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## **AN ANALYSIS OF MICRO, SMALL AND MEDIUM SCALE ENTERPRISES AND INCOME GENERATION IN NASARAWA STATE, NIGERIA: A STUDY OF RICE MILLING ENTERPRISES**

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### **Abstract**

*The study examined the contribution of rice milling micro, small and medium scale enterprises to income generation in Nasarawa state Nigeria, using descriptive statistics and generalized linear models. The results revealed that four of the variables start-up capital (SuC), Quantity of Rice Produced (QRP), Quantity of Rice Sold (QRS) and Level of Education (LEDU) had positive impacts on income generation (INC) in the study area. It showed that an increase in SuC led to an increase in income generation by 0.397 per cent. An increase in QRP, QRS and LEDU led to an increase in income generation by 0.773, 0.296 and 0.015 per cent respectively. Expenses (EXPn) and Savings (SAV) had negative impacts on income generation. However, only SuC, QRP, QRS and EXPn had statistically significant impact on income generation. The study concluded that rice milling activities have significantly contributed to income generation in Nasarawa state, Nigeria. The study recommended that government should encourage the unemployed to engage in rice milling activities by making policies and introducing programmes to support rice milling activities. Provision of improved technology at affordable rates with extended repayment timelines or moratorium would encourage local rice millers. This would give locally produced rice an edge to compete in the global market thereby generating more income.*

**Keywords:** Enterprises, Income, employment, Rice, milling

JEL Classification: L26, D31, E24, Q12, Q13

### **INTRODUCTION**

Micro, Small and Medium Enterprises (MSMEs) have played a very important role in creating employment opportunities, and thus are major sources of income for many individuals in many economies. This has improved the overall welfare of these individuals and reduced the level of poverty within these economies. The experiences of various countries reflect the contribution

of MSMEs to economic development, and the models they adopted in boosting and revamping the sub-sector for greater impact in the economy. Such impact is seen in developed economies like the United Kingdom, Germany, the United States of America and developing economies like India, Malaysia, South Africa and Kenya. In the United Kingdom for instance, MSMEs constitute the largest proportion of the entire businesses representing over 95% of all businesses, and employ over 65% of the labour force as well as contribute over 30% of the Gross Domestic Product (GDP).

MSMEs make up more than 90% of the industries in Indonesia, Philippines, Thailand, Hong Kong, Japan, Korea, India and Sri Lanka. They account for 98% of the employment in Indonesia, 78% in Thailand, 81% in Japan and 87% in Bangladesh (Beyene, 2002). According to Ukeje (2003), MSMEs in Mauritius with government efforts reduced unemployment from 21% in 1983 to 1.6% in 1996. This demonstrates that the subsector in Nigeria (a country blessed with enormous human and natural resources) has the potential to generate employment and income for the teeming Nigerian population. One of such opportunities for Nigeria lies in the fact that the environment is conducive for the cultivation of many crops amongst which is rice.

Rice (*Oryzasativa*) is a staple found in the homes of all classes of people within the society and is the second largest consumed cereal in Nigeria after wheat. It provides for more than half the world's population about 80% of its food calorie requirements (Inuwa, Kyiogwom, Maikasuwa, & Ibrahim, 2011). Over the years, the country has depended so much on imports to fill the local supply gap which arose due to the inability of local producers to meet demand. Since the early 1980s, the federal government of Nigeria encouraged importation of rice from the United States and Brazil to meet the short fall in supply, making the county the world's second largest importer of rice. There is a national recognition of the value of rice in Nigeria and government is putting everything in place to increase local rice production in order to make the country self-sufficient. One of the strategies employed by government towards achieving self-sufficiency is the inauguration of Agricultural Transformation Agenda (ATA) under which the Rice Transformation Agenda (RTA) is being pursued. According to the ATA (2013) report, the annual rice demand in Nigeria was estimated at 5.2 million metric tons (MT), of which about 3.3 million MT of milled rice was produced locally, leading to a demand-supply deficit of about 2 million MT that was filled by imports. According to that report, Nigeria spends over NGN356 billion importing rice annually; an average of NGN1 billion every day. Rice importation exports jobs from Nigeria, transfers income and wealth, depresses local production, and is unsustainable given the rising demand for rice in Nigeria, currently put at 6% increase per year (Akinwumi, 2013).

Nigeria has vast amounts of land and favourable rice growing ecologies to produce upland, lowland and irrigated rice, and this has fostered the drive of the government under ATA to replace all the 2.1 million metric tons of milled rice imported annually into the country with locally produced rice. In 2013, the federal government commissioned the largest rice mill in West Africa which was set up by Olam Nigeria Limited, a multi-million dollar integrated mechanised rice milling facility located in Rukubi, Nasarawa State, fitted with the capacity to produce 105,000 metric tonnes of milled rice per annum. The attached rice farm cultivates 4,351 hectares of rice and employs up to 956 workers at the mill depending on the season. This has given the residents of Nasarawa state especially those situated around the rice mill a means of earning income.

Rice grows well in the three senatorial zones of Nasarawa state and most of the rice growing communities in and around the state are supported by Olam with group formation and training programmes in order to encourage Micro, Small and Medium (MSM) rice farmers and millers around the state. This is expected to curb the problems of low productivity, poor quality, and other disincentives to domestic rice production from the continued dumping of rice on the local market. Despite the recognition of the potential of the subsector by the government and the opportunities that are available for the MSME subsector to thrive in the economy, there has been little evidence of growth in the subsector. This is seen as the level of income inequality, unemployment and poverty continues to rise in the country. According to the World Bank (2018) report, the poverty situation in Nigeria has been on the increase; with poverty rates rising from up to 70% in 2017. The World Bank (2014) poverty report showed that Nasarawa state ranked 20 out of the 36 states in Nigeria and National Bureau of Statistics(NBS) (2019) revealed that the poverty headcount rate in the state was 57.3% in 2018 further dropping the ranking to 24.

In the third quarter of 2018, unemployment level in Nigeria was at a high of 25.7 %. and that of Nasarawa state rose from less than 10% to a high of over 38% within the period of 1990 to 2011 (Nyong, 2013). These situations continue to worsen as the dearth of means of income generation increases in the state. It is on these premise that this study is undertaken in order to analyse the contribution of rice mills to income generation in Nasarawa state. Therefore, the study seeks to find out if rice mills has contributed to income generation in Nasarawa state. The following hypothesis is formulated for the purpose of testing:

**H<sub>0</sub>:** Rice milling activities have not significantly impacted on income generation in Nasarawa State.

The study is organised into five sections, section one is the introduction and section two reviews literature related to the study. Section three explains the methodology while section

four captures the discussion of analysis and result. The last section of the work concludes the paper and presents policy recommendation as drawn from the study.

## **LITERATURE REVIEW**

### **The Concept of Entrepreneurship**

Entrepreneurship is concerned with wealth creation through the creation of value rather than its manipulation, It involves the destruction of existing market structures by the creation of new markets through the improvement of existing products or the development of entirely new products. Ogundele (2007) viewed entrepreneurship as a process involving recognizing opportunities in life and change simultaneously. He considered entrepreneurship as a process through which individuals identify opportunities, allocate resources and create value. It is more than simply starting a business. The creation of value is often through the identification of opportunities for change. Entrepreneurship as defined by Anga & Abimiku (2021) is a courageous action undertaken by an individual to utilize resources such as land, capital, labour, and his own ability to provide a product or a service. The entrepreneur does this with the sole aim of meeting a particular need of the society and thereby creating jobs. This impacts families of the employees and also generates profit as a reward for the entrepreneur. In order for the process of entrepreneurship to be complete and successful, value has to be created in terms of economic goods for growth and development.

### **The Concept of Micro, Small and Medium Scale Enterprises**

The classification of businesses into large scale, medium scale or small scale is highly subjective. The criteria that have been used in the definitions include capital investments (fixed assets), annual turnover and gross output and the number of employees within the enterprise (Ajose, 2010). According to Ajose, MSMEs are enterprises that have an asset base (excluding land) of between 5 million naira and 500 million naira, and labour force of between 11 and 300 in their employ. This agrees with the definition of Small and Medium Enterprises Development Agency of Nigeria (SMEDAN, 2017). The SMEDAN (2007) policy document stated that, where there is a conflict between employment and assets-based criteria, the employment based classification would take precedence. This indicates the importance of the employment base of an enterprise in Nigeria which shows its capacity as other individual's benefit from the entrepreneurial actions of the entrepreneur. This study will reveal the importance of the employment base of enterprises and it's contribution to income generation in Nasarawa state, Nigeria.

## **The Concept of Income**

According to Hicks (1946), income can be defined as the maximum amount that an individual can consume during a week and still expect that he will be able to consume this same amount in real terms in subsequent weeks. The monetary spending in real terms corresponds to the physical consumption of goods and services by the individual. This buttresses the point that income earned is meant to cover expenses for goods consumed. In economic terms, Smith (1776) defined income to be returns derived from factors of production. This implies that income is considered the fair rate of return which is received to compensate for the factors of production employed, which are land, labour, capital and entrepreneurship. This paper views income as an amount earned as a reward for labour which can be expended on consumptions, savings and investments.

## **THEORETICAL REVIEW**

According to Kirzner (1973), an entrepreneur is someone who is alert to and perceives profitable opportunities for trade and exchange. Recognising the possibilities for market demand enables the entrepreneur to benefit by acting as a middleman who facilitates exchange. The Kirznerian theory emphasizes that opportunities for the entrepreneur exist due to access to additional information that others do not have, hence he takes advantage of the circumstance. Opportunities for entrepreneurs in Nasarawa state arise from the ban imposed by the Nigerian government on rice importation. Government has in the same vein encouraged local rice production in the state and country in order to increase demand for locally produced rice, thereby creating room for output expansion. This will in turn boost production and create new employment opportunities, thus improving the welfare of individuals in the society.

Trans-Theoretical Model of Financial Planning and Change theory propounded by Prochaska and Di Clemente (1982) and cited in Xiao, Newman, Liu, Prochaska, Leon, Bassett & Johnson (2013) explains how practitioners might help individuals change their financial behaviour and that financial planning helps influence financial behaviour. This will enable them save more, pay bills and be debt free. According to Muske and Winter (2004), planned financial behaviour is a good indicator of how an individual will actually behave financially. However, this theory is limited in the sense that most low income earners are already operating at an optimal level considering their financial constraints, therefore it is difficult to save as most of the financial planning programmes indicate. It is however important to note that with improved access to funds it is imperative to adopt financial discipline for growth and sustainability of MSMEs.

## **EMPIRICAL REVIEW**

The studies of Inuwa, Kyiogwom, Ala, Maikasuwa and Ibrahim (2011), Adofu and Ocheja (2013), Adebayo and Nassar (2014), Hassan and Ahmad (2016) and Nursini (2020)

investigated the role of micro enterprises in employment and income generation as well as the profitability of rice milling activities in Kano State, Nigeria, Kogi State, Nigeria, Indonesia, Timergara City, Pakistan, and Ibadan metropolis of Western Nigeria respectively. They employed descriptive for the first two studies and theoretical and multiple regression respectively. These studies established in their findings that micro enterprises play a great role in income generation for the owners and employees and that these enterprises were the sole source of family income for the majority of persons. They found out that increase in the output of MSMEs can generate income for operators, which leads to increased expenditure, thus reducing the poverty gap. Their recommendations include strengthening of youth entrepreneurship, increased publicity of Government Business Development and Support Services, liberalization of access to and usage of business premises, access to credit, price control, reduction in cost of production, improvement of infrastructural facilities and provision of energy for the development of these micro enterprises.

Akingunola (2011), Afolabi, (2013) and Gbandi and Amisah (2014) carried out assessments of the effect of SMEs financing on economic growth in Nigeria between 1980 and 2010, and financing options and small and medium scale enterprises and economic growth in Nigeria. They used the spearman's rank correlation technique of analysis, descriptive statistics and Ordinary Least Square (OLS) in listed order, to estimate the multiple regression models to appraise certain financing indicators. The findings indicated a significant positive relationship between SME financing and economic growth in Nigeria via investment level. They also found lending rate to exert negative effects on economic growth. The studies recommended that accessibility to finances with low interest rates should be provided to small and medium scale enterprises in Nigeria in order to enhance economic growth. They suggested that the central authority should create an enabling environment for SME development and concluded that SMEs in Nigeria are very critical if they are to perform their role of growth and development of the nation's economy.

## **METHODOLOGY**

The study adopted the field survey method and the case research design to study rice milling activities in Nasarawa state. The state is located in North Central Nigeria and is bounded in the North by Kaduna state, in the West by Abuja, Federal Capital Territory, in the south by Kogi and Benue States and in the East by Taraba and Plateau States and has Lafia as its capital. According to National Population and National Bureau of Statistics projection (2016), the population of the state is 2,523,400 people. The state has 13 Local Government Areas within three senatorial zones. Data for the study was collected from primary and secondary sources including SMEDAN reports, Nigerian Bureau of Statistics Publications, Central Bank

Publications, World Bank Publications, textbooks, journals, and other relevant publications. The target population of this study included all owners of Micro, Small and Medium rice mills within Nasarawa state. Multi stage sampling technique was adopted using a combination of single stage sampling procedures. Sampling procedures included expert, stratified and matched pairs probability sampling techniques, which were employed in listed order.

The study employed the use of Generalized Linear Models (GLMs) which offer a common framework for specification of linear regression, logistic, probit and poisson regressions, thereby facilitating the development of broad applicable tools for estimation and inference. The model is a flexible generalization of ordinary linear regression models which allows for the response variables (dependent) to have error distribution other than normal distribution (Muller, 2004).

