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Estimating the Impact of Sectoral Output on Employment for Nigeria Economy (1981-2021)

Ololade J. OLANIYAN [a*]

[a] *Afe Babalola University, Business School, Ibadan, Nigeria.*

Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

The purpose of this research is to determine the employment effects of contributions to GDP by the main sectors in the context of Nigeria and to understand the relative importance of each sector. This study investigates the contributions of the three broad sectors of the economy to total employment over the period 1981 to 2021 using the autoregressive distributed lag (ARDL) technique. Sectoral output was proxied by agricultural GDP, industry GDP and services GDP respectively while employment was measured by total number of employed persons. The Bounds test signaled the existence of cointegrating relationships between the series at both aggregated and disaggregated levels, necessitating both short and long run analysis for the study.

The best performing sector in terms of employment intensity is the agricultural sector suggesting its labour-intensive nature. The impact of growth in industrial sector on employment appears to be a case of jobless growth while the impact of increases in service sector GDP on employment appears to be more like the case of job-loss growth. The agricultural sector supports growth-led employment for Nigeria while the service sector negates it. The service and industry sectors have low labour absorption capacity as the former is technology-driven while the latter is capital-intensive.

**Corresponding author: E-mail: loladeolaniyan2@gmail.com;*

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The government should as a matter of urgency improve on its provision of finance and other support services to the agricultural sector. It is also necessary to devise verifiable methods to attract the teeming young population to actively participate in the agricultural sector with a view to developing its value chain. A growing service sector and a shrinking agricultural sector can only at best perpetuate the already challenging unemployment situation in Nigeria. The government should conduct an audit of the country's agricultural sector for an in-depth understanding of the needs and then prioritise these needs in public expenditure allocations while ensuring that targeted funds get to those who are active farmers.

Keywords: Sectoral GDP; employment; Autoregressive Distributed Lag (ARDL); jobless growth; job-loss growth; labour absorption capacity; sensitivity analyses.

1. INTRODUCTION

Two of the core macroeconomic goals pursued by and for any economy are increases in GDP output called economic growth and low unemployment. Unemployment is a cardinal issue that is quite challenging and worrisome, especially considering the population structure of Nigeria which is predominantly youthful. Ideally, there should be a direct relationship between total output increases of a sector and the magnitude of employment opportunities that is generated from such sector. That is, overall GDP should positively influence the quantity of total employment. The most valuable resource any country possess are its people and Nigeria is incredibly blessed with an enormous population of about 224,588,394(2023 UN est.), but whether this supposed demographic advantage is leveraged remains to be seen.

The current economic realities have exacerbated the precariousness of employment in Nigeria and resulted in mass emigration of citizens in search of greener pasture in developed countries, some of which face the challenge of ageing population. The continual loss of the working age population is not unconnected with the harsh economic predicament that has weakened the wellbeing of many Nigerians. It is a two-dimensional loss because - these emigrants were mostly trained in Nigeria but other countries seem to be reaping the benefit of what they could have contributed in value addition to the national output of Nigeria. For some less privileged citizens, labour is the only asset that they have to profit from; and when this becomes impossible, it is a challenge to the shared prosperity and sustainable growth of any nation. Unemployment is undesirable because it means labour loses the opportunity to earn wages which is the reward for that factor input. The government loses revenue that could have been generated from taxes if the unemployed were engaged. Such incidences make the economy grapple with idle and unutilized resources – causing inefficiencies and losing production as a result. There are costs associated with unemployment, including but not limited to: economic, social and psychological costs.

Unemployment issues in the nations of the world are not new; although every country has peculiarities as to the nature, causes and effects of unemployment. For instance, some countries have social safety nets like unemployment benefit or job seekers allowance while in other countries; the unemployed do not have such privileges. Nigeria happens to be one of such developing nations, where there are no such systems to support the unemployed, suggesting that the unpleasant effects on the victims may be particularly noticeable.

This paper is concerned with investigating to know the sectors of the economy that are pro-employment and those that are not. Unemployment leads to reduced total output and aggregate income as it represents goods and services that could have been produced; amounts to waste of investment and erodes human capital while it increases inequality between the employed and unemployed.

For the period under review (1981-2021), the average values for total output (GDP), agricultural output, industry output and service sector output are ₦38,124.89b, ₦8,473.149b, ₦12,216.62b and ₦17,020.71b respectively. Therefore, on average, the service sector has contributed the most, closely followed by the industry sector while the agricultural sector contributed the least. On average, between 1981 and 2021, the proportion of the overall GDP that is accounted for by each of the broad sectors shows that agriculture has about 20.44%, industry with around 38.12% and services returned 40.38% of GDP respectively. However, between 1981 and 2000, the average values for

each sector were slightly different with agriculture having 16.6%, industry 48.87% and services 33.5%. In the pre-2000 era, the industry sector contribution to GDP was markedly higher than its overall average of 38.12% earlier computed. Both the agriculture and services sector average contribution to GDP increased in the post-2000 period. Between 2001 and 2021, agriculture contributed 24.1%, while industry contribution declined by more than 20% than the previous and service GDP rose to 46.9%. The average number of employed persons between 1981 and 2021 is about 44million.

