime. The United Nations Department of Economic and Social Affairs (2015) reports that most of the jobs created for the Nigeria's labour force between 1970 and 2014 are in the agricultural sector. This identifies the important role played by the sector in absorbing the abundant human resources in the Nigerian economy. The share of agriculture of total employment generated as reported by Nigerian Institute of Social and Economic Research, NISER (2015) declined from 51 percent in 2000 to 45 percent in 2014 while that of service sector surge from 24 percent in 2000 to 44 percent in 2014. It equally indicates that the share of manufacturing sector in total labour absorption declined from 11 percent in 2000 to 6 percent in 2014. These evidences suggest that opportunities are shifting across the three core sub-sectors of the Nigerian real sector. The decline in the job creation ability of the real sector has terrible consequences for the Nigerian economy as it adds to the dismal performance of Nigerian economy in the Human Development reports across the globe. Although, theoretical propositions support the positive nexus between real sector productivity and job creation, the underlying empirical evidences demonstrate that it cannot be generalized given varying experiences in different countries. This paper therefore, provides deeper insights into the sensitivity of unemployment to real sector productivity in Nigeria between 1980 and 2016 given that available statistics and empirics on these macroeconomic indicators are characterized by unending controversies.

### *1.1. Statement of the Problem*

The centrality of real sector development in reducing unemployment has received great attention in economic literature. Despite the consensus in economic theory on the role of real sector in job creation, empirical evidences in many developing countries have varied. Whilst some emerging economies are testimonies of the increasing role of real sector in job creation, Nigeria as observed by Manggoel et al. (2012) has achieved sub-optimal results with regard to the effectiveness of real sector in reducing the rate of joblessness in the country. Ewubari and Obayori (2015) observes that in spite of the good macroeconomic policies in place, the real sector, especially industrial and agricultural sectors are still characterized by low productivity and low level of gainful employment. This is suggestive that decline in real sector performance often translates to growth in unemployment. Factors identified by Sanusi (2011) that have worsened the unemployment problem in Nigeria include inadequate infrastructure, poor skills and entrepreneurial abilities as well as mismatch between skills acquired from the educational system and skills required by the industry.

Undoubtedly, several factors have positioned Nigeria to become among the leading economies through real sector development, but structural rigidities have remained major constraints to the performance and labour absorption capacity of the real sector. Although, Mba and Ekeopara (2012) argue that long term economic growth cannot be achieve without investment in real sectors, but the extent of its inclusiveness depends on harnessing the available human capital. The level of harnessing human capital in Nigeria has not been optimal considering the rising levels of unemployment. The Central Bank of Nigeria, CBN (2003) reports that total unemployment rate in Nigeria rose from 4.3 percent in 1970 to 6.4 percent in 1980. This is quite worrisome compared to the experiences of some emerging economies.

It is noteworthy that investment in real sector backed by favorable government policies will help to tackle unemployment problem in Nigeria. Although most government policies are considered as growth-enhancing, their implementations tend to contract the actualization of the intended and desired outcomes. For instance, government policy of financing the real sector through credit rationing methods tends to be counter-productive due to high lending rate and severe collateral conditions provided by Deposit Money Banks (DMBs). These tend to contract the productive capacity of the real sector and their ability to absorb the abundant human resources in Nigeria. Based on the foregoing, the thrust of this paper is to explore the link between real sector performance and unemployment in Nigeria.

## **2. Literature Review**

### *2.1. Theoretical Literature*

#### 2.1.1. Keynesian Theory of Employment

This theory is pioneered by Keynes (1936) in providing explanation for the determination of employment via changes in aggregate demand. Thus, demand for labour resources is a derived demand as productivity growth is expected to drive employment generation thereby reducing unemployment. The Keynesian framework, as remarked by Hussain and Nadol (1997) argues that job creation, growth of capital stock and technological change are largely endogenous as they are driven by other important macroeconomic variables. Thus, the fundamentals of long term growth of output influence the growth of employment.

Contrary to the neo-classical assumptions that equilibrium wage rate, price, interest rate and real cash balances provide basis for full-employment, the Keynesians are of the opinion that aggregate demand provides the pathway for employment generation. Keynes

focused on aggregate demand function to combat depression and unemployment. Thus, the responsiveness of employment to output is predicated on the consumption demand. The Keynesian prescription for reducing unemployment is increase in aggregate total demand through direct increases in government spending or policies that engender real sector productivity. Following the Keynesians argument, in as much as unemployment and excess capacity persists in the output growth propelled by higher demand creates opportunity for higher income and reduction in unemployment.