### **Model Specification**

#### ***Generalized Linear Model (GLM)***

A non-linear GLM model which accounts for non-negative response variables was adopted and estimated. This was done by estimating a nonlinear specification for the activities of rice mills and income generation. A standard GLM has three components, namely random component, linear predictor and a link function. The random component specifies the conditional distribution of the response variable, given the explanatory variables. The distribution is typically from the exponential family. The linear predictor is a function of the regressors:

$\eta = \beta_0 + \beta_1 X_1 + \dots + \beta_k X_k$  and a link function which transform the expectations of the dependent or response variable to the linear predictors. That is, the link function describes the relationship between the linear predictor and the mean of the distribution function (Shafrin, 2010).

#### **Non-linear Specification of the Rice Mills – Income Relationship**

The GLM specification of the non-linear relationship between rice mills and income is as expressed in equation 1:

$$INC_i = \exp(\beta_0 + \beta_1 SuC_i + \beta_2 QRP_i + \beta_3 QRS_i + \beta_4 EXPn_i + \beta_5 SAV_i + \beta_6 LEDU_i) + \varepsilon_i \text{---(1)}$$

Where;

*INC* = Income

*SuC* = Start-up capital

*QRP* = Quantity of rice processed per month

*QRS* = Quantity of rice sold per month

*EXPn* = Expenses incurred in month

*SAV* = Saving made from rice milling activities

*LEDU* = Level of education

*exp* = exponential

$\beta_0$  is the intercept,  $\beta_i$   $i = 1, 2, \dots, 6$  are the parameters/coefficients to be estimated and  $\varepsilon$  is the error term

### **A priori Expectations**

The *a priori* expectation is;  $\beta_1, \beta_2, \beta_3, \beta_5$  and  $\beta_6 > 0$ , while  $\beta_4 < 0$ . That is, all the explanatory variables except expenses incurred in a month are expected to have positive effect on income in the study area, while expenses incurred in a month are expected to have a negative effect on income.

**Decision Rule:** Reject the null hypothesis if the probability value of the Wald Chi-square is less than 0.05 (5%) level of significance.

## **1. Results and Discussion**

The descriptive analysis for this study covered the demographic and socio-economic characteristics of the entrepreneurs who were engaged in rice milling activities in Nasarawa state. It also captured information about the activities of rice mills with respect to income generation in the state. Questions on these phenomena are found in the appendix.

**Table 1: Demographic and Socio-economic Characteristics of Respondents**

Demographic Variables	Frequency	Percentage
<b>Gender</b>		
Male	298	74.5
Female	102	35.5
<b>Age</b>		
≤20	10	2.5
21-40	278	69.5
41-60	96	24.0
≥61	16	4.0
<b>Family Size</b>		
≤3	45	11.2
4-6	133	33.2
7-9	150	37.5
≥10	62	18.1
<b>Educational Level</b>		
No formal education	110	27.5
Primary	71	17.8
Secondary	151	37.8
ND/NCE	40	10.0
HND/First Degree	25	6.2
Masters/PhD	3	0.7

**Source:** Field Survey, 2019

The demographic and socioeconomic characteristics of the respondents are presented in table 1 using variables such as gender, age and level of education. The distribution of operators by gender showed that 74.5% of the respondents were male and 35.5% were female. This indicated that there were more male than female entrepreneurs found within the rice milling MSMEs in the study area. This could be attributed to the fact that the rice milling industry is a highly technical one and employs the use of heavy duty machinery which required physical exertion, more so that the machines used within the study area are mostly crude in nature. Secondly, the predominant presence of male entrepreneurs within the rice milling enterprises could be attributed to the fact that they bear responsibilities as family heads which strongly motivates them to engage in productive activities.

The table presented the age distribution of respondents indicating that 2.5% of the entrepreneurs were below the age of 20, 69.5% were within the age range of 21 – 40, while those that fell within the range of 41 – 60 and above 60 years constituted 24% and 4%, respectively. This showed that entrepreneurs in the micro, small and medium scale rice milling industry in Nasarawa are mostly youth and that the industry holds employment opportunities for the unemployed youth in Nigeria. This further implied that based on the natural endowment and opportunities inherent in Nigeria, youth are able to get themselves engaged in entrepreneurial activities within the agro allied MSMEs rather than wait on government for jobs which are not forthcoming. Furthermore, since 69.5% of the entrepreneurs are youth in their productive age, there is potential for increased output which will generate more income and expansion opportunities as they expend their energy on productive activities. This would further lead to employment generation, hence income generation.

The result showed that 55.5% of the respondents, representing more than half of the sampled population, had household sizes of more than 7 dependents. The least category was respondents who had household sizes of less than 3 dependents. This revealed that there is a high level of dependence in Nasarawa state where the economy is characterized by large household sizes and this factor spurred entrepreneurs towards engaging in ventures profitable enough to sustain their households.

The educational level of respondents captured in the table revealed that 27.5% had no formal education, 17.8% had primary education, while 37.8%, 10%, 6.2% and 0.7% of the respondents had secondary education, National Diploma/National Certificate of Education, Higher National Diploma/First Degree, and Masters/Doctorate degrees, respectively. The information collated showed that 72.5% of respondents had attained different levels of education which served as advantages to them as they could transmit their knowledge into their enterprise for better output. Again, this implies that respondents who had attained the highest level of education were able to find employment and income generation means within the MSME subsector

alongside people that had no formal education. It further revealed that job opportunities are available within the MSME sub sector for the unemployed in Nasarawa state. Rather than have graduates wait on the government to provide jobs, they could create jobs or engage themselves in the MSME subsector.

**Table 2: Sources of Rice Mill Financing in Nasarawa State**

Variables	Frequency	Percentage
<b>Source of your start-up capital</b>		
Personal Funds	357	89.2
Informal Loan	29	7.2
Bank Loans	14	3.6
Government aid	0	0.0
<b>Total</b>	<b>400</b>	<b>100</b>
<b>Access to loan facility/government support for existing businesses</b>		
Yes	147	36.8
No	253	63.2
<b>Total</b>	<b>400</b>	<b>100</b>
<b>Source of financing existing business (loan/government support)</b>		
Micro finance	16	10.9
Friends	9	6.1
Family	35	23.8
<i>Adashi</i>	84	57.2
Government support	3	2.0
<b>Total</b>	<b>147</b>	<b>100</b>

**Source:** Field Survey, 2019

The result in table 2 indicated the distribution of the source of “start-up capital” for the entrepreneurs. It showed that 89.2% of the enterprises surveyed were established using the entrepreneurs’ personal funds (savings), while 7.2% and 3.6% were established with informal loans (from family, friends, informal groups among others) and bank loans, respectively. This means that government support was not accessible to entrepreneurs to start up new businesses. The entrepreneur is then restricted to operating within the capacity of funds he could generate, or not operate at all if he could not raise start-up capital. This led most entrepreneurs to operate below capacity as a result of insufficient funds even when there are ready markets and opportunities for expansion. In cases where individuals could not raise money for investment, the business then remained a far-fetched dream.

The table also captured the number of respondents who were able to access loans in the course of their business activities. Only 36.8% of the entrepreneurs were able to access loans or get

support from the government for their business, while 63.2% of entrepreneurs were unable to access loans or government support for their business. The distribution of source of loans for MSME operators in the table showed that 10.9% of MSME operators were able to get loans from Microfinance institutions, 6.1% from friends, while 23.8%, 57.2%, and 2% were able to get family support, loans from *adashi* and government intervention, respectively. 57.2%, which represents more than half of the respondents, obtained their loans from *adashi* indicating that it was the major source of funding accessible by rice milling MSMEs in Nasarawa state.

#### **4.1 Rice Mills and Income Generation in Nasarawa State**

The basis of comparison is income level before and after the entrepreneur engaged in rice milling activities. The data was analysed using descriptive statistics to ascertain whether or not rice milling activities had increased the income level of participants and is interpreted in this section.

**Table 3: Average Monthly Income Before and During Rice Milling Business in Nasarawa State**

Income Level (Naira)	Before Rice Milling		During Rice Milling	
	Frequency	Percentage (%)	Frequency	Percentage (%)
<b>Less than 10,000</b>	<b>84</b>	<b>21.0</b>	<b>12</b>	<b>3.0</b>
<b>10,000-49,999</b>	<b>153</b>	<b>38.3</b>	<b>80</b>	<b>20.0</b>
<b>50,000-99,999</b>	<b>142</b>	<b>35.5</b>	<b>93</b>	<b>23.3</b>
<b>100,000 and above</b>	<b>21</b>	<b>5.2</b>	<b>215</b>	<b>53.7</b>
<b>Total</b>	<b>400</b>	<b>100</b>	<b>400</b>	<b>100</b>

Source: Field Survey, 2019

Table 3 has showed that prior to joining rice milling industry, the respondents were earning very low incomes per month. During this period, the percentage of respondents that earned less than ₦10,000.00 dropped from 21% to 3%, while those who earned between ₦10,000.00 – ₦49,999.00 dropped from 38.3% to 20%. The proportion of entrepreneurs who earned between ₦50,000.00 – ₦99,000.00 dropped from 35.5% to 23.3% and those that earned above ₦100,000 increased from 5.2% to 53.7%. This revealed that the rice millers’ income increased overtime in the industry as the business expanded and progressed.

**Table 4: Capital Invested in Rice Milling Business At Start and At Present**

Income Level (Naira)	At Start		At Present	
	Frequency	Percentage (%)	Frequency	Percentage (%)
<b>Less than N1million</b>	<b>375</b>	<b>93.7</b>	<b>253</b>	<b>63.2</b>
<b>N1million to N5million</b>	<b>24</b>	<b>6.0</b>	<b>115</b>	<b>28.8</b>
<b>Above N5million</b>	<b>1</b>	<b>0.3</b>	<b>32</b>	<b>8.0</b>
<b>Total</b>	<b>400</b>	<b>100</b>	<b>400</b>	<b>100</b>

Source: Field Survey, 2019

Table 4 showed that at the time of commencement of rice milling business, 94% of the entrepreneurs started with less than one million naira and 5.7% of the entrepreneurs started their businesses with between one and five million naira, while only 0.3% representing one enterprise started with above 5 million naira. At the time of the survey, only 63.2% of the entrepreneurs had less than one million naira invested, while 28.8% had between one and five million naira and 8% of the entrepreneurs had above 5 million naira invested. It is hereby clear that most rice millers had been able to expand their businesses as amount invested in the business increased overtime as shown in the percentage of growth in initial capital invested at the start of the business. The growth is attributed to the viability and profitability of the venture which created room for expansion as most entrepreneurs indicated during the interview that they expand their business by re-investing profit realised. The increased improvement in the industry in recent times is attributed to the increased demand for rice after the federal government of Nigeria placed a ban on rice importation, causing an increase in the demand for local rice in the market.

### **Analysis of the Impact of Rice Milling Activities on Income Generation**

The study estimated the Generalised Linear Model (GLM) to show evidence or otherwise of the contribution of rice milling activities to income generation in Nasarawa state. The results of the analysis are presented in table 5.

**Table 5: Result of GLM Showing the Effects of Rice Milling Activities on Income Generation in Nasarawa State**

<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>Z-statistic</b>	<b>Prob.</b>
<b>SuC</b>	<b>0.39693</b>	<b>0.10211</b>	<b>3.89</b>	<b>0.000</b>
<b>QRP</b>	<b>0.77297</b>	<b>0.30082</b>	<b>2.57</b>	<b>0.002</b>
<b>QRS</b>	<b>0.29638</b>	<b>0.10378</b>	<b>2.86</b>	<b>0.004</b>
<b>EXPn</b>	<b>-0.17829</b>	<b>0.04669</b>	<b>-3.82</b>	<b>0.000</b>
<b>SAV</b>	<b>-0.05672</b>	<b>0.12514</b>	<b>-0.45</b>	<b>0.650</b>
<b>LEDU</b>	<b>0.01530</b>	<b>0.03867</b>	<b>0.40</b>	<b>0.693</b>
<b>C</b>	<b>1.30451</b>	<b>0.51280</b>	<b>2.54</b>	<b>0.011</b>
<b>Chi-square</b>	<b>30.11</b>			
<b>Prob.(Chi-square)</b>	<b>0.000</b>			
<b>Deviance</b>	<b>0.235</b>			

**Source:** Authors' compilation using STATA 15

The result of the GLM in table 5 revealed that four of the variables (SuC, QRP, QRS and LEDU) had positive impacts on income generation (INC) in the study area. A 1% increase in

startup capital (SuC) led to an increase in income generation by 0.397%. Also, a 1% increase in the quantity of rice produced and quantity sold led to an increase in income generation by 0.773% and 0.296% respectively. It also showed that the higher the level of education, the higher the level of income generated from rice milling activities by 0.015%. On the other hand, expenses incurred (EXPn) had a negative impact on income generation in the study area. The inverse relationship between the explanatory variables and income indicates that a 1% increase in expenses incurred decreased the level of income generation by 0.178%. This implies that as more money was expended, less was available for reinvestment or business expansion which ultimately affected the rate of returns.

The *a priori* expectation is that  $\beta_1, \beta_2, \beta_3, \beta_5$  and  $\beta_6 > 0$ , while  $\beta_4 < 0$ . That is, all the explanatory variables except expenses incurred in a month were expected to have positive effect on income in the study area, while expenses incurred in a month is expected to have negative effect on income. However, the result indicated that savings also had a negative effect on income while all other explanatory variables conformed to *a priori* expectations. Two of the variables (SAV and LEDU) had insignificant impacts on income generation in the study area. Judging from the probability value of Chi-square test (0.000) the result indicated that the joint effects of the variables was statistically significant at 5% level of significance given the probability value of 0.000 which is less than 0.05 level of significance.

The results of the Deviance statistic which measures the goodness of fit of a model (i.e how well the model fits the data) had a value of 0.235 which is less than 0.3 threshold. This implies that the model has a good fit and that the model predictions are close to the observed outcomes, hence, estimates emanating from the model are reliable and unbiased. Since the probability value of the Chi-square (0.0000) was greater than 0.05 ( $p > 0.05$ ), the null hypothesis was rejected. The study concluded that rice mills have significantly impacted on income generation in Nasarawa State.