It has been established in theory that, to sustain any economy, the increases in national output are a critical factor that is required for generation of employment. However, there is a body of evidence that suggests a weak relation between output growth and employment generation in developing countries, described as 'jobless growth' [1] (Yaruz, 2009; Adawo et al. [2], Oloni, [3]. Generally, it has been found that growth-led employment has underperformed following investigations on the link between growth and productive employment.

Several country-specific studies examined the relationship between economic growth and employment, mostly at aggregate level, including among others Ogunrinola & Sodipe [4], Swane & Vistrand, 2006; Oloni, [3] and Adawo et al. [5]. A few other country-based studies have investigated the impact of sectoral output growth on employment like Ajilore & Yinusa [6] and Mkhize [7]; while Kapsos [8] and Yaruz (2009) focused on cross country analysis. Mkhize [7] sought to identify the key growth sectors of the South African economy that are employment intensive, while Asaleye et al. (2023) investigated the impact of selected macroeconomic variables on agricultural employment and output in Nigeria. Aminu & Raifu [9] assessed the contribution of the Nigerian ICT sector to the Nigerian economy following reforms in the sector. Obisike et al. [10] in their sectoral study on Nigeria only focused on a short run analysis and did not consider the inclusion of other relevant variables in their model capable of influencing the outcome variable. Adu et al. [11] in a seminal study found an inverse and elastic relationship between industrial output and unemployment in Nigeria, suggesting unemployment is sensitive to changes in industrial output.

After conducting a review of related studies, a study that depicts how employment responds to sectoral output growth in order to know each sector's capacity in absorbing labour is necessary. The identified gap, specifically, is that none of the studies reviewed, investigated the contribution of these broad sectors' output (agriculture, industry and services) to overall employment generation. Although Ajilore and Yinusa [6] conducted a sector specific analysis, but it was for Botswana, not Nigeria. The aggregate studies that have been done on Nigeria mostly concluded on jobless growth as the main finding. It is pertinent to know which of these broad sectors' contributions to national output are deficient of opportunities. Growth and employment are by definition long term in nature. Most studies reviewed on Nigeria; the country of interest only stopped at short run analysis (i.e. Obisike et. al [10]). Even though Adu et al. [11] conducted a viable long run analysis but only considered the industrial sector as a predictor for unemployment. Carrying out a long-term analysis is needed because the phenomenon in question has long term implications for the economy. The temporal scope of the previous studies is mostly dated and do not reflect current realities. To the best of my knowledge, a study that depicts the responsiveness of employment to changes in sectoral output of the three broad sectors on Nigeria remains to be seen.

This study is an attempt to provide answers to the following questions: one, what is the relationship between agricultural output and employment? Two, what is the relationship between service sector output and employment? Three, what is the relationship between industry sector output and employment? Four, what is the contribution of total output to employment? Five, what is the role of government policies (fiscal and monetary) in the growth-employment nexus?

The broad objective is to examine the nexus between sectoral output and employment in Nigeria. Specifically, the objectives are to: examine the effect of agricultural output on employment, analyse the effect of service sector output on employment, investigate the effect of industrial output on employment, examine the contribution of total output on employment and assess the role of policy in the growth-employment relationship. This research is significant in the field of economics because it exemplifies important information on the labour market and the structure of the Nigerian economy. More importantly, the study sheds light on the activity of the main sectors and their role in employment generation. Finding the

employment effects of total output and sec toral shares in GDP, especially in the context of Nigeria is useful for the purpose of policymaking in the face of towering youth unemployment. The study's spatial scope is Nigeria while the temporal scope is over the period 1981- 2021.

Conceptually, employment is the state of being productively engaged in exchange for rewards either as an employee or as self-employed. The more productively engaged people there are in a country, the less the potential output loss attributable to unemployment. Unemployment results in loss of output that could have improved the total output of a country. Employment and unemployment can be used interchangeably since the employed persons (those productively engaged) and the unemployed persons (those unengaged but actively seeking work) make up the labour force. The employment and unemployment rates respectively are proportions of the labour force. Each of the concepts can be deduced from the other. In the context of this study, the dimension of employment that is focused on is the 'total employment' from both private and public sector. Campbell & Ahmed [1] came up with the notion of growth-led employment and employment-led growth in a study on labour market in developing countries where either growth or employment was regarded as either the lead or lag variable as the case may be.