### 2.1.2. Search Theory of Unemployment

This theory was put forth by Fitzgerald (1998) who believes that workers have different skills requirements. Hence, workers need to find well-paying jobs, while firms need to find the most productive workers. According to Fitzgerald (1998) neither firms nor workers have all the information they need about the options available to them as a result, they must engage in search since, search is costly and time consuming hence; both firms and workers must use some of their resources to find a good match. On the part of workers, it is assumed that they only search when they are unemployed. Hence, they are faced with an uncertain environment as firm do on their part. When a worker gets a job wage offer, for instance, he must decide whether to accept it or continue searching for a better offer because accepting such offer means foregoing the chance of a higher wage offer later; while continuing the search means losing the wages he/she would have earned if she had accepted the offer and started working. The wage at which the worker is indifferent between continuing the search and accepting the current job is called the reservation wage as a result the workers accept all job offers above the wage and turn down all offers below it.

Sequel to the above when a search is successful, that is when there is a match between the needs of the workers and the firm. The worker leaves unemployment. Hence, the theory pinpointed that, the wage offered by the firm is directly related to the workers' productivity all things being equal. Suppose, that there is an economy-wide increase in productivity that worker is not aware of. Then, there is the tendency that such higher productivity can make it more attractive for the firm to increase employment by allowing it to do so by increasing the wage it offers to workers. This in turn increases the likelihood that the average worker will find an acceptable job offer and reduces the time she is likely to spend searching. Thus, the unemployment rate will decline in response to the increase in productivity.

Furthermore, the search theory of unemployment is a way in which improvement in technology could have a long lasting effect on the rate of unemployment if it leads to permanent increase in the rate at which searching firms and workers find the right match. The foregoing further buttressed the study of Gomme (1998) which suggested that the internet has made this possible because firms now routinely post vacancies on the internet, so that workers can look for jobs in multiple locations at almost no cost.

### 2.2. Stylized Facts of Unemployment and Real Sector Output in Nigeria

Since the inception of civilian administration in more than a decade, the unemployment rate has continued to fluctuate with most periods in 1999-2016 witnessing constant increase in this socio-economic indicator despite policy initiatives of the successive governments to tackle this menace. This is illustrated in Figure 1.

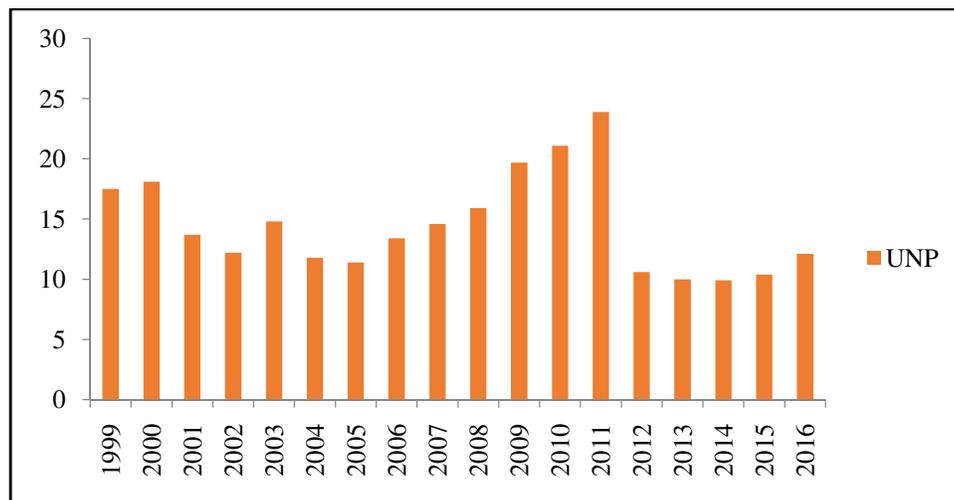


Figure 1: Nigeria's Unemployment trend (in percentage), 1999-2016

Source: Author's estimation based on data sourced from the Annual Abstract of Statistics of National Bureau of Statistics (2016)

The socio-economic indicator reported in Figure 1 which captures the percentage of the working population that is qualified and constantly seeking for gainful employment at a prevailing wage rate increased to 18.1 percent in 2000 before declining to 12.2 percent in 2002 prior to establishment of National Economic Empowerment and Development Strategy (NEEDS) in 2004. Between 2003 and 2010, unemployment rate in Nigeria averaged 15.33 percent. It rose rapidly to all-time high of 23.9 percent in 2011 before trending downward by declining from 10.4 percent in 2012 to 9.9 percent in 2014. In response to the realities of economic recession in Nigeria, unemployment rate rose from 10.4 percent 2015 to 12.1 percent in 2016. This is an indication that the working population in paid employment continues to dwindle overtime.

Additionally, the sectoral distribution of real sector output is reported in Figure 2.