## **DISCUSSION OF FINDINGS**

The study found that rice mills activities had significant impact on income generation in Nasarawa State. Sources of capital, quantity of rice produced, quantity of rice sold and level of education of the respondents had positive impact on income generation, while expenses and savings had negative impact on income generation in the study area. The findings indicated that an increase in start-up capital would result in an increase in income generation. Entrepreneurs stand better chances of expanding their business and generating more income from the rice milling activities when they have access to cheap capital. The analysis shows that some of the entrepreneurs had been able to expand their businesses as they ploughed back certain parts of

their profit towards the expansion of their business, causing an increase in economic activities and thus rise in income level.

The outcome of the descriptive statistics also showed that 93.7% of the rice millers started out their businesses with less than one million naira and at the time of the study more than 30% of the entrepreneurs had grown their capital above one million naira. Also no respondent admitted to starting up his/her business with up to five million naira at the start of the business. However, 8% of the enterprises had up to five million naira invested at the time of this study. This is a clear indication that firms were able to grow their capital overtime, all things being equal, and this resulted in the expansion of businesses. This is attributed to the fact that available finance for investments boost firm's capacity for expansion which would in turn create employment and income generating opportunities for the stakeholders. Prior to joining rice milling industry, 60% of the respondents were earning very low incomes of less than 49,999 naira monthly. The proportion of respondents who were low income earners decreased over time and high income earners increased.

Entrepreneurs obtained their income from rice milling activities and as such, the quantity of rice produced and sold had a direct impact on income generation. The higher the quantity produced and sold, the higher the level of income. For instance, a miller who produced and sold 100 bags of rice earned more income than a miller who produced and sold 60 bags of rice given a uniform price. Regarding expenses and savings, the study revealed that the more expenses rice millers incurred, the less investible funds they had to invest in their business and thereby reduced their level of income. Similarly, the higher they saved, the less investible funds and consequently, the less income they generated from the rice milling activities. An increase in the quantity of rice produced and quantity sold also led to an increase in income generation, and this could be attributed to the fact that as rice was being produced, demand for it was created and sales triggers the production cycle to repeat itself, hence the market thrives on turnover.

The findings also showed that the level of education impacted positively on income. It is generally expected that the more educated someone is, the more efficient he would be in his business. Millers who were educated would add skill and value to improve production and marketing skills which would earn them more money compared to those who were less educated. The results indicated that most of the entrepreneurs had attained different levels of education. The higher the level of education, the higher the level of income they generated from rice milling activities, implying that attaining education was an advantage to the entrepreneur. Education empowered entrepreneurs by improving human resource quality and

efficiency as the entrepreneur is able to apply knowledge to production processes and marketing skills which eventually enhanced his chances of increased income generation in order to raise the country's economic status. This implies that when labour is trained then productivity will increase among entrepreneurs.

The findings also indicated that expenses incurred and savings had negative impact on income generation in the study area, the latter showing a deviation from *a priori* expectations. An increase in expenses incurred decreased the level of income generated, likewise an increase in savings. This implies that as more money is expended or saved, less is available for reinvestment or business expansion which ultimately affects the rate of returns. The expenses could be triggered by high cost of machine maintenance, sourcing for alternative power supply, multiple taxation, high cost of getting rice paddy at off season periods, transportation among other demands. The large household size of the entrepreneurs was also a factor responsible for higher rate of consumption than reinvestment or savings. Overall, the study established that rice milling activities had significant impact on income generation in the study area.

## **CONCLUSION AND POLICY RECOMMENDATIONS**

The findings of the study indicated that there was an increase in income generated among respondents as rice milling businesses grew. Results from the analysis confirmed the underpinnings of the economic theory of entrepreneurship which stated that government intervention is crucial to the success and survival of MSMEs. Micro, Small and Medium Enterprises are an antidote to unemployment and a means for income generation, empowering the populace. Access to employment and income creates value addition and improves the welfare of an individual. From the findings of the study, it is evident that rice millers within Nasarawa state have been able to improve their welfare and that of their family and dependents by engaging in rice milling activities. Furthermore, rice milling activities also created income for other ancillary workers associated with the business. It is therefore the submission of this study that one of the preconditions to reduce income inequality in Nasarawa state and in Nigeria at large is to encourage micro, small and medium scale enterprises.

Based on the findings of the study, the following recommendations are made:

1. Government should encourage the unemployed to engage in rice milling activities by making policies and introducing programmes in order to attract more people to the rice industry. This can be done by providing improved quality seedlings for rice farming and improved technology for milling, respectively, on terms which entrepreneurs can afford including giving them an extended timeline for payments as well moratorium on interest. This will encourage local rice milling MSMEs and give locally produced rice

an edge to compete with the imported rice, thereby generating more income for the economy.

2. Government intervention in terms of financing and providing subsidies should be targeted at grassroots where the intervention is most needed by decentralising the channels of interventions to states, LGAs, villages and even wards so that it is widely spread and can reach areas of need. This will boost and expand rice milling activities within the state.
3. High level of expenses was incurred by rice millers as a result of lack of certain crucial amenities like power supply. Therefore, the government is advised to support rice milling by ensuring that essential amenities like electricity and water, as well as other infrastructures are made available for rice millers so as to reduce the cost of operation. This could be implemented in stages starting with the rice cluster so that the majority of the rice millers can benefit from the initial intervention.
4. Rice millers should channel more of their savings towards investment rather than consumption so that they can expand their businesses increasing the quantity of rice produced and sold, thereby improving their income. They are also advised to continue and improve on their thrift since that is the major source of capital easily accessible to them.

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## APPENDIX

### QUESTIONNAIRE

**Instructions:** Please tick or fill using Capital letters only where necessary.

#### SECTION A: PERSONAL DATA

1. Gender: Male [ ] Female [ ]
2. Age: ≤ 20 [ ] 21 - 40 [ ] 41 – 60 ≥ 61 [ ]
3. Family size: <3 [ ] 4 – 6 [ ] 7 – 9 [ ] >10 [ ]
4. Educational Level: No formal Education [ ] Primary [ ] Secondary [ ] ND/NCE [ ] HND/FIRST DEGREE [ ] Masters [ ] Others (please specify).....
5. Can you read and write Yes [ ] No [ ]

#### SECTION B: BUSINESS INFORMATION

6. How long has your business been in operation? Less than 5 years [ ] 5 -10years [ ] 10- 15 years [ ] more than 15 years [ ]
7. Do you belong to the association of local rice millers? Yes [ ] No [...]
8. What are the benefits of being a member of the association?.....
9. How many rice mills did you start with? .....
10. How many rice mills do you have now? ,.....

#### SECTION C: RICE MILLS AND INCOME GENERATION

11. What was your start-up capital? >less than 1.50 million [ ] >less than 50 million [ ] >less than 200 million [ ]
12. What was the source of funds for your start-up capital? Informal Loan [ ] Personal Funds [ ] Ploughed back Profit [ ] Bank Loan [ ]
13. How much capital is invested now? >less than 1.50 million [ ] >less than 50 million [ ] >less than 200 million [ ]
14. Did you have any source of income before you started working at the rice mill? Yes [ ] No [ ]
15. Has your income improved since you started operating/working at the rice mill? Yes [ ] No [ ]
16. What is your average daily income? .....
17. Do you have access to loan facility? Yes [ ] No [ ]
18. If yes what is your source of loan? Commercial Bank [ ] .Micro finance [ ] Friends [ ] Family [ ] Adashi [ ]
19. Have you benefitted from any government financial aid? Yes [ ] No [ ]

20. Has this loan/aid helped you to expand your business? Yes [ ] No [ ]

21. How much do you save monthly? .....

**SECTION D: CHALLENGES**

22. Which amenities affect your business? Electricity [ ] Water [ ] Good roads [ ]

Others [ ]

23. What other factors affect your business? List.

(i) .....

(ii) .....

(iii) .....

(iv) .....

(v) .....

Name of interviewer: .....

Signature.....

Date.....

# SYSTEMATIC PENSION PLAN AND ITS PAYOUT PHASE IN FEDERAL UNIVERSITIES IN NIGERIA

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## ***Abstract:***

*Accumulation phase of Defined Contribution (DC) pension represents a critical period where the regulator and DC beneficiaries need to monitor how contributed funds are invested to grow into sufficient funds for old age security. However, more critical in DC pension is the payout phase which has to do with different actuarial models for converting the accumulated funds into streams of retirement income. This has not received much research efforts. This study combines the two phases by modeling accumulated funds for retirement income options. Data for employees' salaries for different grade levels were collected from one of the federal universities in Nigeria. The salaries data collected were used to compute accumulated funds while the 1983 Individual Annuity Mortality Table for males' lives were used to determine annuity rates from 4% to 6%. These rates were used to convert the accumulated funds into annual pension withdrawals for prospective annuitants. The findings revealed that annuity rates decrease with increasing age at any given rate of interest and age. Also, retiring employees with phased withdrawal options have more annual pension income for short payout duration than those with extended years in payout. The study recommends among other things that retiring employees need to ensure that their monthly pension contributions are remitted to their retirement saving accounts as and when due in order to accumulate sufficient funds for retirement.*

**Keywords:** *Accumulated Funds, Annuity Rates, Payouts, Phased Withdrawals*

Classification JEL: G18, G23, J32

## **INTRODUCTION**

Many countries around the world including Argentina, Australia, Chile, Ghana, Colombia, Mexico, Nigeria, Peru, Poland, Sweden, and Switzerland have introduced defined contribution (DC) model into their pension system (Adeyele & Imokhome, 2014). The DC model otherwise known as systematic investment plan by Adeyele (2015a) is a plan whereby both employees and employers jointly contribute defined percentage of the former's salaries throughout years of service and remit same to retirement saving accounts (RSAs) of employees until retirement age is attained. The DC model is divided into two major parts: the accumulation phase and the payout phase of retirement.

The accumulation phase is a period employees save and invest for their old age, while the payout phase otherwise called decumulation phase is the period the employees begin to withdraw funds from their retirement saving accounts (Black & Skipper, 2000). It has been acknowledged by previous studies that accumulation phase of DC represents a critical stage that the contributors as well as regulators need to pay careful attention to especially how contributed funds are invested to grow to sufficient volume for old age income (Adeyele, 2015b; Adeyele & Maiturare, 2012). The regulatory body, National Pension Commission (here after, PenCom), as part of its roles must ensure all funds are well managed and those portion representing funding gaps are depleted within the shortest time so that all statutory contributions go to employees' RSAs (Adeyele, 2015a).

However, the payout phase of DC pension is more crucial and technical than the accumulation phase as issues on how to convert accumulated funds to streams of retirement income is relatively new to the industry players and have not received necessary attention of pension scholars in Nigeria (Adeyele, 2015b). Unlike other countries in which the actuarial profession has grown to a position of prominence, Nigeria has less than 16 years' experience in DC pension, particularly about the choice of retirement income options that beneficiaries of DC pension need to make at retirement.

In the payout phase, there are two options of retirement income, namely, phased withdrawal and retiree's life annuity. Whether retirees will have stable income at retirement is a function of what they have contributed whilst in active service and the choice they make with those funds. The models for converting accumulated funds to choice of retirement income options are not well articulated by many studies in Nigeria due to relative low knowledge.

Many previous studies on pension that attempt to address issues of DC pension have either focused on accumulation phase (Adeyele & Maiturare, 2012; Ibiwoye, 2008; Ibiwoye & Adesona, 2011) or payout phase (Evans & Sherris, 2009; James & Vittas, 1999; Mitchell & Piggott, 2011; Palme & Sandgren, 2008). This implies that there is no evidence of any particular studies that has critically analysed and linked both stages of DC pension. In fact, early studies of DC pension have given more preferences to issues and challenges of the accumulation phase of DC (Ibiwoye, 2014; Palacios, 2005) with limited research on how accumulation phase can be transited to pension income thereby creating knowledge gaps for many beneficiaries of DC as they do not know what ought to be done at payout phase (Adeyele & Olujide, 2016; Adeyele & Ogungbenle, 2019; Adeyele *et al*, 2020).

Following the failure of most employers (plan sponsors) to comply with remittance of 18% of employees' monthly emolument as and when due, the PenCom in 2006 realised the need to regularly value pension assets so as to account for the amount owed to employees by their respective employers. Hence, the agency came up with regulation to standardize the procedures

to be followed in carrying out such valuation exercise of pension assets which must be in accordance with the regulations issued by the body. In subsection 2.5, 2.6, and 2.7 of the guidelines issued by PenCom in 2006, the valuation of pension assets which has always been the jurisdiction of actuarial profession was delegated to Pension Fund Administrators (PFAs.).

The regulation also states the manner in which the valuation is to be conducted which is based on actual positive or negative events and not based on expected or planned accomplishment of pension assets by PFAs. The process under their control shows lack of clarity on how the pension asset should be valued. Also, the manner and frequency of the valuation exercise as stated in PenCom (2006) exposed the scheme members to investment risks and subjective opinion of PFAs that are not systematic in nature. To provide for stable and systematic valuation, there is need for actuarial intervention to ensure all past and future contributions are ascertained.

The present study therefore closes this gap by combining the two phases with relevant models for proper conversion of accumulated funds to choice of retirement income. Hence, the focus of this study on payout phase include techniques for annuity rates pricing and the expected annual pension withdrawals for both phased withdrawal and retiree's life annuity. This study will not only be of great importance to policy makers and stakeholders in the pension industry but will contribute to the body of knowledge on pension literature in Nigeria. The research outcome will also guide the current employees especially those who are close to retirement on how to go about their choice of retirement income selection at payout phase.