In theory, employment is expected to increase in periods of increased effective demand and economic expansion according to the Keynesian theory of employment. The theory linked expansion of the aggregate demand to growth that induces employment in an economy. Where effective demand refers to the money spent on consumption and investment and is the same with total expenditure, national income or output. Keynes believed that level of employment depends on the national output and that the relationship between the two variables is direct. Exceptions to this expected norm is very possible, for instance, jobless growth occurs when increases in GDP neither support job creation nor is employment generation sensitive to growth. While job-loss growth typifies increases in GDP marred by cost-cutting and belt-tightening approaches that lead to retrenchment and/or job losses.

On the other hand, Arthur Okun developed the Okun's law which documented the empirical relationship between changes in output and unemployment. The law states that a country's gross domestic product (GD) must grow at a particular rate in order to achieve a specific percentage reduction in unemployment. An economy growing at 3% can achieve a 1% reduction in unemployment rate; this may vary by economy, however.

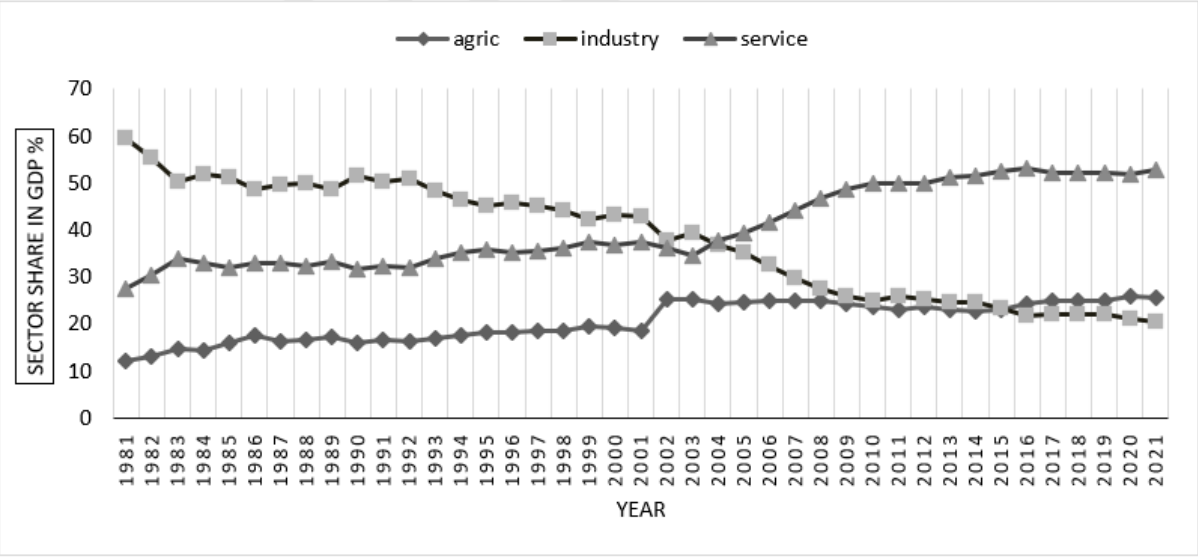

Fig. 1. The average values for total output (GDP), agricultural output, industry output and service sector

(Source: CBN Statistical Bulletin 2022)

Empirically, a number of studies have examined the nexus between changes in GDP and employment in different contexts and from varying dimensions. Aminu and Raifu [9] finds that the ICT sector has a high output multiplier and even a higher employment multiplier which leads to a larger share in overall employment using the Leontief input-output analysis which is, though, more applicable when the economy is in equilibrium state and operating at full capacity. The assumptions are not very realistic as Nigeria's economy faces some structural imbalances and market inefficiencies. Mkhize [7] employed the use of OLS on a study of South Africa on sectoral employment intensity of growth found the best performing sectors in terms of employment generation to be in the services sector. The study only focused on the non-agric sectors and this may not provide a complete picture.

Oloni [3] in an aggregate study on Nigeria using Johansen cointegration technique reveals output increases exerts an insignificant though positive influence on employment, public expenditure has a positive impact on employment while foreign private investment negatively impacts it. The study however did not examine the nexus between sectoral output contribution and employment. Ainomugisha et al [12] studied the employment-growth relationship within the context of East African countries over the period 2000-2018 using a panel ARDL technique and found a positive though weak relationship between growth and employment and found education, inflation and foreign direct investment as some of the factors that exert an influence on the employment-growth nexus.