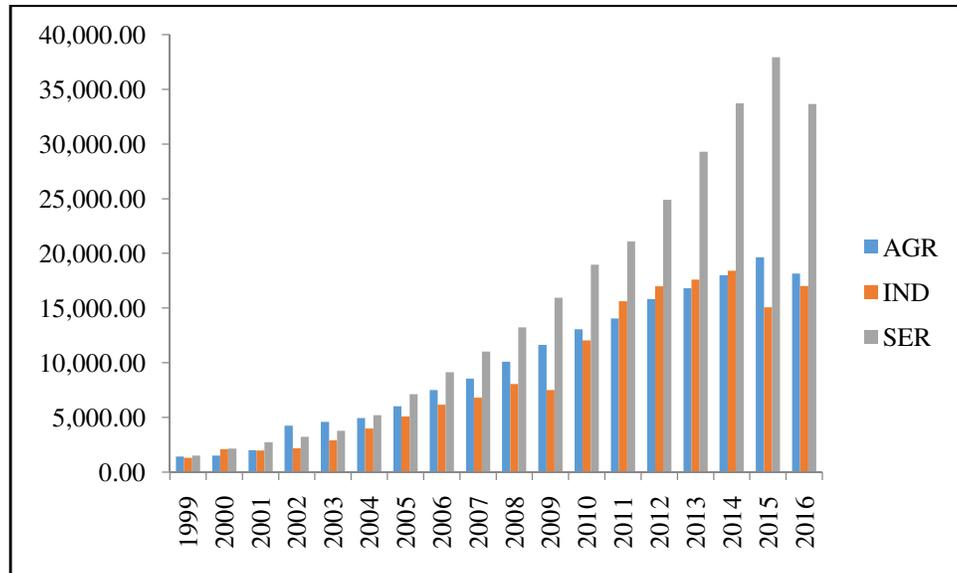


Figure 2: Sectoral distribution of real sector output in Nigeria (in ₦ billion), 1999-2016

Source: Author's estimation based on data sourced from Central Bank of Nigeria Statistical Bulletin (2016)

Starting from 2000, service sector output comprising transportation, information and communication, real estate and public administration amongst others emerged as an important driver growth in Nigeria following continuous increase in its output. Between 2000 and 2010, service sector output averaged ₦8,413.75 billion while agricultural and industrial sectors outputs respectively averaged ₦6,742.62 billion and ₦5,345.16 billion. The service sector output increased rapidly from ₦21,085.01 billion in 2011 to ₦37,933.06 billion in 2015. Similarly, agricultural output rose marginally from ₦14,037.83 billion in 2011 to a maximum value of ₦19,636.97 billion in 2015. Unlike service and agricultural sectors outputs, industrial sector output trended downward from ₦15,626.42 billion in 2011 to ₦15,073.78 billion in 2015. The increase in service sector output is a pointer that opportunities are constantly being shifted from agriculture to services in Nigerian economy over the past decade. This adds to the current macroeconomic debate on whether growth in the productivity of the service sector can engender rapid economic growth and its attendant long term benefits of gainful and sustainable employment. Although, Rodrick (2014) argues service sector growth seem to impair medium and long term goals of economic growth and job creation, Ghani and O'Connell (2014) find evidence to support the claim that increase in service sector productivity is growth-enhancing. The increasing importance that the service sector assumes in Nigerian economy as depicted in Figure 2 could be traced to the boom in the mobile communications and home-grown film industry, which has been described as the second largest in the world with high employment generating capacity. Notably, the decline in agriculture, service and industrial sectors outputs to ₦18,157.38 billion, ₦33,648.51 billion and ₦17,030.09 billion in 2016 is undoubtedly a reflection of the economic realities in Nigeria as the country is technically described to be undergoing recession following a negative growth in the gross domestic product in 2015 and 2016.

### 2.3. Empirical Literature

The question on whether increase in real sector productivity contracts or intensifies unemployment has continued to take the center stage policy debates, thus sparking numerous empirical investigations. These empirics have overtly generated mixed results as some indicate that growth in real sector delivered gainfully employment while others demonstrate that real sector productivity translates to a jobless growth.

Ewubare and Obayori (2015) analyzed the impact of the real sector performance on unemployment rate in the Nigerian integrating Ordinary Least Squares (OLS) cointegration test and error correction mechanism as well as Granger causality test as analytical techniques. The Central Bank of Nigeria (CBN) Statistical Bulletin and National Bureau of Statistics served as the sources of data for unemployment rate, index of agricultural productivity and index of industrial productivity. The short run results reveal that the key indicators of real sector productivity comprising indexes of agricultural and industrial productivity have significant impact on unemployment rate. Specifically, it was uncovered that only index of industrial productivity has a negative relationship with unemployment rate while parsimonious error correction mechanism showed that both indexes of agricultural and industrial productivities are negatively related to unemployment. The Granger causality tests results show evidence unidirectional causation between unemployment and index of agricultural productivity, unemployment and index of industrial productivity respectively. Considering the findings, the study recommends amongst others that governments should strive to ensure that enabling environment for the profitability of the private is put in place through policy initiative of realistic power and energy programmes and reforms.