## **LITERATURE REVIEW**

### ***Conceptual Framework***

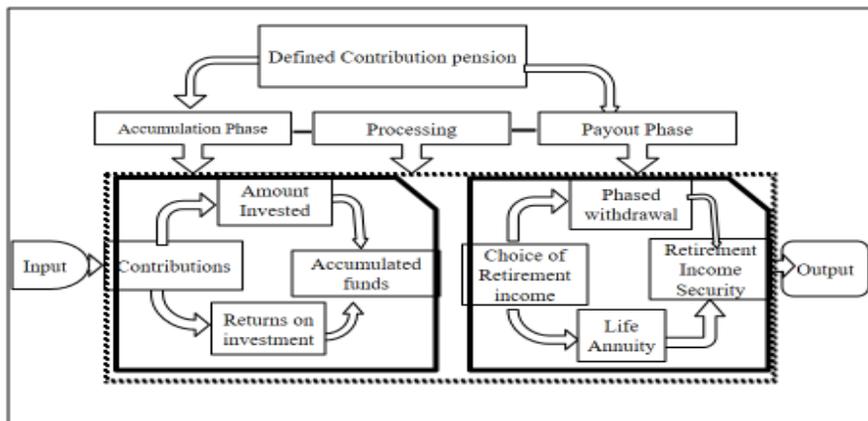
Defined contribution retirement benefits in Nigeria allows retirees to choose from two or more benefit structures (Adeyele, 2015a). For example, in Nigeria and Chile, retiring employees can choose between a programmed withdrawal and a life annuity. Adeyele (2015b) noted that one of the major concerns about payout phase is the credibility of insurance companies and their ability to honour contracts that may last up to 30 or more years. This new retirement system has increased the structure around a benefit plan that mandates among other options the purchase of an annuity upon retirement (Pettinato *et al*, 2005).

While government payouts will likely continue to increase for many decades, it is now evident that future retirees will not be well off as they had thought (Mitchell & Piggott, 2011) due to demographic trends in almost every country (Brunton & Masci, 2005). This global age wave has heightened awareness of the financial and mortality risk that confront retirees; risk that sometimes take people by surprise (Bodie, 2000), leading to a situation described as pension 'time-bomb' by Blommestein (2000). Many countries have responded to this by reforming their

pension systems by shifting to DC model which has become important sources of retirement finance the world over (Palacios & Bowlers'-Miralles, 2000).

The Chilean social security reform of 1981 gave birth to defined contribution scheme which other countries of the world adopted to share burden of pension liabilities (Iyer, 1999). On retirement of a member, the accumulated balance is mandatorily converted into an indexed pension subject to a specified minimum which is guaranteed in Chile, whereas in Nigeria, employees may have to choose between phased withdrawal and retiree’s life annuity. Defined contribution pension is a funded scheme that enables both the enrollees and plan sponsors to systematically determine the expected future contributions for retirement based on defined contribution formula. If all contributions are remitted to enrollees’ RSAs as and when due, it is hoped funding gap emanating from default remittances will not create any issue between the plan sponsors and beneficiaries.

The conceptual framework adopted for the study explicitly explains various links in defined contribution pension. In theory and practice, DC consists of accumulation phase which deals with the period of accumulating funds for retirement. In this case, the contributed funds are also invested (Black & Skipper, 2000). Both contributions and returns on invested funds give accumulated fund upon which employees make choice about retirement income options: the phased withdrawal and retiree’s life annuity. The level of income security depends on a retirees decision. If a retiree thinks he/she has lower expectation of life at retirement and chooses phased withdrawal but eventually lives far beyond his/her expectation of life, such decision leads to financial insecurity. Likewise, if retiree chooses retiree’s life annuity with the expectation of living longer but lived below the expected life span, such person will lose money to insurance companies. Whichever case, the ability of a decision maker to precisely reduce the longevity risk determines the amount of financial security.



Authors’ Framework

Figure 1: Links between accumulation phased and payout phase of DC pension

Figure 1 shows the linkages in defined contribution pension. In this study, accumulation phase is considered as input while the payout phase is seen as the output stage. Thus, employees' funds in defined contribution go through the input, processing and output stages. If there exists any problem at the input stage which is the accumulation phase, the payout phase will be characterized with issues of delay in payment of funds and sometimes non-payment of pension benefit which has been the order of the day. Both the accumulation and payout phases are combined to denote the processing stage that are virtual in nature because not many pension scholars in Nigeria have found it necessary to examine the intricacies involved in defined pension scheme. Most analyses and investigations conducted among pension scholars only looked at the input stage and resulting in lack of information about the processing stage. Lack of proper understanding of the detailed processing stage of defined contribution has put many researchers on pension at disadvantage in proffering lasting solutions to existing problem with pension in the country.

Consequently, when attempting to solve problem associated with the accumulation phase, the payout phase must be critically analysed so as to identify the key problems that lead to delay in pension payment. At the same time, many pension analysts have tried to solve problems at payout phase without considering the accumulated phase where the problem originated. Consequently, going through the various stages of defined contribution will allow the problems of DC to be addressed systematically.

### **THEORETICAL REVIEW**

Actuarial accumulated value theory in compound interest theory by Kellison (1970) and Ruckman and Francis (2005) provides useful insights into how to determine the accumulated funds of stream of payments. This theory assists in series of payments in the past and future payments. Adeyele et al (2020) redefined the actuarial accumulated value theory and termed it as recovery models to ascertain the expected funds to be remitted to employees' retirement saving accounts.

In order to liquidate the accumulated funds at retirement, scholars from different jurisdictions have advocated for the use of immediate annuities to cushion the effect of longevity risk. Immediate annuity enables DC members to exchange accumulated funds (premiums) for periodic payments of income (annuity) contingent on survival. Consequently, this study adopts two theories: actuarial accumulated value and discrete life annuities for the accumulated phase and payout phase of DC pension, respectively. The discrete annuities theory is analogous, step-by-step to the theory of continuous life annuities, with integrals replaced by sums, integrands by summands, and differentials by differences. For continuous annuities there was no distinction between payments at the beginning of payment intervals or at the end, that is, between annuities-due and annuities-immediate. For discrete annuities, the distinction is meaningful (Bowers et al, 1997), and we give a brief information about annuities-due as they



The models above provide impetus to details of discrete life annuities models considered in Section 3 as applicable to the present study. Whereas the present study focuses on how rates for annuities and phased withdrawals can be determined, following the step-by-step procedures will reduce employees' exposure to unwarranted risk of wrong choice of pension income at retirement options.

### **EMPIRICAL REVIEW**

Hershey and Mowen (2000) revealed that the lack of individual financial preparedness for retirement and the rapidly changing demographic trends associated with the aging of the baby boom generation, together serve to create strong psycho-economic pressures that are felt at both the individual and societal levels. Pugh (2006) finds it counter-productive to be distracted by the current economic challenges. Bernheim *et al* (1997) revealed that the lack of retirement preparedness stems from insufficient educational opportunities aimed at cultivating positive attitudes toward saving, the tendency of individuals to overestimate the quality of their financial decisions (Hershey & Wilson, 1997), and the propensity to incorrectly estimate one's own longevity (Walsh *et al*, 1989).

In a study by Adeyele and Jim-Suleiman (2021) on public universities in Nigeria, it was found that the scheme was significantly underfunded as such funds not regularly remitted lost investment returns. They also found that low investment returns on contributed funds lead to low accumulated funds. A related study by Adeyele and Maiturare (2021) found shortfalls in accumulated funds due to irregular remittances and lack of returns on invested funds which in turn affects the choice of retirement income. For instance, those who wish to purchase retiree's life annuity may not be able to do so due to inadequate accumulated funds. Adeyele (2015b) finds that employees' perception of financial commitment to families and friends significantly leads to selection of phased withdrawal as option of retirement income.

Adeyele and Igbinosa (2015) focused on accumulation phase computation and found that DC model is complicated with irregular remittances to employees' RSAs. The complexities of irregular remittances and employees. Silence shows lack of readiness for the future income. Predictions made by financial and retirement planning experts suggest that an economic crisis looms under DC plan arrangement due to inadequate pre-retirement financial planning that has continued to worsen.

Babbal and Merrill (2007) revealed that selection of annuity as old age income protects annuitants against longevity risk since steady income will be guaranteed contingent on annuitants' survival. In their report, they showed that it would cost between 25 percent and 40 percent more to achieve a similar riskless guarantee of income if retirees self-annuitised. Blake *et al* (2006) recognized retiree's life annuity as the mainstay of pension plans throughout the world.

With the tremendous increase in personal longevity witnessed in the past century (Davies & Sparrow, 1985), and given the current rate of medical advances, we can expect this trend to continue. Iyer (1999) noted that the mechanism of indexation of accumulated pension funds may be based on the cost-of-living index relating to index of earnings, and limits may apply to the extent of adjustment either in absolute terms or as a proportion. Richardson and Spence (2010) examined the economic benefit of self-annuitization (or phased withdrawal) plan and discovered that failure of retirees to understand the uncertainty associated with plans may put them into financial difficulty if things do not go according to plan.

The experiments conducted by Tversky and Kahneman (1992) also showed that for both positive and negative prospects, decision makers always overweight low probability events and underweight high probability events which in turn lead to wrong selection of retirement income option. In a study by Chen *et al* (2019), elderly retirees that have a lower possibility of surviving pay a higher price for immediate annuity products due to overestimation in their survival rate. Annuity framing by marketers has been found to make immediate annuities become more preferable for older retirees than younger retirees.

**DATA DERIVATIVE AND ASSUMPTIONS**

Three stages including computations of accumulated funds, rates for phased withdrawal and annuity and annual pension withdrawals were followed. In order to determine annuity rates, assumptions about expectation of life at retirement from the age of 70 was fixed to 20 years while the highest lifespan for all retirees was pegged to 90 years. The study made use of secondary data which were collected from the bursary department of one of the federal universities in Nigeria. Since the university system is homogenous in nature, data collected from any of the federal universities can be used for generalization for academic staff in all Federal Universities in Nigeria. In order to determine the annual pension withdrawal, the annuity rates computed were used to determine annual pension withdrawals based on the accumulated funds from fixed interest rates of 4% to 6.5% as shown in Table 3.

Following the models developed for accumulated funds, actuarial software was used to compute different annuity rates which were used for annual pension withdrawals.

**Mathematical model** – the accumulation phase of DC as shown in the conceptual framework deals with accumulation of both the contributions and returns on investment. For purpose of ascertaining pension funds at *i*th years, the study adopts the following formula developed by Adeyele *et al* (2020):

$$APF_i = \left[ (1 + g_f)^m - 1 \right] / g_f \times \left\langle \sum_{i=0}^n C_m^{n-i} (1 + r)^i \right\rangle \quad - \quad - \quad - \quad \dots 3.1a$$

Where

$$\left[ (1 + g_f)^m - 1 \right] / g_f = \text{convertable monthly} \quad - \quad - \quad - \quad - \quad \dots \quad 3.1b$$

$$g_f = r^m / m = \int_f \text{ nominal rate}$$

APFi = accumulated

$APF_i$  = accumulated pension funds for  $i$  years;

$n$  is total number of years of contribution while  $i$  represents different years of service

This model was used to arrive at pension funds for years in service as employees may retire at different ages due to health reason or other reasons.

Using 6% annual rate of return convertible monthly, accumulated nominal interest convertible monthly is shown as follow:

$$\left[ (1 + g_f)^m - 1 \right] / g_f = \left[ \left( 1 + \frac{0.06}{12} \right)^{12} - 1 \right] / \frac{0.06}{12} = 12.34$$

$$APF_{20} = \left[ (1 + g_f)^m - 1 \right] / g_f \times \left\langle \sum_{i=0}^{20} C_m^{20-i} (1 + 0.06)^{20} \right\rangle =$$

$$\left[ (1 + g_f)^m - 1 \right] / g_f \times \left\langle \sum_{i=0}^{20} C_m^{20-i} (1.06)^{20} \right\rangle$$

If an employee assumed duty as Lecturer I and worked for only 20 years as specified in Table A in the appendix, the monthly contributions size (MCS) for each year of service is calculated as:

$$MCS = \left\{ \begin{array}{l} C_m^{20} \Rightarrow Cr \times m_m^{20} = 0.18 \times 435,588.75 = 78,405.98 \\ C_m^{19} \Rightarrow Cr \times m_m^{19} = 0.18 \times 422,257.25 = 76,006.31 \\ \dots\dots\dots \dots\dots\dots \dots\dots\dots \dots\dots\dots \\ \dots\dots\dots \dots\dots\dots \dots\dots\dots \dots\dots\dots \\ C_m^2 \Rightarrow Cr \times m_m^2 = 0.18 \times 180,191.42 = 32,434.46 \\ C_m^1 \Rightarrow Cr \times m_m^1 = 0.18 \times 173,899.58 = 31,301.92 \end{array} \right.$$

Note: Cr = contribution rate;  $C_m^i$  = monthly contributions for  $i = 1, 2, \dots, 12$

From equation (3.1), the detailed accumulated pension funds from 1 to 20 years in service are:

Detailed accumulated funds' computation from year 1 to 20	
	$A(F, M) \times C_m^{20} (1.06)^0 \Rightarrow 12.34 \times 78,405.98 \times (1.06)^0 = 967,181.80 +$
	$A(F, M) \times C_m^{19} (1.06)^1 \Rightarrow 12.34 \times 76,006.31 \times (1.06)^1 = 937,380.52 +$
	$A(F, M) \times C_m^{18} (1.06)^2 \Rightarrow 12.34 \times 73,606.62 \times (1.06)^2 = 907,979.06 +$
$APF_{20} =$	.....
	.....
	$A(F, M) \times C_m^2 (1.06)^{18} \Rightarrow 12.34 \times 32,434.46 \times (1.06)^{18} = 400,097.25 +$
	$A(F, M) \times C_m^1 (1.06)^{19} \Rightarrow 12.34 \times 31,301.92 \times (1.06)^{19} = 386,126.84$
	$APF_{20} = A(F, M) \left\langle \sum_{i=0}^{20} C_m^{20-i} (1 + 0.06)^{20} \right\rangle = 23,837,523.75$

It should be noted that ₦23,837,523.75 was obtained using software. Other computations of accumulated funds from age 50 to 70 used for retiree’s life annuity pricing are obtained with the same procedures as above.