A study on Botswana by Ajilore & Yinusa [6] on employment intensity of sectoral growth and found the country has a low labour absorptive capacity at both aggregate and sectoral levels. They suggest that output performance appear to be more labour-productivity driven than labour-employment driven. Adeniyi [13] focused on just the mining and quarrying sectors using data spanning from (1981-2014) while employing the VECM approach and found the sector's contribution to employment remained very low at about 0.2%. Obisike et. al. [10] found that the manufacturing sector outputs exerted downward pressure on urban unemployment in the short run while agriculture, oil and services exerted an upward pressure on urban employment rate. The study also found that as GDP increases, unemployment also increases. Although it is only a short run analysis that did not consider the long run effect.

Adu et al. [11] found unemployment to be quite sensitive to changes in output in the industrial sector in Nigeria. The study used ARDL technique and was restricted to only the industrial sector neglecting all other sectors. Das [14] used data spanning 1973-2018 to study the relationship between sectoral composition of output and employment in India and found that output elasticity of employment does not improve employment growth like that of income GDP. Das [14] coined the term job-loss growth which mean loss of jobs co-existing with economic growth indicating a leading challenge to meeting the SDGs. Prakash [15] tried to explain why output rises faster than employment in the service sector in India, he attributed this to the fact that the modern service sector is more capital intensive relative to labour. The structural change in the economy that sees speedy expansion in the services sector (service-led growth or de-industrialisation according to Gupta and Gordon 2004) were found to have negative effect on employment therefore widening the gap between output and employment.

2. DATA AND METHODS

The theoretical underpinning for this study is the Okun's law, which characterizes the relations between output and unemployment (and its corollary employment by implication) following the contributions of Okun (1970). Authur Okun empirically quantified the relationship between an economy's total output and the rate of unemployment and suggested an indirect relationship subsists. The total output is typically measured by the Gross Domestic Product (GDP). As already put forward earlier, employment and unemployment are literally two sides of a coin. The two concepts can therefore be used interchangeably. The central idea of Okun's law is that, as an economy's output increases, unemployment declines because more jobs are being created. On the other hand, in periods of economic contractions, a contrary outcome to previous case will suffice. With a robust economy, production expands, investment rises and more workers are hired while this should drive down the unemployment rate.

The typical Okun's law can be represented in a functional relationship as:

$$UNEMP = f(GDP) \quad (1)$$

Where UNEMP is unemployment rate and GDP is total output. This can be further expressed in terms of changes in these variables

$$\Delta UNEMP = \beta_0 + \beta_1 \Delta GDP \quad (2)$$

β_1 is the Okun's coefficient indicating an inverse relationship between GDP growth and the unemployment rate. The size of this coefficient quantifies how much of impact a given change in GDP has on the unemployment rate. This theory is modified for this study with employment as dependent variable in place of unemployment rate.

2.1 Model Specification

Equation 3 and 4 captures the functional relationship between employment and the aggregate and sectoral output respectively.

$$EMP = f(GDP) \quad (3)$$

where EMP refers to total employment (number of employed persons) and GDP is the total output i.e., Gross Domestic Product. In order to capture the sectoral shares of the three main sectors in the Nigerian economy, the aggregate GDP can further be disaggregated into agricultural output, industry sector output and service sector output as shown in equation.

$$EMP = f(AGRGDP, INDGDP, SERVGDP) \quad (4)$$

This is an empirical work that employs the broad classification of GDP and shares of GDP attributed to Agriculture, Industry and Services as the independent variables and employment(measured by number of employed person) as dependent variable. This is necessary to perform a sensitivity analysis of the sectoral GDPs on employment. The variables included for control in both the aggregate and sectoral analysis are public expenditure(PE) and inflation(INF) as reflected in equation 5. The number of employment persons in the previous year is also believed to be a significant predictor of current employment.

$$\Delta EMP_t = \beta_0 + \beta_1 \Delta EMP_{t-1} + \beta_2 \Delta GDP_t + \beta_3 \Delta INF_t + \beta_4 \Delta PE_t \quad (5)$$

$$\Delta EMP_t = \beta_0 + \beta_1 \Delta EMP_{t-1} + \beta_2 \Delta AGRGDP_t + \beta_3 \Delta INDGDP_t + \beta_4 \Delta SERVGDP_t + \beta_5 \Delta INF_t + \beta_6 \Delta PE_t \quad (6)$$