Tara (2004) explores the impact of permanent and transitory movements in Output on unemployment rate in the United States of America. The methodology employed by the study provided for the separation of the two key macroeconomic indicators into permanent and transitory components and provided estimates of the correlations among these components. It was evident from the

empirical results that fluctuations in both output and unemployment are largely permanent and these permanent components are negatively related which coincides with the propositions of the Okun's law. Additionally, Andrei, Vasile and Adrian (2009) examined the long term effects of real GDP on unemployment in Romania using Augmented Dickey Fuller and Phillips-Perron unit root tests and Ordinary Least Squares (OLS) methodology. The study uncovered that 1 percent increase in unemployment is as a result of roughly half percent change in real GDP growth. Hence, the study suggested for attention to be focused on stimulating real GDP to drive job creation.

Ayinde (2008) assess the implications of changing dimensions of agricultural growth and unemployment rates in Nigeria. The required datasets were analyzed using multiple regression analysis and Granger Causality test. The results reveal that growth in agricultural output is helpful in contracting the unemployment rate in Nigeria. In view of the empirical findings, the study recommends that that polices geared towards containing rising unemployment and poverty reduction should prioritize increase in agricultural productivity.

Ajakaiye *et al.* (2016) empirically analyzed the relationship between growth and employment in Nigeria to better understand the country's paradox of high economic growth alongside rising poverty and inequality. The methodology adopted is the Shapley decomposition approach, complemented with econometric estimation of the country's employment intensity of growth. The study demonstrates that Nigeria's growth over the sampled period is after all is a jobless growth and sustained mainly by factor reallocations rather than productivity enhancement. Specifically, the findings indicate that labour has been constantly shifting from agriculture and manufacturing towards the low productive services sector. Thus, the study recommends that manufacturing sector should an important attention with a view to promoting technological development in the sector in general while advancing the labour-intensive components in particular.

Byiers *et al.* (2015) investigates the movements in a group of Development Progress countries from Latin America, Africa, and Asia using the JoGGs decomposition tool, focusing on economic structural transformation. The findings demonstrate that labour movements were towards the services sector comprising mainly precarious, low-productivity jobs, rather than manufacturing. The results also show that productivity depends largely on labour movements.

Ajilore and Yinusa (2011) explore the employment intensity of sectoral output growth in Botswana with a view to identifying key sectors of the Botswana economy that are employment intensive. The study employed both simple elasticity and econometric methodology to provide empirical evidence on the extent to which growth that has occurred in the economy of Botswana is employment intensive and the sectors that provide the opportunities. The findings reveal that the Botswana economy has low labour absorptive capacity at the aggregate and at sectoral levels. This is suggestive that the growth performance in the Botswana economy is perhaps a jobless growth. Drawing support from the findings, the study recommends for the country to focus on mineral-led economy capable of diversifying into sectors and initiating labour-intensive activities.

Onaran (2008) adopts a labor demand equation using panel data of manufacturing industry in the Central and Eastern European Countries comprising the Czech Republic, Hungary, Poland, Slovakia, Slovenia, Lithuania, Bulgaria, and Romania with a view to gain deeper insight into the effect of domestic factors, especially wages and output and international factors involving exports, imports, and FDI on employment during the post-transition recovery period. The findings indicate that the output elasticity of labor demand is mostly positive and low. Additionally, the findings reveal that the external factors captured by FDI and international trade intensified the problem of unemployment. On the strengths of the findings, study recommended for a coordinated macroeconomic and industrial policy around the European Union focusing on job creation and boosting productivity in the medium and the long run.

Fasanya and Onakoya (2012) explored the impact of informal sector on employment generation in Nigeria using time series data that span from 1970 to 2010. The augmented Solow growth analytical framework provided the empirical front for the study. The findings attest to the robustness of the informal sector in absorbing the ever increasing population of the labour in Nigeria. In the light of the findings, this study recommends for the government to critically re-examine its policies on informal sector with view to stimulating employment generation.

Ogunrinola and Osabuohien (2010) appraised the implications of globalisation on employment level in the manufacturing sector in Nigeria. The datasets they utilized ranged from 1990 to 2006 and the analytical techniques relied on Ordinary Least Squares procedure. The results revealed that globalization enhances opportunities for employment generation in the Nigerian manufacturing. This finding is very welcoming as the study recommended for efforts to be directed towards infrastructural development to improve the level of production and boots the level of employment generation in the manufacturing sector.

### 3. Materials and Methods

#### 3.1. Model Specification

Building on ex-post facto research design, this paper adopts a multivariate cointegrating regression model which anchors on the Keynesian theory of employment. The Keynesian theory of employment proposed by Keynes (1936) assumes that productivity growth should increase demand for labour thereby reducing unemployment. The model is patterned after the model employed by Ayinde (2008) while exploring the impact of agricultural sector on unemployment in Nigeria. However, this model is improved upon in this paper following the inclusion of industrial and service sectors outputs. This is intended to gain broader insight into the effectiveness of the growth in real sector constituents in tackling the unemployment problem in Nigeria. The functional form of the model is formalized as:

$$UNP = f(AGR, IND, SER) \quad (1)$$

Where: UNP = unemployment rate

AGR = agricultural sector output  
 IND = industrial sector output  
 SER = service sector output