**Programmed withdrawal (or Annuity Certain) models** - According to Mitchell et al (1999) reported in Pettinato et al (2005), the calculations required to understand the life cycle of a single-premium annuity contract is obtained by solving two diverging trends: the compound interest that builds up the account on one side and the depletion of the account (through annuity withdrawals) on the other. Thus the present value to defray accumulated funds is given as:

$$\text{Present value} = a_n = v^1 + v^2 + v^3 + \dots + v^{n-1} + v^n \quad - \quad - \quad - \quad 3.2a$$

$$a_n = (1 - v^n) / i \quad - \quad - \quad - \quad - \quad - \quad - \quad 3.2b$$

Equation (3.2b) is used at payout phase to determine the amount retiring employees who favour programmed withdrawal option are likely to access at retirement. For those who would favour programmed withdrawal, their gross contributions are subject to tax only at payout phase.

- (i) if the employer regularly remitted all the due contributions as and when due, and the retired employees want their retirement income to commence immediately, then the accumulated pension fund is given as follows:

$$A_F^P (1 - T_d^r) - A_W^P a_n = 0 \Rightarrow A_W^P = A_F^P (1 - T_d^r) / a_{nt} \quad - \quad - \quad - \quad 3.3$$

Where  $A_F^P =$  Accumulated pension fund and

where  $A_W^P =$  annual pension withdrawal,

$A_F^P =$  accumulated pension funds,  $a_{nt} =$  present value of future payments;

$T_d^r =$  Tax deferred at retirement

The amount to be charged as tax on contributed funds is uncertain. As a result, the tax portion will be ignored at this level. If a retiree wishes to use his/her accumulated pension fund of 1 for phased withdrawal income, and the fund 1 is expected to be used up at the end of 15 years, the present value of 1 using equation (1a) is determined as follows:

$$a_{15} = \frac{1}{(1+i)^1} + \frac{1}{(1+i)^2} + \dots + \frac{1}{(1+i)^{14}} + \frac{1}{(1+i)^{15}} = \sum_{t=1}^{15} \frac{1}{(1+i)^t}$$

$\frac{1}{(1+i)^1} = 0.995943$	$\frac{1}{(1+i)^9} = 0.836755$
$\frac{1}{(1+i)^2} = 0.995569$	$\frac{1}{(1+i)^{10}} = 0.8203483$
$\frac{1}{(1+i)^3} = 0.942322$	$\frac{1}{(1+i)^{11}} = 0.8042630$
$\frac{1}{(1+i)^4} = 0.923845$	$\frac{1}{(1+i)^{12}} = 0.788493$
$\frac{1}{(1+i)^5} = 0.905731$	$\frac{1}{(1+i)^{13}} = 0.773033$
$\frac{1}{(1+i)^6} = 0.887914$	$\frac{1}{(1+i)^{14}} = 0.757850$
$\frac{1}{(1+i)^7} = 0.870560$	$\frac{1}{(1+i)^{15}} = 0.7430145$
$\frac{1}{(1+i)^8} = 0.853490$	

$$i = 0.02,$$

$$a_{15} = \sum_{t=1}^{15} \frac{1}{(1+i)^t} = 12.849264$$

Another method for this calculation can be obtained using equation (2) as follows:

$$a_{15} = \frac{1 - (1+i)^{-15}}{i} = \frac{1 - 1.02^{-15}}{0.02} = \frac{1 - 1.02^{-15}}{0.02} = \frac{0.25698527}{0.02} = 12.849264$$

Equation (3.1b) gives detailed procedures employed to perform the calculations. However, the method is rather too slow and space consuming when compared with equation (3.2). At best, equation (3.1) is very efficient and time saving if on spreadsheet.

**Life Annuities models** -A life annuity of 1 payable periodically to life aged x is a periodic payments of 1 commencing at the end of one year if the life aged x is then living and continuing throughout his life time. Its present value, denoted  $a_x$  may be expressed as the sum of a series of pure endowment value:



$$a_{50} = {}_1P_{50} \times \frac{1}{(1+i)^1} + {}_2P_{50} \times \frac{1}{(1+i)^2} + \dots + {}_{41}P_{50} \times \frac{1}{(1+i)^{41}} = \sum_{t=1}^{41} \frac{{}_tP_{50}}{(1+i)^t}$$


---

${}_1P_{50} \times \frac{1}{(1+i)^1}$	→ 0.995943 × 0.98039216 =	0.976415
${}_2P_{50} \times \frac{1}{(1+i)^2}$	→ 0.995569 × 0.96116878 =	0.956910
.....	.....	.....
.....	.....	.....
${}_{40}P_{50} \times \frac{1}{(1+i)^{40}}$	→ 0.874606 × 0.45289042 =	0.396101
${}_{41}P_{50} \times \frac{1}{(1+i)^{41}}$	→ 0.865113 × 0.44401021 =	0.384119

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$i = 0.2,$	$\sum_{t=1}^{40} \frac{{}_tP_{50}}{(1+i)^t} = 26.95402$
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If retirement takes place at age 51, the actuarial equivalent annuity rate is calculated as follow:

$$a_{51} = {}_1P_{51} \times \frac{1}{(1+i)^1} + {}_2P_{51} \times \frac{1}{(1+i)^2} + \dots + {}_{40}P_{51} \times \frac{1}{(1+i)^{41}} = \sum_{t=1}^{40} \frac{{}_tP_{50}}{(1+i)^t}$$


---

${}_1P_{51} \times \frac{1}{(1+i)^1}$	→ 0.995569 × 0.98039216 =	0.976048
${}_2P_{51} \times \frac{1}{(1+i)^2}$	→ 0.995188 × 0.96116878 =	0.956544
.....	.....	.....
.....	.....	.....
${}_{39}P_{51} \times \frac{1}{(1+i)^{39}}$	→ 0.874606 × 0.461948223 =	0.404023
${}_{40}P_{51} \times \frac{1}{(1+i)^{40}}$	→ 0.865113 × 0.45289042 =	0.391801

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$\sum_{t=1}^{40} \frac{{}_tP_{51}}{(1+i)^t}$	= 26.49716
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However, if retirees are to retire at age 70, the detailed computation of annuity rate is given as follow:

$$a_{70} = {}_1P_{69} \times \frac{1}{(1+i)^1} + {}_2P_{69} \times \frac{1}{(1+i)^2} + \dots + {}_{21}P_{69} \times \frac{1}{(1+i)^{21}} = \sum_{t=1}^{21} \frac{{}_tP_{69}}{(1+i)^t}$$

${}_1P_{69} \times \frac{1}{(1+i)^1} \rightarrow 0.978629 \times 0.980392 = 0.95944$	${}_{12}P_{69} \times \frac{1}{(1+i)^{12}} \rightarrow 0.937209 \times 0.788493 = 0.738983$
${}_2P_{69} \times \frac{1}{(1+i)^2} \rightarrow 0.976353 \times 0.961169 = 0.93844$	${}_{13}P_{69} \times \frac{1}{(1+i)^{13}} \rightarrow 0.930919 \times 0.773033 = 0.719631$
${}_3P_{69} \times \frac{1}{(1+i)^3} \rightarrow 0.973869 \times 0.942322 = 0.917699$	${}_{14}P_{69} \times \frac{1}{(1+i)^{14}} \rightarrow 0.924092 \times 0.757875 = 0.700346$
${}_4P_{69} \times \frac{1}{(1+i)^4} \rightarrow 0.971165 \times 0.923845 = 0.897206$	${}_{15}P_{69} \times \frac{1}{(1+i)^{15}} \rightarrow 0.91677 \times 0.743015 = 0.681174$
${}_5P_{69} \times \frac{1}{(1+i)^5} \rightarrow 0.968206 \times 0.905731 = 0.876934$	${}_{16}P_{69} \times \frac{1}{(1+i)^{16}} \rightarrow 0.909013 \times 0.728446 = 0.662167$
${}_6P_{69} \times \frac{1}{(1+i)^6} \rightarrow 0.964954 \times 0.887971 = 0.856852$	${}_{17}P_{69} \times \frac{1}{(1+i)^{17}} \rightarrow 0.900878 \times 0.714163 = 0.643373$
${}_7P_{69} \times \frac{1}{(1+i)^7} \rightarrow 0.961369 \times 0.870560 = 0.83693$	${}_{18}P_{69} \times \frac{1}{(1+i)^{18}} \rightarrow 0.892423 \times 0.700159 = 0.624838$
${}_8P_{69} \times \frac{1}{(1+i)^8} \rightarrow 0.957413 \times 0.853490 = 0.817143$	${}_{19}P_{69} \times \frac{1}{(1+i)^{19}} \rightarrow 0.883684 \times 0.686431 = 0.606588$
${}_9P_{69} \times \frac{1}{(1+i)^9} \rightarrow 0.953049 \times 0.836755 = 0.797469$	${}_{20}P_{69} \times \frac{1}{(1+i)^{20}} \rightarrow 0.874606 \times 0.672971 = 0.588585$
${}_{10}P_{69} \times \frac{1}{(1+i)^{10}} \rightarrow 0.948245 \times 0.820348 = 0.777891$	${}_{21}P_{69} \times \frac{1}{(1+i)^{21}} \rightarrow 0.865113 \times 0.659776 = 0.570781$
${}_{11}P_{69} \times \frac{1}{(1+i)^{11}} \rightarrow 0.942974 \times 0.804263 = 0.758399$	
$\sum_{t=1}^{21} \frac{{}_tP_{69}}{(1+i)^t} = 15.97087$	

The computations do not include the cost of annuity loading in the annuity rates computed for pricing exercise under the retiree's life annuity but rather based on actuarial fairness principle. Meanwhile, the purchase of annuity can take place at any point in time. It may even be at the age of 75 or so depending on the prevailing situation. For the purpose of this study, the annuity rates computed in this work are based on age 50 to 90. It is being assumed that the life span will not exceed 90 years for all annuitants<sup>1</sup>. The use of hand calculator to perform this exercise may become boring if the period is longer than 21. Hence, spreadsheet makes the calculations from any given period of time faster, easier, optimal and efficient.

## RESULTS AND INTERPRETATION

### Phased Withdrawal Computation Approaches

The method of performing the calculation is very simple after the schedules for the highest payout are entered into spreadsheet. Table 1 shows the computation results of present value annuity at rates of 4% to 6.5% interest rates.

<sup>1</sup> It is possible for some retirees to exceed the age of 90 while a great majority will not attain this age. For any risk of longevity, annuity underwriters will be responsible for financial loss as there will be gains/losses which are inevitable.

Table 1: Present value annuities at different of rate of returns from 4% to 6.5%

Years in payout	4%	4.50%	5%	5.50%	6%	6.50%
5	4.7134595	4.8780488	4.5797072	4.5150524	4.4518223	4.3899767
6	5.6014309	5.8536585	5.4171914	5.328553	5.2421369	5.1578725
7	6.4719911	6.8292683	6.230283	6.114544	6.0020547	5.8927009
8	7.3254814	7.804878	7.0196922	6.8739555	6.7327449	6.5958861
9	8.1622367	8.7804878	7.7861089	7.6076865	7.4353316	7.2687905
10	8.982585	9.7560976	8.5302028	8.3166053	8.1108958	7.9127182
11	9.7868481	10.731707	9.2526241	9.001551	8.7604767	8.5289169
12	10.575341	11.707317	9.954004	9.6633343	9.3850738	9.1185808
13	11.348374	12.682927	10.634955	10.302738	9.9856478	9.6828524
14	12.106249	13.658537	11.296073	10.92052	10.563123	10.222825
15	12.849264	14.634146	11.937935	11.517411	11.118387	10.739546

**Source:** Authors’ computation

Table 1 contains present values of annuity immediate between 4% and 6.5% from 5 to 15 years for retirees who may wish to use their accumulated funds for phased withdrawal. As shown in the table, increase in interest rate reduces the accumulated present values for any given years. For instance, accumulated present value for interest rates of 4% and 6% in the payout of 10 years are 8.982585 and 7.9127182 respectively. This means that annual pension withdrawals for phased withdrawal increases with increasing interest rate.

Table 2: Annual phased withdrawal at rate of returns from 4% to 6.5%

Years in payout	Accumulated pension fund	4%	4.50%	5%	5.50%	6%	6.50%
5	48,610,337.35	10,919,200.58	11,073,027.80	11,227,762.00	11,383,396.83	11,539,918.52	11,697,327.28
6	48,610,337.35	9,273,000.18	9,424,494.70	9,577,085.72	9,730,766.78	9,885,526.63	10,041,354.42
7	48,610,337.35	8,098,949.00	8,249,245.52	8,400,830.25	8,553,689.89	8,707,814.34	8,863,189.00
8	48,610,337.35	7,219,987.89	7,369,796.47	7,521,079.28	7,673,822.86	7,828,011.26	7,983,630.36
9	48,610,337.35	6,537,749.40	6,687,541.85	6,838,991.94	6,992,084.85	7,146,800.73	7,303,121.67
10	48,610,337.35	5,993,214.23	6,143,317.30	6,295,261.02	6,449,024.85	6,604,587.33	6,761,926.12
11	48,610,337.35	5,548,823.12	5,699,473.61	5,852,144.78	6,006,811.38	6,163,447.16	6,322,027.81
12	48,610,337.35	5,179,536.93	5,330,910.30	5,484,481.02	5,640,219.97	5,798,096.60	5,958,080.14
13	48,610,337.35	4,868,020.32	5,020,249.96	5,174,850.65	5,331,788.54	5,491,028.80	5,652,534.38
14	48,610,337.35	4,601,890.69	4,755,078.69	4,910,809.21	5,069,042.93	5,229,738.68	5,392,854.38
15	48,610,337.35	4,372,067.40	4,526,293.51	4,683,231.12	4,842,833.88	5,005,054.68	5,169,844.58

**Source:** Authors’ computation.

Table 2 shows retiring employees with identical accumulated funds but with different years which accumulated funds are to be used up. Considering the different rates of returns, the higher the rate, the

higher the annual pension withdrawal and vice versa. However, the retirees with lesser years to use up accumulated funds have more annual pension withdrawal than those with more payout years. Consequently, retirees with 5 years' payout at the rate of 4% has almost twice of retirees with 11 years' payout option (5,548,823.12) at the same rates.