The estimation technique that is appropriate given the stationarity status of the series is the autoregressive distributed lag(ARDL) model because it allows the combination of series integrated of order one and zero. In the ARDL framework, the dependent variable is a function of its lagged value and the current and lagged values of the independent variable. To perform bounds test for cointegration, the optimal lag for each of the variable is determined by the appropriate test. The error correction model to be estimated since cointegration is established are:

$$\Delta EMP_t = \beta_0 + \beta_{1i} \Delta EMP_{t-i} + \sum_{i=1}^{q} \beta_{2i} \Delta GDP_{t-i} + \sum_{i=1}^{q} \beta_{3i} \Delta INF_{t-i} + \sum_{i=1}^{q} \beta_{4i} \Delta PE_{t-i} + \gamma ECT_{t-i} + e_t \quad (7)$$

$$\Delta EMP_t = \beta_0 + \beta_{1i} \Delta EMP_{t-i} + \sum_{i=1}^{q} \beta_{2i} \Delta AGRGDP_{t-i} + \sum_{i=1}^{q} \beta_{3i} \Delta INDGDP_{t-i} + \sum_{i=1}^{q} \beta_{4i} \Delta SERVGDP_{t-i} + \sum_{i=1}^{q} \beta_{5i} \Delta INF_{t-i} + \sum_{i=1}^{q} \beta_{6i} \Delta PE_{t-i} + \gamma ECT_{t-i} + e_t \quad (8)$$

The error correction term component (ECT) captures the long run representation in the model where γ is the speed of adjustment parameter (must be with a negative sign to indicate model convergence) that tells how fast the errors in the previous period is corrected in the current period.

The a priori expectations according to theory shows that coefficient of real GDP is expected to be positive since increases in the overall output of any nation should ideally result in more people being employed. When disaggregated into sector GDPs, the same positive sign is still expected from the respective coefficients of each sector GDP. Also, the coefficients of the additional explanatory variables – inflation and public expenditure are expected to be positive.

Parameter: Equation 7	A priori Expectation	Parameter: Equation 8	A priori Expection
β_{1i}	+	β_{1i}	+
β_{2i}	+	β_{2i}	+
β_{3i}	+	β_{3i}	+
β_{4i}	+	β_{4i}	+
		β_{5i}	+
		β_{6i}	+

2.2 Data Sources

The data on GDP, sectoral GDP and public expenditure were sourced from the 2022 CBN Statistical Bulletin, while the data on employment was sourced from the latest edition of the Penn World Tables. The sectoral GDP was broadly categorized into three - agriculture, industry and services. The agriculture GDP is an amalgam of output from crop production, livestock, forestry and fishing. While that of industry GDP comprises mining, quarrying, manufacturing, electricity, water supply, sewage and construction. Services GDP on the other hand comprises activities in the tertiary sector including trade, hoteling, food services, transportation, finance & insurance, arts & entertainment, real estate, education and public administration. The data on employment ends in 2019, the values for 2020 and 2021 were generated using simple moving average process.

3. RESULTS AND DISCUSSION

All variables are log transformed before performing stationarity tests. The stationarity status for each of the series are summarized in the Table 1. The GDP and public expenditure variables are adjusted for inflation and hence are real values.

From Table 1, three (employment, industry GDP and inflation) of the seven series were found to be integrated of order zero, that is, stationary at levels. While the remaining four series became stationary after first-differencing. The realization of the unit root status of the series authenticates the earlier stated preferred technique of estimation – autoregressive distributed lag (ARDL) which allows estimation with a combination of series integrated of both order zero and one.

The test was conducted using Pesaran et. al. [16] Bounds test. From Table 2, the decision rule is that the F-test be compared with the upper bound of the I(1) critical values. The F-test must be greater than the critical values for all the I(1) variables. In the model containing the GDP aggregates, we can reject the null of no cointegration at 5% and 10% suggesting a short run ARDL and error correction model (ECM) can both be estimated.

From Table 3, when the Bounds test is applied to the model that captures sectoral output, we reject the null of no cointegration at all levels of significance for both the F and t-tests making it appropriate to proceed for both short and long run analysis [17,18].

Table 1. Stationarity Tests for all Series

Variable	Test at Levels	Test at First Difference	(Order of Integration)
EMP	-3.774(0.0179)*		I(0)
GDP	-1.696 (0.7526)	-3.987(0.0015)*	I(1)
AGRGDP	-1.571(0.8037)	-6.012(0.000)**	I(1)
INDGDP	-4.041(0.007)*		I(0)
SERVGDP	-2.181(0.5005)	-3.207(0.019)*	I(1)
INF	-4.113(0.001)**		I(0)
PE	-2.852(0.1785)	-7.948(0.000)**	I(1)

*Source: Author's computation from Stata 13. (** and * - significance at 1% and 5%)*

Table 2. Result of Bounds Test (when GDP is aggregated) (Optimal lags determined by AIC)

Test	10% I(0)	I(1)	5% I(0)	I(1)	1% I(0)	I(0)
F	2.880	4.114	3.527	4.933	5.076	6.877
Overall P-value	I(0) – 0.008	I(1) – 0.038	F-value:	5.253		

*Source: Author's computation from Stata 13. (** and * - significance at 1% and 5%)*

Table 3. Result of Bounds Test (when GDP is disaggregated) (Optimal lags determined by AIC)