The formal specification of the Dynamic Least Squares (DOLS) based cointegrating regression model using the notations for the underlying variables in equation (1) is provided as follows:

$$UNP_t = \psi_0 + \psi_1 \ln IND_t + \psi_2 \ln AGR_t + \psi_3 \ln SER_t + \sum_{q=-y}^p \Omega_1 \Delta \ln AGR_{t-y} + \sum_{q=-y}^p \Omega_2 \Delta \ln IND_{t-y} + \sum_{q=-y}^p \Omega_3 \Delta \ln SER_{t-y} + e_t \tag{2}$$

Where: UNP, AGR, IND and SER are the same as defined earlier in equation (1)

$\psi_0$  = constant parameter  
 $\psi_1 - \psi_3$  = long run multipliers, depicting the long run effects of changes in the explanatory variables on unemployment.  
 P and q = lag and lead lengths respectively  
 $e_t$  = stochastic term which captures the unobserved characteristics

### 3.2. Data Type and Sources

Data used in this paper are annual time series on national unemployment rate, agricultural, industrial and service sectors outputs which relate to the period 1981 to 2016 and were collected from the National Bureau of Statistics and Central Bank of Nigeria Statistical Bulletin. The variables description, nature of data and sources are summarized in Table 1.

Variable	Data Type	Source
Unemployment rate (UNP)	Annual time series data, 1981-2015.	National Bureau of Statistics, NBS (2016)
Industrial output (IND)	Annual time series data, 1981-2015.	Central Bank of Nigeria Statistical Bulletin, CBN (2016).
Agricultural output (AGR)	Annual time series data, 1981-2015.	Central Bank of Nigeria Statistical Bulletin, CBN (2016).
Service sector's output (SER)	Annual time series data, 1981-2015.	Central Bank of Nigeria Statistical Bulletin, CBN (2016).

Table 1: Data type and their sources  
 Source: Author's compilation (2017)

### 3.3. Data Analysis Techniques

The Dynamic Least Squares (DOLS) estimating technique developed by Stock and Watson (1993) is adopted for estimating the long run coefficients of the regressors following the difference stationarity characteristics depicted by most macroeconomic time series. As a cointegrating regression model estimator, the DOLS is selected for its capability of yielding robust estimates in convenient form and because of its outstanding performance in previous studies using time series data. More importantly, the DOLS tends to produce optimal estimates of cointegration regressions and corrects for endogeneity usually associated with regressors by including lags and leads of the difference explanatory variables. This allows for valid inference to be made regarding the coefficients of the explanatory variables included in the cointegrating regression equation. Before estimating the model, the necessary estimation tests with focus on unit root and cointegrated tests are conducted.

i. **Unit root test:** The stationarity characteristics of the underlying economic time series are examined using Phillips-Perron methodology. Ozigbu and Ubani (2017) argue that the unit root test provides the framework for checking whether or not the assumptions of the Ordinary Least Squares are undermined. This procedure provides better insight into the order of integration of each of the variables in the model. The model for unit root which includes both intercept and trend is expressed as:

$$\Delta W_t = \mu_0 + \mu_1 W_{t-1} + \sum_{i=1}^k \phi_i \Delta W_{t-i} + e_t \tag{3}$$

Where:  $W_t$  = variable being investigated

$\mu_1$  and  $\phi_i$  = parameter estimates of the variables  
 k = lag length  
 $\Delta$  = First difference operator  
 $e_t$  = white noise

#### ii. Cointegration test:

This cointegration test is used to ascertain whether or not long run equilibrium relationship exist between the variables. Specifically, the cointegration test for multivariate model proposed by Johansen and Juselius (1990) is utilized in this paper to test the null hypothesis of no cointegration against the alternative hypothesis of cointegration at 5 percent level. The formalization of the log-likelihood ratio based on Trace and Max-Eigen statistics are as follows:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^n \ln \left( 1 - \hat{\lambda}_i \right) \tag{4.1}$$

$$\lambda_{max}(r, r+1) = -T \ln \left( 1 - \hat{\lambda}_{r+1} \right) \tag{4.2}$$

where  $\hat{\lambda}$  denotes the estimated values of the characteristic roots and  $T$  is the sample size. Basically, the Trace statistic tests the restriction  $r < q$  ( $q < n$ ) against the completely unrestricted model  $r < n$  and the maximum Eigen value statistic makes the alternative more precise by specifying that only one additional cointegrating vector exists ( $r \leq q + 1$ ). Notably, the critical values for both trace and Max-Eigen statistics have been calculated by Johansen and Juselius (1990). Evidence of at least one cointegrating vector at 5 percent indicates that the series have long run relationship.

#### 4. Results and Discussion

##### 4.1. Descriptive Statistics

The descriptive statistics comprising the mean, median, range (minimum and maximum values), standard deviation and Jarque-Bera statistics for the underlying series are reported in Table 2.