In negotiating rate of returns, it is advisable for retirees to get returns that will give them annuity rates closer to expected number of years at retirement. If employees are expected to commence retirement from age 55 and the expectation of life in retirement is 20 years, then the rate of returns to be sought should start from 3% upwards. Anything less than this rate limits will lead to overcharging of annuitants.

**Table 3: Retiree's life annuity rates computation results**

Age	4%	4.50%	5%	5.50%	6%	6.50%
65	15.25129	14.47038	13.74907	13.0819	12.46396	11.89085
66	14.87419	14.1344	13.44938	12.81426	12.22465	11.6766
67	14.48336	13.78465	13.13605	12.53324	11.97233	11.44978
68	14.07841	13.42067	12.80857	12.23829	11.70639	11.20974
69	13.65896	13.04202	12.46641	11.92881	11.42618	10.95578
70	13.22462	12.6482	12.10902	11.60419	11.13105	10.6872
71	12.77497	12.23874	11.73585	11.26379	10.82028	10.40324
72	14.7222	11.81313	11.34629	10.90694	10.49315	10.1031
73	11.82813	11.37086	10.93973	10.53296	10.14887	9.78594
74	11.33009	10.91138	10.51555	10.1411	9.78664	9.45086
75	10.81509	10.43419	10.07312	9.73066	9.40563	9.09696
76	10.28274	9.93877	9.61183	9.30089	9.00501	8.7233
77	9.73268	9.42465	9.13105	8.85107	8.58394	8.32895
78	9.16458	8.90454	8.64326	8.39341	8.15439	7.92561
79	8.57811	8.36607	8.13605	7.91548	7.70389	7.50084
80	7.97299	7.80889	7.60892	7.60892	7.23165	7.05365
81	7.34894	7.02079	6.8356	6.65775	6.48687	6.32264
82	6.70568	6.60916	6.46529	6.32615	6.19155	6.0613
83	6.04299	5.97752	5.85923	5.74449	5.63319	5.52518
84	5.36062	5.23705	5.13594	5.03792	4.94285	4.85063
85	4.65828	4.62871	4.5504	4.47421	4.40007	4.32791
86	3.93559	3.98603	3.92883	3.87297	3.8184	3.76509
87	3.19214	3.30745	3.26942	3.23208	3.19544	3.15947
88	2.4274	2.5591	2.53522	2.51171	2.48856	2.46577
89	1.64081	1.74932	1.73695	1.72474	1.71267	1.70076
90	0.83184	0.89685	0.89258	0.88835	0.88416	0.88001

**Source:** Authors' computation

In Table 3, the annuity rates decrease with increasing rates of returns for different ages. The annuity rate at age 65 is 14.470380 with 4.5% returns on interest and decreased to 11.890850 at 6.5% rate of returns on investment. Annuity rates decrease with increasing age at a constant rate of interest. This decreasing pattern at fixed interest rates with increasing ages conforms to reality as those who purchase annuity at age 65 have up to 25 years to continue to access annul pension income than someone who purchased annuity at age 70 but has only 20 years to enjoy the equivalent annual pension income in line with accumulated funds. As shown in Table 3, it can be seen that the cost of annuity is higher at age 65 than age 70 which means that those who purchase annuity at younger ages pay higher cost than those who purchase annuity at more advanced ages. Consequently, when employees are making decision with respect to retirement annuity, they need to be furnished with prevailing rates and cost of annuity so as to make wise choice on any given rate of returns.

**Table 4: Accumulated pension funds and payout annuity rates based on investment returns from 4% to 6.5%**

Age	Service years	Accumulated funds at 6% p.a.	Annual pension withdrawal of fund invested at computed annuity rates:					
			4%	4.50%	5%	5.50%	6%	6.50%
65	35	82,452,695.24	5,406,276.80	5,698,032.48	5,996,965.27	6,302,807.33	6,615,288.82	6,934,129.62
66	36	88,515,046.64	5,950,915.42	6,262,384.44	6,581,347.74	6,907,542.58	7,240,701.91	7,580,549.70
67	37	94,941,139.11	6,555,187.41	6,887,453.73	7,227,525.71	7,575,147.30	7,930,046.96	8,291,961.86
68	38	101,752,797.14	7,227,577.34	7,581,797.12	7,944,118.44	8,314,298.58	8,692,073.06	9,077,177.27
69	39	108,973,154.64	7,978,144.36	8,355,542.67	8,741,342.11	9,135,291.34	9,537,146.68	9,946,635.90
70	40	116,626,733.60	8,818,910.00	9,220,816.69	9,631,393.26	10,050,398.49	10,477,603.96	10,912,749.23

**Source:** Authors’ computation

Table 4 is the results of accumulated pension funds and payout annuity rates based on investment returns form 4% to 6.5%. As it can be seen in Table 4, an employee who retires at age 65 after 35 years of service will accumulate ₦82,452,695.24 for retirement funds. Given the different rate of returns, the higher the rate of returns, the higher the annual pension withdrawal and vice versa. For instance, the annual pension withdrawal at the rate of 4% is ₦5,406,276.80 while the annual rate at the rate of 5% is ₦5,996,965.27 for the same accumulated pension funds. This shows that the higher the rate of returns, the more the annual pension income the retiree’s life annuity option is able to access. The same interpretations go for other accumulated funds at ages 66 to 70.

## **CONCLUSIONS AND RECOMMENDATIONS**

This study was designed to link the accumulated phase of DC pension with its payout phase. Life data were used to determine the future pension contributions. The annual rates of withdrawal for phased withdrawal and retiree's life annuity were computed. These rates were used to determine the annual pension withdrawals for two pension income options. It is expected that those in *under average lives* (those with substandard health) will go for phased withdrawal while those in sound health should go for retiree's life annuity.

The findings from this study revealed that annuity rates decrease with increasing age at any given rate of interest. These rates at younger ages reduce the accumulated pension funds of retirees with life annuity. Hence, pension income under the DC scheme depends on the accumulated funds. To have adequate protection at retirement, employees must have accumulated sufficient funds whilst in active years of service. However, retirees with lesser years to use up accumulated funds under phased withdrawal have more annual pension incomes than those with extended years in payout. The phased withdrawal options with consumption period exceeding 10 years expose retirees to inflation erosion.

On the basis of the above findings, it is recommended that retiring employees need to ensure that their monthly pension contributions are remitted to their RSAs as and when due in order to accumulate sufficient funds for retirement. Similarly, the study recommends that when employees are making decision with respect to retiree's annuity, they need to be informed about prevailing rates and cost of annuity so as to make wise choice on any given rate of returns.

Although retiring employees may choose any retirement income option irrespective of health status, phased withdrawal option of retirement income exposes them to risk of inflation and longevity. A retiree's life annuity which is designed to protect against the risk of inflation and longevity is recommended for those in sound health. The loading to be used by the annuity underwriters may depend on prevailing market conditions. However, there will be need for the market to be transparent so as not to discourage potential annuitants. If the pricing rates are high, many retirees will be forced to self-insure, i.e. by taking phased withdrawal option.

This study is not without limitation, however. In the annuity rates computed, actuarial fair value, i.e. equivalent principle was employed and no loading was used in the computations. Despite the non-incorporation of loading into annuity rates computations, this study contributes to the existing body in knowledge by guiding practitioners by showing step by step approach on how annuity rates were computed, unlike other studies that relied on already computed annuity rates that are abstract or alien to the economic realities in Nigeria. The study also contributes to existing literature by demonstrating how the accumulation models relate to payout models.

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## APPENDIX

**Table A: Data on academic staff salaries form Lecturer I to Professorial Grades**

S/N	Entry Age	Expected years of service	Years of Contribution	Grade	Step	Monthly Consolidated
1	30	39	1	CN01	1	173,899.58
2	30	38	2	CN01	2	180,191.42
3	30	37	3	CN01	3	186,483.17
4	30	36	4	CN01	4	258,192.08
5	30	35	5	CN02	1	267,664.33
6	30	34	6	CN02	2	277,136.50
7	30	33	7	CN02	3	286,608.75
8	30	32	8	CN02	4	296,081.00
9	30	31	9	CN03	1	305,553.25
10	30	30	10	CN03	2	314,585.08
11	30	29	11	CN03	3	326,034.42
12	30	28	12	CN03	4	337,483.75
13	30	27	13	CN04	1	348,933.08
14	30	26	14	CN04	2	360,382.42
15	30	25	15	CN04	3	371,831.75
16	30	24	16	CN05	1	382,262.42
17	30	23	17	CN05	2	395,594.00
18	30	22	18	CN05	3	408,925.67
19	30	21	19	CN05	4	422,257.25
20	30	20	20	CN05	5	435,588.75
21	30	19	21	CN05	6	448,920.42
22	30	18	22	CN06	1	462,252.08
23	30	17	23	CN06	2	475,583.83
24	30	16	24	CN06	3	488,915.33
25	30	15	25	CN06	4	502,246.92
26	30	14	26	CN06	5	502,246.92
27	30	13	27	CN06	6	502,246.92
28	30	12	28	CN07	1	502,246.92
29	30	11	29	CN07	2	502,246.92
30	30	10	30	CN07	3	502,246.92
31	30	9	31	CN07	4	502,246.92
32	30	8	32	CN07	5	502,246.92
33	30	7	33	CN07	6	502,246.92
34	30	6	34	CN07	7	502,246.92
35	30	5	35	CN07	8	502,246.92
36	30	4	36	CN07	9	502,246.92
37	30	3	37	CN07	10	502,246.92
38	30	2	38	CN07	10	502,246.92
39	30	1	39	CN07	10	502,246.92
40	30	0	40	CN07	10	502,246.92

Source: Authors' computation

**Table B: 1983 annuity mortality data**

Retirement age	p(x)	Retirement age	p(x)
50	0.995943	71	0.976353
51	0.995569	72	0.973869
52	0.995188	73	0.971165
53	0.994802	74	0.968206
54	0.994409	75	0.964954
55	0.994006	76	0.961369
56	0.993591	77	0.957413
57	0.993161	78	0.953049
58	0.99271	79	0.948245
59	0.992218	80	0.942974
60	0.991662	81	0.937209
61	0.991017	82	0.930919
62	0.99026	83	0.924092
63	0.98937	84	0.91677
64	0.988336	85	0.909013
65	0.987149	86	0.900878
66	0.985801	87	0.892423
67	0.984283	88	0.883684
68	0.982586	89	0.874606
69	0.980704	90	0.865113
70	0.978629		

**Source:** Black and Skipper, 2000

# NET MIGRATION AND ECONOMIC GROWTH NEXUS: EMPIRICAL EVIDENCE FROM NIGERIA

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## Abstract

*Migration plays an important role in determining the economic status of most developing countries in the World and Nigeria is not an exception. Record has shown that Nigeria experiences high emigration rate relative to its immigration, and this alone has posed a serious threat to the growth and development of the economy. This study examines net migration and economic growth nexus: empirical evidence from Nigeria, using time series secondary data spanning the period of 1970 to 2017, applying the Autoregressive Distributed Lag (ARDL) Bounds testing approach. The results of the cointegration test shows that, there is a long run cointegrating relationship between net migration and economic growth alongside other control variables. Specifically, the findings of the study revealed a negative significant long run relationship between net migration and economic growth. Therefore, the study recommends that the push factors such as poor wage and incentive structure in Nigeria need to be addressed. Moreover, the pull factors, such as good quality of life abroad need to be provided in Nigeria, in order to discourage people from leaving the country. The latter can be achieved through massive infrastructural development, transparent recruitment process and incentive based remuneration system that rewards achievement and hard work.*

**Keywords:** Net Migration, Economic Growth, ARDL.

**JEL Classification:** F22, O47, C5

## INTRODUCTION

Nigeria plays an important role in African migration to other parts of the world. As the most populous African country, Nigeria has become increasingly involved in international migration to Europe, Gulf countries and South Africa. The economic reasons for migration in most cases are related to wage differentials, differences in GDP per capita, large economic disparities among regions and also unemployment differentials (Afaha, 2018). Moreover, there is continuing debate about the impact of international migration on the sending and receiving countries as well as on the migrants themselves. However, the question is what will happen if

both highly skilled and unskilled workers from developing countries move in large numbers to advanced countries to seek for opportunities. In addition, Migration is a global phenomenon which is not peculiar to a single country or a particular region. However, the impact of migration is worrisome to the extent that its effects go beyond the country of origin, but also the destination and the migrants. Even though it may be difficult to have a clear statistical figure on the skill level of emigrants, there are indications that the possibility to migrate is high among skilled labour particularly in Nigeria. However, it is on record that the number of emigrants from Nigeria is growing significantly against that of immigrants (Abiola, 2019), which poses a great threat towards attaining economic growth in Nigeria. Data from the World Development Indicators (2014) revealed that net-migration for Nigeria was -95,769 in 1992; it however rose to -170,000 in 2002 and in 2012 it stands at -300,000. This indicates that net-migration for the country has remained negative and rapidly rising especially since the early 1990s to 2012. Furthermore, the net migration for Nigeria in 2016 was -327 per thousand population, while it stands at -3.19 per thousand population in 2017, showing a decline, when compared to 2016 (WDI, 2017).