Test	10% I(0)	I(1)	5% I(0)	I(1)	1% I(0)	I(0)
F	2.468	3.822	2.995	4.541	4.273	6.272
P-value	I(0): 0.001	I(1): 0.006	F value:	6.898		

*Source: Author's computation from Stata 13. (** and * - significance at 1% and 5%)*

Table 4. Short Run ARDL Estimates (with aggregated GDP) Dependent Variable: EMP

Variable	Coefficient	t-Statistic	Prob. Value
EMP(-1)	0.9144**	12.18	0.000
GDP	0.2671*	2.63	0.014
GDP(-1)	-0.1865	-1.59	0.122
INF	0.0261*	2.88	0.007
INF(-1)	-0.1178*	-2.08	0.046
INF(-2)	0.0203*	2.82	0.009
PE	0.05*	2.84	0.008
PE(-1)	-0.0263	-1.29	0.208
PE(-2)	-0.0273	-1.38	0.178
Cons	-0.5565*	-3.01	0.005

*Source: Author's computation from Stata 13. (** and * - significance at 1% and 5%)*

The estimates in Table 4 are short run elasticities. In the short run, a direct relationship exist between total employment and total output(GDP) as documented in Table 4. The two variables move in the same direction, as a 1% rise in total output (GDP) translates to only 0.27% increase in employment and estimates is significant at 5%. Hence, employment has an inelastic response to changes in output in the short term. Also, a 1% increase in previous level of employment causes an 0.91% increase in current employment at 1% level of significance. Past employment (in the previous year) is a reliable predictor of the current employment.

The control variables – inflation and public expenditure both returned significant estimates at 5% levels of significance. Current inflation exerts a direct though very weak influence on employment in line with theory as dictated by the Phillips curve. A 1% increase in inflation results in an 0.03% rise employment. While a per cent rise in current public expenditure results in an equally weak 0.05% increase in employment.

The long run estimates from the Error Correction Model (ECM) with aggregate GDP shows that the adjustment parameter(ɣ) is significant and has the expected negative sign. The speed of adjustment to restore equilibrium is at about 20% correction per annum. A 1% increase in GDP results in an 0.53% increase in employment in the long run. While inflation exerts a positive but insignificant influence on employment in the long run. A 1% increase in public expenditure causes a significant 0.20% increase in employment.

Table 5. Long Run ARDL Estimates(with aggregated GDP) Dependent Variable: EMP

Variable	Coefficient	t-Statistic	Prob. Value
ɣ(adj. para)	-0.1976*	2.82	0.008
GDP	0.5303**	7.25	0.00
INF	0.023	0.73	0.47
PE	0.198*	2.61	0.013

*Source: Author's computation from Stata 13. (** and * - significance at 1% and 5%)*

Table 6. Short Run ARDL Estimates (with disaggregated GDP)Dependent Variable: EMP

Variable	Coefficient	t-Statistic	Prob. Value
EMP(-1)	0.5971**	6.96	0.000
AGRGDP	0.1536*	2.73	0.011
AGRGDP(-1)	-0.1015	-1.43	0.165
AGRGDP(-2)	0.1587*	2.16	0.04
INDGDP	-0.024	-0.42	0.681
SERVGDP	-0.251	-1.57	0.128
SERVGDP(-1	-0.230	-0.13	0.897
SERVGDP(-2	0.245*	2.29	0.031
INF	0.011	1.68	0.105
INF(-1)	-0.0142	-1.96	0.061
INF(-2)	0.0165*	2.56	0.017
PE	0.051**	3.26	0.003

*Source: Author's computation from Stata 13. (** and * - significance at 1% and 5%)*

Table 7. Long Run ARDL Estimates(with disaggregated GDP) Dependent Variable: EMP

Variable	Coefficient	t-Statistic	Prob. Value
∱(adj para)	-0.4028**	-4.70	0.000
AGRGDP	0.5232**	3.48	0.002
INDGDP	-0.061	-0.42	0.676
SERVGDP	-0.0728	-0.53	0.602
INF	0.0337	1.55	0.132
PE	0.1263**	3.74	0.001

*Source: Author's computation from Stata 13. (** and * - significance at 1% and 5%)*

Table 8. Diagnostic Tests

Model	Durbin Watson	Breusch-Godfrey	White Test
Model (agg)	2.2879	0.1746	0.4246
Model (disagg)	2.0875	0.4303	0.4246
PE	0.1263**	3.74	0.001

Source: Author's computation from Stata 13.

Table 6 shows the estimates of the short run model with disaggregated GDP. A 1% increase in past employment leads to a significant 0.60% increase in employment in the current period. Also, a 1% in agricultural GDP culminates in a significant increase of 0.15% in employment. While a commensurate 1% increase in industry and service GDP leads to a insignificant decrease of 0.02% and 0.25% respectively. The control variables – inflation and public expenditure both returned comparable estimates that shows direct relationship as with the model with aggregate GDP. Although, public expenditure's estimate of 0.05 is significant at 1%, but the estimate for inflation of 0.01 is insignificant.