	UNP	AGR	IND	SER
Mean	9.402778	5111.679	4641.574	7791.756
Median	8.900000	1384.005	1242.820	1376.355
Maximum	23.900000	19636.97	18402.19	37933.06
Minimum	1.900000	17.05000	37.02000	64.24000
Std. Dev.	6.009539	6502.694	6195.662	11414.45
Jarque-Bera	2.973563	6.664089	8.832597	12.95841
Probability	0.226099	0.035720	0.012079	0.001535
Observations	36	36	36	36

Table 2: Summary of the Descriptive statistics

Source: Author's estimation from E-views Statistical Package

The descriptive statistics for each of the series reported Table 2 indicate that within the 35 years period (1981-2016) national unemployment rate in Nigeria averaged 9.40 percent while the mean values of industrial output, agricultural output and service sectors outputs are ₦4641.574 billion, ₦5111.679 billion and ₦7791.756 billion respectively. The respective minimum and maximum values of the series indicates that unemployment ranged from 1.9 percent to 23.9 percent while agricultural sector output ranges from ₦17.05000 billion to ₦19636.97 billion. The result also shows that industrial sector output ranges ₦37.02000 billion to ₦18402.19 billion while the service sector output ranges from ₦64.24000 billion to ₦37933.06 billion. The standard deviation reveals that only the observations for unemployment clustered around its corresponding mean value while the observations for the other variables are divergent from their respective mean values. More so, the corresponding probability value of Jarque-Bera statistics for unemployment rate exceeds 0.05, indicating that at 5 percent level the series are normally distributed. However, the other variables (agricultural, industrial and service sectors outputs) are found not to be normally distributed at the conventional 5 percent level as the corresponding probability values of their Jarque-Bera statistics are less than 0.05. Hence, the null hypothesis of normal distribution at 5 percent level is only rejected for unemployment rate.

##### 4.2. Unit Root Test

As stated earlier, the Phillips-Perron methodology is utilized to examine the time series characteristics of each of the variables and identify their different orders of integration. The results of the Phillips-Perron unit root test are summarized in Table 3.

Phillips-Perron test statistic				
Variable	Levels Test	1 <sup>st</sup> diff. test	2 <sup>nd</sup> diff. test	Order of Integration
UNP	-2.57	-6.022**	-	I(1)
Log(AGR)	0.005	-3.778**	-	I(1)
Log(IND)	-1.193	-5.032**	-	I(1)
Log(SER)	-2.068	1.836	-13.453***	I(2)
Critical value (5 %)	-3.544	-3.548	-3.55	

Table 3: Phillips-Perron unit test result

Source: Author's estimation from E-views Statistical Package

NB: \*\* and \*\*\* denote stationary at 1<sup>st</sup> difference and 2<sup>nd</sup> difference respectively

The unit test result is reported in Table 3. It was evident from the result that none of the variables is stationary at levels as their respective computed Phillips-Perron statistics are less than the corresponding critical values at 5 percent level. This finding is perhaps not surprising as it depicts the common characteristics of time series data which tend to be non-stationary at levels as proposed by Newbold and Granger (1974). However, the variables are found to be difference stationary with all the variables except service sector output being integrated of order one [I (1)]. The service sector output is integrated of order two [I (2)]. The results of the unit root test are very insightful as they authenticate the claim that the differencing of data is helpful to achieving stationarity in a non-stationary economic time series.

#### 4.3. Cointegration Test

The Johansen-Juselius multivariate cointegration methodology is used in testing the null hypothesis of  $n$  cointegration against the alternative cointegration at 5 percent level. The outcome of the cointegration test is reported in Table 4.

Series: UNP LOG(AGR) LOG(IND) LOG(SER)				
Trace test				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.633689	75.59832	63.87610	0.0038
At most 1 *	0.505135	43.46159	42.91525	0.0440
At most 2	0.325535	20.95054	25.87211	0.1816
At most 3	0.229618	8.347792	12.51798	0.2246
Max-Eigen test				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.633689	32.13673	32.11832	0.0497
At most 1	0.505135	22.51105	25.82321	0.1290
At most 2	0.325535	12.60274	19.38704	0.3611
At most 3	0.229618	8.347792	12.51798	0.2246

Table 4: Results of Johansen-Juselius cointegration test

Source: Author's estimation from E-views Statistical Package

NB: \* implies rejection of null hypothesis of no cointegration at the 0.05 level

The cointegration test results presented in Table 4 indicate that the variables are cointegrated. Specifically, the trace statistics shows evidence of two cointegrating equations while the Max-Eigen statistics indicates that one cointegration equation exists in the model at 5 percent level. This finding is very welcoming as it suggests that the variables can move together in the long run.

#### 4.4. Cointegrating Regression Model

Following the evidence of cointegration among the underlying series, the parameters of the explanatory variables which capture their long run impact on unemployment are estimated using the Dynamic least Squares (DOLS). cointegrating regression model which depicts the long run behavior of the regressors is estimated using Dynamic Least Squares (DOLS) and the result is reported in Table 5.