Drinkwater, Lotti and Pearlman (2003) asserted that migration may drain away valuable talents, since educated and motivated people are in most cases likely to migrate in search of greener opportunities. They explained further that in 2000, about 10.7% of highly skilled work force (trained in Nigeria) migrated abroad especially to Organisation for Economic Cooperation and Development (OECD) countries. Further, Fadahunsi and Rosa (2002) noted that 64% of Nigerian emigrants (on the average) have attained tertiary level of education. All these assertions provide strong evidence that many trained professionals, athletes and other skilled work force, who could have contributed to the development of Nigeria if they were engaged, have abandoned the nation and used their skills and intellect to aid the development of other countries.

Against this background, this study intends to empirically examine the nexus between net migration and economic growth in Nigeria. The study is also aimed at investigating the direction of causality between net migration and economic growth in Nigeria. After the introduction, the paper is structured as follows: section two provides theoretical literature review; section three is empirical literature, while section four describes the data and explains the methodology. Section five presents and explains the results. Finally, section six concludes and provides policy recommendations.

## **THEORETICAL LITERATURE**

### **Neoclassical Theory of Migration**

The neoclassical theory of migration is among the most influential theories of migration. The theory posits that wages differentials and employment conditions between countries as well as migration costs are factors causing migration. According to this theory intending migrants estimate the benefits and costs of migrating before making such decisions; hence migration occurs if their expected return (ER) is positive (Arango, 2000). “This theory of migration is based on familiar tenets like rational choice, utility maximisation, expected net returns, factor mobility, wage differentials and the fact that migration results from the uneven geographical distribution of labour and capital.” (Arango, 2002).

According to this theory, workers usually move from countries with abundance of labour and low wages to others that are labour-scarce with higher wages. Hence the principal motivation for migration is the increased welfare that individuals receive from higher labour income or wages. However, the neoclassical theory of migration is argued to suppress the role of non-economic factors which to a large extent play a deterministic role in an individual migrant’s decision to leave his home country (Arango, 2002). The theory has failed to explain why few people move in view of existing and very large income gaps across countries. One would expect that massive movement of labour would be migrating across countries (that have scarce labour) with new information or the perception of higher returns on labour, but the reality is that existing barriers such as obtaining travel permits, visas and other documents which intending migrants must have, limit the degree of such exchange of labour across countries (labour immobility).

### **Dual Labour Market Migration Theory**

The dual labour market theory is another important theory applicable to migration. The theory links immigration to the structural requirements of modern industrial societies. The theory states that international migration is largely demand-based and is initiated by recruitment on the part of employers in developed societies or by government acting on their behalf; migration is driven by an increasing demand for “cheap” labour. The dual labour market theory pays more attention to the receiving end of migration in the destination countries or regions (Arango, 2000). Motivated to ‘make it’ in a foreign land, an immigrant accepts relatively low pay and is willing to endure just a little more hardship than natives, to the advantage of profit-motivated employers who gain from cheaper labour. The theory presumes that more developed economies require foreign workers to take up jobs, which local workers have refused (Arango, 2004, cited in Lucas, 2006).

The theory, according to Arango (2002) does not principally provide general explanations of the factors affecting migration, but points that international migration occurs as a structural

demand for foreign workers present in the economic structure of more developed economies. The theory explains only a part of reality, since it suggests that international migration is driven by demand and does not take into account the push factors from sending countries; so it is a one-sided theory. Migration in present times does not result primarily from recruitment practices, as migrants largely come based on their own planning and decision making, not necessarily to take up existing jobs or openings in the labour market of the destination country.

In summary, the neoclassical theory emphasized the role of economic factors as a major cause of migration. The dual labour market theory states that the pull factors in receiving countries, such as the chronic need for foreign workers that more advanced destination countries have are more significant in explaining the causes of international migration. It accords less significance to the push factors in source countries. However, all the above mentioned theories do not deny the fact that migrants play an important role to economic growth and development of many countries in the world. International migration contributes to growth through the provision of labour services, which is an essential factor in the production process, that may result into increase income, and consequently rise in the Gross Domestic Product (GDP) of not only the host country but even the migrant's own country, through remittances and job opportunities they can create.

### **EMPIRICAL LITERATURE REVIEW**

Sanderson and Kentor (2009) examined the relationship between globalization, development and international migration from 1970 to 2000 in less developed countries, using cross national empirical analysis. The finding showed a significant non-linear relationship between net emigration and economic development. Ramirez and Gonzalez (2018) investigated the contribution of migration to economic growth in Spain from 2009 to 2015 using input output analysis. The result indicated a positive relationship between migration and economic growth during the reviewed period.

Kotani (2012) undertook an empirical research to understand the effect of net-migration on economic growth relations in Indonesia. The study employed Ordinary Least Square (OLS) regression techniques, using annual time series data from 1993 to 2005 for GDP, population growth, fertility rate and net migration. The study revealed that lagged fertility rate does not affect the economic growth in the two-variable regression. However, there exists a significant negative relationship between population growth and economic growth upon the inclusion of net-migration as a variable in the model. The study therefore concluded that net-migration is a key determinant of economic growth.

Akanbi (2017) examined the impact of migration on economic growth and human development in sub-Saharan African countries from 1999 to 2013. The study used two stage least square estimation technique for the analysis. The result showed significant negative relationship

between migration and economic growth. Obomeghie, Abubakar and Abdurrahman (2018) investigated the impact of net migration on total fertility rate in sub-Saharan African countries, with empirical evidence from Nigeria for the period of 2000 to 2016, using descriptive statistics method. It was found that net migration impact positively in Nigeria.

Afaha (2013) investigated the relationship between migration, remittances and development in Nigeria from 1977 to 2008. Household survey-based method was used for the study. The result showed that migrants' remittances in Nigeria have significant positive relationship with economic growth. Darkwah and Verter (2014) examined the determinants of international migration in Nigeria spanning the period from 1991 to 2011. Ordinary least square estimation method was used. The result indicated that the level of unemployment, migrants' remittances and population growth are the key determinants of emigration from Nigeria to other countries. The findings also showed a strong positive relationship between the number of Nigerian's abroad and unemployment rate, migrants' remittances and population growth in Nigeria. Olarinde (2015) conducted a research on the effect of migration on Nigeria's human capital and economic growth from 1980 to 2011. Ordinary least square technique (OLS) was employed. The outcome of the study revealed a significant positive long run relationship between migration, human capital development and economic growth during the study period.

Moreover, Abiola (2019) investigated the impact of labour migration, remittances and economic growth in Nigeria from 1980 to 2016. The study used indirect least square approach for the analysis. The findings indicated a positive relationship between emigration and economic growth in Nigeria. In another study, Umar and Abdullahi (2019) empirically examined the impact of net population growth and economic growth in Nigeria using time series data from 1970 to 2017, through the application of ARDL model approach. The study realized a negative and significant long run cointegrating relationship between economic growth and net population growth within the sample period. Also, a unidirectional causality exists running from net population growth to economic growth. The study however failed to address the issue of net migration (difference between emigrant and immigrants) and its relationship to economic growth. From the reviewed studies, there are certain observed weaknesses in the use of methodology and application of control variables to examine the effect and the relationship between net-migration and economic growth. Studies conducted by Kotani (2012), Darkwah and Verter (2014), and Olarinde (2015) applied Ordinary Least Square Method, which may not be suitable for series that are not integrated in the same order, that is a combination of  $I(1)$  and  $I(0)$ . Hence the obtained results may not be reliable in such cases. To fill this gap, the present study employed Autoregressive Distributive Lag to examine the relationship between net migration and economic growth in Nigeria. In addition, none of the related studies have considered the relationship between net migration and economic growth in-

depth with particular reference to Nigeria. This study further incorporates other control variables such as human capital (proxy by educational expenditure), investment (proxy by gross fixed capital), and Foreign Direct Investment, as included in the previous studies.

## **METHODOLOGY**

### ***Variable Description and Data Source***

This study utilizes annual time series data spanning from 1970 to 2017. The growth rate of real Gross Domestic Product (GDP) is used as a proxy for economic growth. Net migration is the difference in the rate of emigration and immigration in Nigeria. The control variables include educational expenditure (proxy by total government expenditure in primary, secondary and tertiary levels in Nigeria), investment (proxy by gross fixed capital) and foreign direct investment measured by FDI stock. Moreover, education expenditure as the control variable plays a role in boosting economic growth based on human capital theory. Also investment serves as an important ingredient in the production processes; hence its contribution towards achieving economic growth can never be overemphasized. Finally, foreign direct investment also plays a significant role in promoting economic growth as re-echoed by Yaseen (2014), who holds that FDI helps in attaining economic growth through the transfer of external resources, which in turn increases the level of productive investment and supports the entire economy. The data on GDP, net migration, educational expenditure, and foreign direct investment were sourced from the World Development Indicators (WDI, 2017) while data on gross fixed capital were collected from the United Nations Conference on Trade and Development (UNCTAD, 2017).

### ***Estimation Technique***

The study adopts the bounds testing approach to co-integration based on Autoregressive Distributed Lag (ARDL) model framework, as proposed by Pesaran, Shin, and Smith (2001), in order to examine the relationship between net migration and economic growth in Nigeria. An important feature of the ARDL approach compared to other co-integration approaches such as Engel and Granger (1987) and Johansen and Juselius (1990) is that the ARDL does not impose restriction on the integration order of the variables being all  $I(1)$ . Consequently, the ARDL can be applied if one or some of the variables are  $I(0)$  and others are  $I(1)$  ( Abubakar & Kassim, 2016). The ARDL model involves gross domestic product, net migration alongside other control variables and is presented in equation (1) as:

$$\begin{aligned} \Delta L(GDP)_t &= \alpha_0 + \alpha_1 LGDP_{t-1} + \alpha_2 (NMGR)_{t-1} + \alpha_3 L(ED)_{t-1} + \alpha_4 L(INV)_{t-1} \\ &+ \alpha_5 L(FDI)_{t-1} + \sum_{i=1}^p \beta_1 \Delta L(GDP)_{t-i} + \sum_{i=0}^p \beta_2 \Delta (NMGR)_{t-i} + \sum_{i=0}^p \beta_3 \Delta L(ED)_{t-i} + \sum_{i=0}^p \beta_4 \Delta L(INV)_{t-i} \\ &+ \sum_{i=0}^p \beta_5 \Delta L(FDI)_{t-i} + \mu_t \dots \dots \dots (1) \end{aligned}$$

Gross domestic product (GDP) is the dependent variable and net migration (NMGR) is the core variable in the model. While education expenditure (ED), investment (INV) and foreign direct investment (FDI) stands as control variables, L is the natural logarithms, P is the optimal lag length and  $\mu_t$  is the error term. However, all the variables are logged except NMGR. Moreover, F- Test was conducted in order to detect if the variables are co-integrated, that is have long run relationship. The null hypothesis is  $H_0: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = 0$ , which is tested against the alternative hypothesis  $H_1: \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq 0$ . The decision rule is that if the computed F-statistic is greater than the upper bound critical value, then the  $H_0$  is rejected (the variables are co-integrated). On the contrary, if the F-statistic is below the lower bound critical value, then the  $H_0$  cannot be rejected (there is no co-integration among the variables). But if the computed statistic falls within (between the lower and upper bound) the critical value band, the result of the inference is inconclusive (Umar, 2018). In order to get the short-run coefficients of the variables, an error correction model (ECM) is estimated. The ARDL specification of the ECM is represented in equation (2) as:

$$\begin{aligned} \Delta L(GDP)_t &= \alpha_0 + \sum_{i=1}^p \beta_1 \Delta L(GDP)_{t-i} + \sum_{i=0}^p \beta_2 \Delta (NMGR)_{t-i} + \sum_{i=0}^p \beta_3 \Delta L(ED)_{t-i} \\ &+ \sum_{i=0}^p \beta_4 \Delta L(INV)_{t-i} \\ &+ \sum_{i=0}^p \beta_5 \Delta L(FDI)_{t-i} + \delta ECT_{t-1} + \mu_t \dots \dots \dots (2) \end{aligned}$$

**ANALYSIS AND DISCUSSION OF RESULTS**

**Results of Unit Root Test**

To ascertain the unit root (or stationarity) property of the series, Augmented Dicker-Fuller (ADF) and Philips-Perron (PP) statistics were used and the result is presented in table 1:

**Table 1: Results of Unit Root Tests**

Variable	ADF		PP	
	Level	First difference	Level	First difference
LGDP	-0.821	-5.764***	-1.045	-5.850***
NMGR	-4.292***	-----	-3.900**	-----
LED	-1.914	-3.610***	-1.359	-7.353***
LGFC	-2.339	-4.209***	-1.536	-4.205***
LFDI	-2.516	-12.901***	-1.411*	-----

Source: Researcher’ computation using e- views 9.

\*\*\*\*\*and \* indicate statistical significance at 1%, 5%, and 10%, respectively. L denotes logarithm. Lag length are selected based on AIC.

The results of the stationarity tests reported in Table 1 showed that NMGR is stationary at level (I (0)). Whereas, LGDP, LED, LINV and LFDI are stationary only after taking their first difference (I(1)).This shows that the series are a mixture of I(0) and I(1). The mixed order of integration of the variables provides a strong justification for the application of the ARDL method in this study.

**Results of ARDL Co-integration Test**

Upon verifying the stationary properties of the variables, the cointegration test is then conducted using the Bounds testing approach. The results of cointegration test of the model involving GDP, net migration and other control variables are presented in Table 2.

**Table 2: Results of ARDL Bound Tests**

Dependent Variable	Function				F-Statistic			
LGDP	F(NMGR,LED, LGFC,LFDI)				4.107**			
<b>Critical Values Bounds</b>								
10%		5%		2.5%		1%		
I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	
2.00	3.09	2.56	3.49	2.88	3.87	3.29	4.37	

Source: Researcher’s computation using Eviews 9.0

\*\* denotes statistical significance at 5%

The result shows that, the calculated F-statistic (4.107) is greater than the upper critical Bounds value at 5%, this implies that there is long run equilibrium co-integrating relationship between GDP, NMGR and other control variables over the sample study periods.