In the model with disaggregated GDP, the long run estimates show that the adjustment parameter is negatively signed as expected and equally significant at all levels. The speed of adjustment to restore equilibrium is at about 40% correction per year. The coefficient on agricultural GDP shows that a 1% rise leads to a significant 0.52% rise in employment. A 1% increase in industry and service GDP leads to an 0.06% and 0.07% fall in employment. Industry and service GDP returned estimates consistent with the short run estimates in terms of direction with an inverse though insignificant relationship with employment. Changes in inflation and public expenditure both exerted positive influence on employment in the long run, but only public expenditure is significant with 0.13%.

3.1 Post-estimation Tests

The relevant diagnostic tests (see Table 8) were conducted after estimation to ascertain the reliability and validity of the estimates generated. The Durbin Watson and Breusch-Godfrey tests both shows there is no serial correlation in all the models estimated. The White's test also did not detect heteroscedasticity, skewness or kurtosis. The CUSUM tests also confirms the stability of the estimated models as shown in the graphs in Figs. A1 and A2 in the appendix.

4. DISCUSSION

This is an aggregate and disaggregated study of the nexus between changes in total and sectoral outputs and employment for Nigeria using annual data from 1981 and 2021. Inflation and public expenditure were introduced in the analysis as additional explanatory variables as suggested by the Keynesian theory and Phillips curve. The results generated in this study are particularly interesting because it sheds more light on the challenging phenomenon of unemployment in Nigeria.

The study finds that when the impact of changes in aggregate GDP on employment is considered, the long run effect doubles the short run influence in terms of employment intensity of the GDP increase. In the two cases, employment increases as GDP increases but not by as much as the increase in the impulse variable. This finding is at variance with Oloni [3] who found economic growth to have an insignificant positive effect on employment and Ndubueze (2021) who opines that GDP growth increases unemployment. The techniques of analysis of these two studies (Johansen cointegration and OLS) have their limitations and Oloni [3] is dated. In the short term, as expected, both inflation and public expenditure exert a positive but weak

influence on employment. The influence of inflation fizzled out in the long term while that of public expenditure was, on the other hand, significantly more pronounced. How long it takes for the dependent variable (employment) to be restored back to equilibrium when the explanatory variables are altered is about 20% correction per year.

However, when the GDP impact is examined in its disaggregated form using sectoral outputs, the results are quite fascinating. This study finds that only increases in agricultural output exert a strong positive effect on employment both in the short and long run. The contribution of the agricultural sector to employment more than tripled in the long run relative to the short run. While industry and services GDP increases were both detrimental to employment, with more harm attributable to the services sector. The finding of this study is in consonance with Prakash [15], which indicate a negative effect of service sector expansion on employment, but at variance with Mkhize [7] that tags the service sector as best performing in terms of employment intensity in the case of South Africa. Inflation displayed a positive but insignificant effect on employment in short and long run, while public expenditure has a direct significant effect on employment both in the short and long term. The influence of public expenditure almost tripled in the long run relative to what occurred in the short run.

5. CONCLUSION

This work carried out an aggregated and disaggregated study of the relationship between total GDP and employment for Nigeria over the period 1981 and 2021 using the autoregressive distributed lag (ARDL) technique as dictated by the stationarity status of the series of interest. The Bounds test signaled the existence of cointegrating relationships between the series at both aggregated and disaggregated levels, necessitating both short and long run analysis for the study.

From the analysis and the inferences drawn from the study, the employment intensity of GDP growth can be attributed to the agricultural sector GDP growth and not the industry or services GDP. The agricultural sector absorbs a lot of labour and is therefore instrumental to the generation of employment in Nigeria. The impact of expansion of the industrial sector on employment appears to be a case of jobless growth in line with Adeniyi [13] who stated that the contribution of the mining and quarrying sector to employment has remained stagnant. Meanwhile, the impact of increases in service sector GDP on employment appears to be more like the case of job-loss growth.

From this analysis, the best performing sector in terms of employment intensity is the agricultural sector suggesting its labour-intensive nature. The agricultural sector supports growth-led employment for Nigeria while the service sector negates it. The service and industry sectors have low labour absorptive capacity as the former is technology-driven while the latter is capital intensive. The tough business terrain in Nigeria can be a contributory factor to the suboptimality of these two sectors in their ability to be employment-creating. One can conclude that whether Nigeria's overall economic growth will be employment-generating or not largely depends on how the agricultural sector is performing, given the country's current stage of development. Succinctly put, employment generation in Nigeria is agricultural GDP growth-led.