Dependent Variable: UNP				
Method: Dynamic Least Squares (DOLS)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(AGR)	16.63455*	5.308932	3.133314	0.0086
LOG(IND)	-11.40352**	5.273940	-2.162240	0.0515
LOG(SER)	-4.945552	4.959760	-0.997135	0.3384
C	17.68766**	6.267547	2.822102	0.0154
R-squared	0.940465	Mean dependent var		9.835484
Adjusted R-squared	0.851163	S.D. dependent var		6.262723
S.E. of regression	2.416119	Sum squared resid		70.05159
Durbin-Watson stat	1.802617	Long-run variance		5.881225

Table 5: Summary of cointegrating regression result

Source: Author's estimation from E-views Statistical Package

NB: \* and \*\* respectively denote significant at 1 percent and 5 percent levels

It was observed from the result in Table 5 that the coefficient of industrial sector output is consistent with the a priori and statistical expectations as it is negatively signed and statistically significant at 5 percent. This shows that industrial sector growth is helpful in reducing the unemployment rate in Nigeria. A percentage increase in industrial output contracts unemployment rate by 11.4 percent. The finding supports the finding of Ewubare and Obayori (2015) that increase in index of industrial productivity contracts unemployment rate in Nigeria. More so, this finding suggests that opportunities are increasing shifting to industrial activities in Nigeria. Additionally, service sector output exerts a negative, but insignificant influence on unemployment rate during the period of study. This is suggestive that opportunities that are associated with increase in service sector output seem inadequate to reduce the state of joblessness in Nigeria. However, the result shows that the growth of agricultural sector output increases unemployment problem given its coefficient is positive and highly significant at 1 percent level. As observed from the coefficient, a percentage increase in agricultural output is associated with 16.6 percent increase in unemployment. This finding conflicts with the theoretical expectation which assumes that growth in agricultural output is expected to provide opportunities that boost job creation in the long run. This finding also disagrees with the findings of Ayinde (2008) which indicates that growth in agricultural output is helpful in

contracting the unemployment rate in Nigeria. The coefficient of determination (0.940) indicates that 94 percent of the total variations in unemployment are due to changes in agricultural, industrial and service sectors output. This is an indication that the model is in actual fact a good fit. The Durbin-Watson test result for serial correlation shows that after all autocorrelation is not a problem in the model, thus validating the reliability of the cointegrating regression model for long term prediction. Aside authenticating the reliability of the estimated model, the computed Durbin-Watson statistics attests to the robustness of the DOLS in correcting for serial correlation.

**4.4.1. Wald Test for Coefficient Restrictions**

The joint statistical significance of the coefficients of the explanatory variables are examined using Wald test and F-statistics form basis for decision taken. The result is reported in Table 6.

Test Statistic	Value	df	Probability
F-statistic	5.435079	(3, 12)	0.0136
Chi-square	16.30524	3	0.0010
Null Hypothesis: C(1)=C(2)=C(3)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)	Value	Std. Err.	
C(1)	16.63455	5.308932	
C(2)	-11.40352	5.273940	
C(3)	-4.945552	4.959760	

Table 6: Wald test result

Source: Author’s estimation from E-views Statistical Package

The Wald test result reported in Table 6 shows that coefficients of the regressors are significantly different from zero at 5 percent level. This is because the probability value (0.0136) of the computed F-statistic (5.435). Thus, despite the statistical insignificant of some of the variables, especially service sector output, they are jointly significant in explaining changes in unemployment rate. This finding demonstrates that collectively agricultural, industrial and service sectors outputs have predictive power for unemployment in Nigeria.

**4.4.2. Normality Test**

The normal distribution of the errors in the estimated cointegrating regression model is examined at 5 percent level using Jarque-Bera statistics and the result is showed in Figure 5.