6. RECOMMENDATION

The recommendations for policy making emanating from this study are, that:

i. the government should as a matter of urgency improve on its provision of finance and other support services to the agricultural sector. It is clear that one of the solutions to the unemployment challenge in Nigeria is agricultural sector development with a view to developing its value chain.
ii. it is also necessary to devise verifiable methods to attract the teeming young population to actively participate in the agricultural sector Despite the fact that service GDP trumped both agricultural and industry GDP(see Fig. 1) since 2004, this has not translated to creation of more jobs in the services sector as the analysis suggest. A growing service sector and a shrinking agricultural sector can only at best perpetuate the already precarious unemployment situation in Nigeria.
iii. the government should conduct an audit of the country's agricultural sector for an in-depth understanding of the needs and then prioritise these needs in public expenditure allocations and ensure that targeted funds get to those who are active farmers and actually need it.

iv. the challenge of insecurity as it affects the agricultural sector must be surmounted as this will further enable the sector to thrive.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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APPENDIX

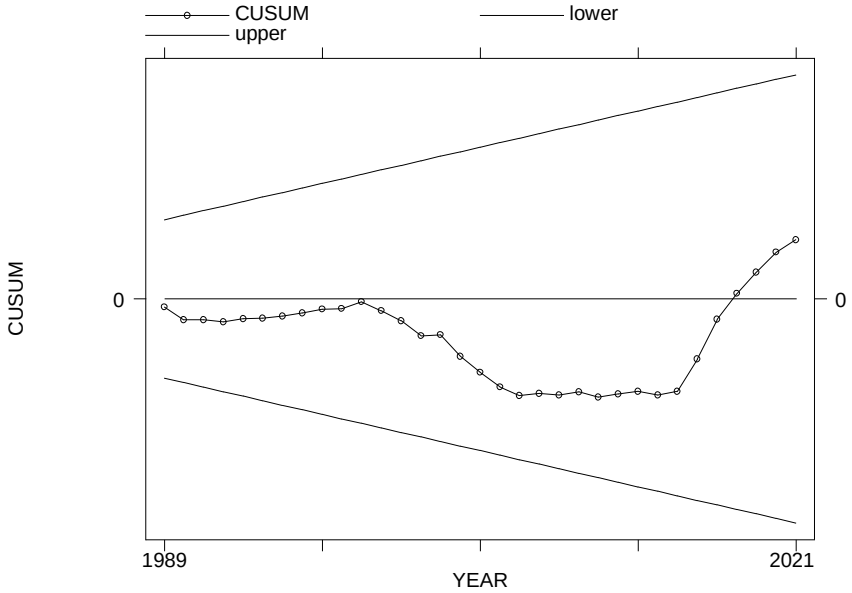

Fig. A1. Stability test for the Disaggregated model

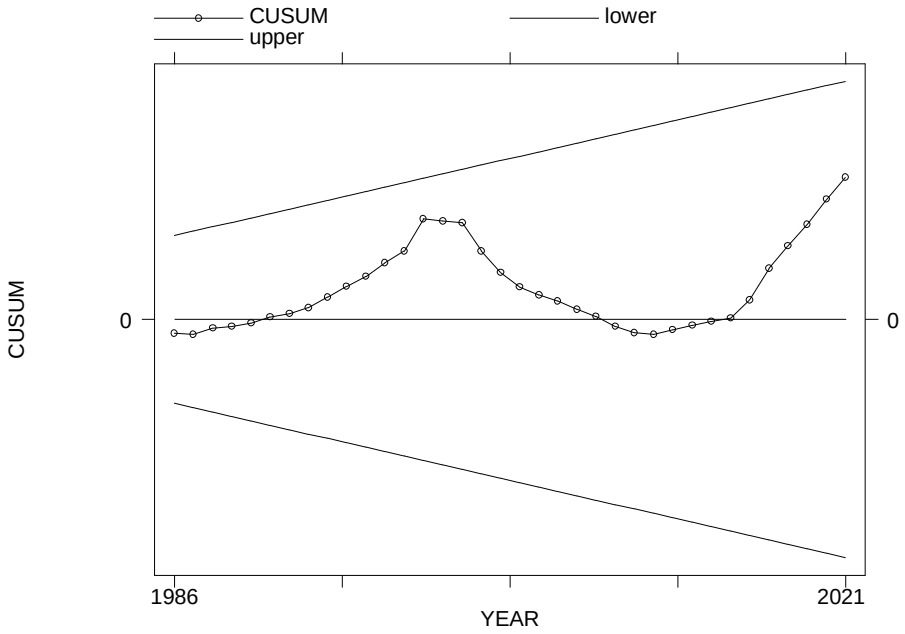

Fig. A2. Stability test for the Aggregated model

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