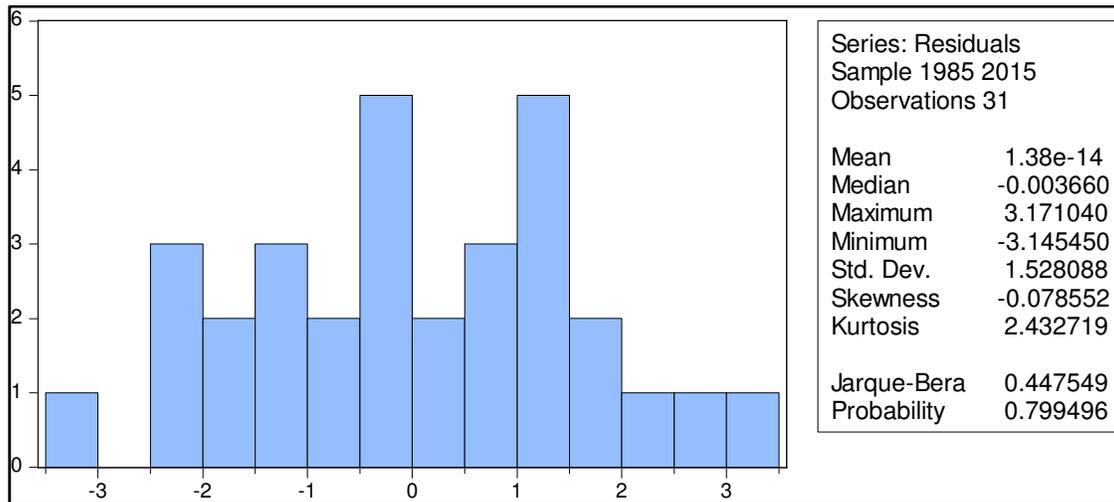


Figure 3: Normal test result

Source: Author’s estimation from E-views Statistical Package

The result of the normality test depicted in Figure 5 shows that the errors in the cointegrating regression model are normally distributed at 5 percent level given that the probability value (0.7994) of the Jarque Bera statistic (0.4475) are more than 0.05. Hence, the null hypothesis that errors are normally distributed cannot be rejected.

**4.5. Forecast of Unemployment Model**

The outcome of the forecast for unemployment at the beginning of 1981 to the end of 2016 at plus and minus 2 standard error band is reported in Figure 6 below:

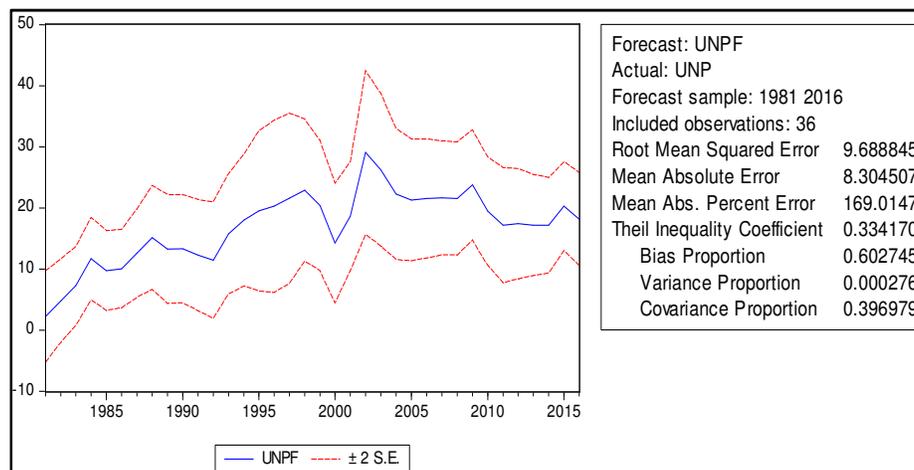


Figure 4: Result of unemployment forecast  
Source: Author's estimation from E-views Statistical Package

Figure 4 reports the forecast of unemployment with the exogenous variables over the sample period 1981-2016. It was uncovered from the result that the trend is tracked reasonably well as no point is located outside the critical point. This suggests amongst others that after all model is well performed and stable as the actual values are completely located within the forecast interval during the sample period.

## 5. Conclusion Remarks and Recommendations

### 5.1. Conclusions Remarks

The importance of the real sector in any economy is mostly mirrored through its role in employment generation or reducing national unemployment as well as distribution of unemployment between urban and rural areas amongst others. Thus, this paper focused on the sensitivity of employment to real sector output in Nigeria. The findings indicate that the industrial and service sectors outputs are negatively related to the unemployment while agricultural sector output has a positive relationship with unemployment rate. This finding demonstrates that there exist structural changes in sectoral employment in the Nigerian economy with the industrial and service sectors playing leading roles in contracting the unemployment rate. Thus, labour resources tend to be reallocated from the agricultural to the industrial and service sectors of the economy. The significant positive impact of agricultural output on unemployment suggests that growth in agricultural sector output seems to produce a jobless growth in Nigeria. This is a pointer that policy interventions need to be directed towards agricultural development to tackle the unemployment problem in Nigeria. Based on the findings, this paper concludes that agricultural sector has lagged behind in the employment elasticity of output in Nigeria as the industrial and service sectors are increasingly taking the center stage by providing opportunities for inclusive growth in through reduction in unemployment in Nigeria.

### 5.2. Recommendations

1. Policy actions for growth and sustainability of industrial output should be put in place, properly executed and continuously monitored with a view to enhancing the employment elasticity of output in the industrial sector.
2. Government should exploit the opportunities in the service sector, especially boom in the Mobile communications and the home-grown film industry in order to reduce unemployment in Nigeria.
3. Government and other key stakeholders should demonstrate resolute commitment to the development of agricultural sector through sustained massive support for agricultural research and enhanced value chain through effective support for agribusinesses in order to contract unemployment in Nigeria.
4. Specific labour-market interventions at federal and sub-national levels and innovative public works initiative including the current N-Power programme of the present Nigerian government should be targeted towards the highly vulnerable and unemployed people.

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