**Results of the Estimated Long Run Coefficients**

In order to estimate the relationship between the variables, the optimal lag-length (2,4,3,1,3) was automatically chosen by the Akaike Information Criterion (AIC). The results of the long-run is reported in Table 3:

**Table 3: Results of Estimated Long Run Coefficients**

<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistics</b>	<b>Prob.</b>
<b>LNMG</b>	<b>-0.706***</b>	<b>0.163</b>	<b>-4.322</b>	<b>0.000</b>
<b>LED</b>	<b>-0.113</b>	<b>0.089</b>	<b>-1.263</b>	<b>0.220</b>
<b>LINV</b>	<b>0.449***</b>	<b>0.132</b>	<b>3.393</b>	<b>0.003</b>
<b>LFDI</b>	<b>-0.157</b>	<b>0.126</b>	<b>-1.247</b>	<b>0.226</b>
<b>C</b>	<b>26.466***</b>	<b>2.791</b>	<b>9.482</b>	<b>0.000</b>

**R<sup>2</sup> = 0.751**  
**F-Stat= 3.911**

**Source:** Researcher’s computation using Eviews 9.0.  
**Note:** The ARDL model selected based in AIC is 2,4,3,1,3.

The results illustrate that net migration has a negative and significant effect on economic growth at 1% level of significant. Specifically, a 1% increase in net migration leads to a 0.71% reduction in economic growth. This outcome conforms to the finding of Drinkwater et al. (2013) who opined that migration can drain away valuable talents, because educated and motivated people are in most cases likely to migrate in search of better opportunities. This reflect the situation in Nigeria where many trained professionals such as teachers, doctors, engineers and so on, leave the country to look for better jobs abroad. These trained professionals that would have contributed to the development of Nigeria if engaged, abandoned the nation and used their skills and intellects to aid the development of other countries. The study is also in line with the finding of Akanbi (2017), who also found negative relationship between migration and economic growth in Nigeria.

The study therefore aligned with the neoclassical theory of migration which postulates that wages differentials and employment conditions between countries, as well as migration costs

are factors causing migration. The theory argues that intending migrants estimate the benefits and costs of migrating before making such decisions; hence migration occurs if their expected return (ER) is positive. Looking at the Nigerian context, the negative relationship between net migration and economic growth is not unexpected, considering the large turnout of skilled professionals and other unemployed youth who are emigrating out of the country to look for greener pasture in developed countries. Some of THE other reasons for emigration from Nigeria are associated problems of corruption which has eroded human value, the harsh economic climate, the rising unemployment, inadequate provision of basic social amenities and infrastructural decays, especially poor electricity supply and bad roads network which has rendered many gainfully employed youths either unemployed or under-employed. In addition, stringent economic policies that favour only the few elites at the detriment of the teeming masses has caused many Nigerians to abandon the country and look for opportunities outside. Therefore, while these skilled and trained Nigerians contribute to the development of their host countries, they became brain drain to their country of origin. The consequences of this are the underdevelopment and sluggish economic growth.

The coefficient of LED shows insignificant negative relationship with LGDP in the long run. A 1% increase in LED leads to a 0.11% decrease in economic growth in Nigeria during the study period. However, the negative relationship found between LED and LGDP was due to lack of skilled human resources which composes the ultimate basis for the wealth of nations. Therefore, capital and natural resources are considered as passive factors of production, human beings are the active agents who accumulate capital, exploit natural resources and build economic, social and political organization for sustainable economic development. Misplaced priority, poor budgetary allocation to education, and lack of political will to education can be said to have resulted in a negative relationship between economic growth and expenditure on education in Nigeria during the review period. On the other hand, investment (LINV) has a long run positive and significant effect on economic growth in Nigeria, a 1% increase in investment leads to an increase in economic growth in Nigeria by 45%. This result is consistent with the findings of previous studies such as Ugochukwu and Chinyere (2013), Shu'aib and Ndididi (2015), Onyinye et al. (2017) and Ikechi and Anayochukwu (2014).

The F-statistic is 3.911 and is statistically significant at 1 per cent probability level. This indicates that the coefficients included in the model are jointly statistically significant. The computed value of  $R^2$  is 0.751 shows that 75.1% of the total variation in the economic growth is accounted for by the included explanatory variables, while 24.9% of the total variation in economic growth is attributable to influence of other variables, which are not included in the estimated model.

**Results of Estimated Short Run Coefficients**

Having established the long run co-integration relation between the variables of interest, we then proceed to examine the short run behaviour of the variables in case of long run disequilibrium, and then observe the speed of adjustment towards the long run equilibrium using Error Correction Mechanism. The ECM measures the speed of adjustment and it shows how fast the system adjusts to restore equilibrium. The results of the short run model are reported in Table 4. The results indicate a positive and significant short run relationship between NMGR and LGDP. A 1% increase in NMGR leads to 39% increase in LGDP. The short run positive effect of NMGR on LGDP portrays a situation whereby trained and skilled Nigerians who travel abroad contribute to the economic growth, but only in the short run.

**Table 4. Results of the Estimated Short-Run Coefficients**

<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistics</b>	<b>Prob.</b>
<b>D(LGDP(-1))</b>	<b>0.208</b>	<b>0.124</b>	<b>1.675</b>	<b>0.108</b>
<b>D(NMGR)</b>	<b>0.385***</b>	<b>0.122</b>	<b>3.147</b>	<b>0.005</b>
<b>D(NMGR(-1))</b>	<b>0.054</b>	<b>0.122</b>	<b>0.443</b>	<b>0.662</b>
<b>D(NMGR(-2))</b>	<b>-0.294</b>	<b>0.272</b>	<b>-1.080</b>	<b>0.292</b>
<b>D(NMGR(-3))</b>	<b>-1.766***</b>	<b>0.300</b>	<b>-5.876</b>	<b>0.000</b>
<b>D(LED)</b>	<b>0.062*</b>	<b>0.023</b>	<b>2.689</b>	<b>0.013</b>
<b>D(LED(-1))</b>	<b>0.113***</b>	<b>0.028</b>	<b>3.976</b>	<b>0.001</b>
<b>D(LED(-2))</b>	<b>0.107***</b>	<b>0.027</b>	<b>4.005</b>	<b>0.001</b>
<b>D(LINV)</b>	<b>0.108***</b>	<b>0.035</b>	<b>3.039</b>	<b>0.006</b>
<b>D(LFDI)</b>	<b>-0.028*</b>	<b>0.016</b>	<b>-1.723</b>	<b>0.099</b>
<b>D(LFDI(-1))</b>	<b>0.061***</b>	<b>0.019</b>	<b>3.148</b>	<b>0.005</b>
<b>D(LFDI(-2))</b>	<b>0.043*</b>	<b>0.016</b>	<b>2.640</b>	<b>0.015</b>
<b>ECM(-1)</b>	<b>-0.392***</b>	<b>0.071</b>	<b>-5.499</b>	<b>0.000</b>

Source: Researcher’s computation using Eviews 9.0

\*\*\*, \*\*, \* denotes statistical significance at 1%, 5%, and 10%, respectively.

LED is found to have a positive and significant short run relationship with GDP. This means that a 1% increase in LED leads to 6% increase in economic growth in Nigeria. The coefficient of LED lag one and lag two show a positive and significant relationship with LGDP; that is a 1% increase in LED leads to an increase in economic growth by 11%. Furthermore, a positive and significant relationship exists between investments (LINV) and LGDP. The result indicates that a 1% increase in investment (LINV) leads to 0.11% increase in LGDP. Similarly, a negative and significant short run relationship was found between LFDI and LGDP. This means that a 1% increase in LFDI leads to 3% decrease in LGDP. Furthermore, the coefficient of ECM bears a negative sign and it is statistically significant at 1% level. This indicates that ECM which measures the speed of adjustment at which LGDP adjusts to change in LNPG,

LED, LINV and LFDI before restoring to its equilibrium is about 39%. This shows that 39% of deviations from the long run equilibrium would be corrected within a period one year.

***Results of Diagnostic Test***

In order to check for the reliability of the estimated model, diagnostic tests were conducted. Thus, Breusch-Godfrey serial correlation LM test, Breusch-Pegan hetroskedasticity test, Jarque-Bera normality test and Ramsey RESET (functional form) tests were carried out.

**Table 5: Results of Diagnostic Tests**

<b>LM Test Statistic</b>	<b>Results</b>
<b>Serial Correlation: <math>\chi^2</math></b>	<b>0.813 [0.458]</b>
<b>Functional Form (Ramsey Test): F-Stat.</b>	<b>0.807 [0.379]</b>
<b>Normality (Jarque-Bera)</b>	<b>19.38210[0.000]</b>
<b>Heteroscedasticity: <math>\chi^2</math></b>	<b>1.288 [0.285]</b>

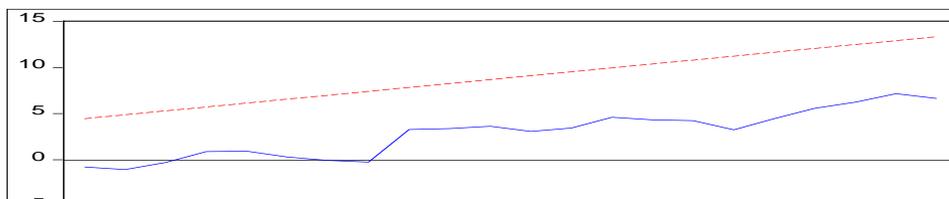
**Source:** Researchers’ computation using Eviews 9.0 .P-values are in parenthesis

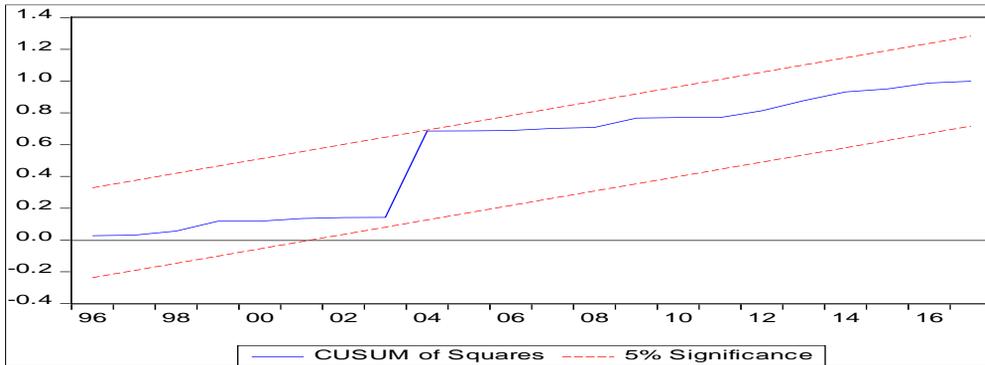
The result of diagnostic tests is reported in Table 5. The result of the serial correlation test using Breusch-Godfrey LM test indicates that the series is statistically insignificant, signifying that the error terms are not serially correlated. This implies that error terms are independent implying that the error term in one period does not depend on the error term in another period; therefore, we accept the null hypothesis of no serial correlation.

Normality (Jarque-Bera) test is shown to be statistically significant at 1% probability value, showing that the series are not normally distributed. This means a rejection of the null hypothesis of normally distributed series and accepting the alternative that the series are not normally distributed. However, according to Arshed cited in Umar (2018), if the sample is higher than 30, then one can ignore the normality issue as per central limit theorem. The results of the Breusch-Pagan-Godfrey heteroscedasticity test illustrate a high p-value. This suggests an acceptance of the null hypothesis and conclusion that the residuals have a constant variance (Homoscedasticity). The result of Ramsey test suggests that the estimated parameters of the models are stable.

***Results of Stability Tests***

In order to ascertain the stability of the parameters of the model, the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMQ) tests were conducted. If the plots of CUSUMQ break in the lower/upper bounds, the parameters are said to be unstable.





**Figure 1:** Cumulative sum of recursive residuals plots

The plots in Figure 1 falls within the boundaries, as the (CUSUM) and (CUSUMQ) plots do not fall in any of the 5% critical lines. This shows that the estimated parameters used in this study are stable for the period under study; confirming the stability of the model.

## **CONCLUSION AND POLICY RECOMMENDATIONS**

The ARDL Bound test of co-integration indicates a long run co-integrating relationship between economic growth, net migration and other control variables, namely educational expenditure, investment and Foreign Direct Investment. Moreover, a negative and significant long run relationship between net migration and economic growth is established, which reinforced the fact that the exodus of well trained professional and skilled labour force from Nigeria to other parts of the world in search of a greener pasture would negatively affect the productivity of the economy in the long run. However, in the short run, the effect of net migration on economic growth is found to be positive and statistically significant, buttressing a short run gain of net migration on the Nigeria economic growth. This may not be unconnected with the fact that proceeds from diaspora in form of remittances is no doubt being translated to economic growth through the process of multiplier effect.

Therefore, the study recommends that the push factors such as poor wage and incentive structure in Nigeria should be addressed through the provision of sound and effective

remuneration systems for employees across professions. This is in addition to promoting a system that rewards achievement and hard work, as well as ensuring transparent recruitment process. Moreover, government at all levels should ensure that they make life better through providing good quality of life (pull factors) for its citizens, equivalent to what is obtainable in those countries attracting Nigerians, in order to discourage more migration of people. This can be achieved through infrastructural development and observing high ethical standards and inculcating high moral values in the minds of Nigerians. Lastly, Nigerian government should provide an enabling environment and economic opportunities that will encourage Nigerians abroad to return home and invest, so as to develop the domestic economy.

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# DOES FISCAL CONSOLIDATION IMPROVE CURRENT ACCOUNT BALANCE? EVIDENCE FROM SUB-SAHARAN AFRICAN ECONOMIES.

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## **Abstract**

*The worrying debt situation in Sub-Saharan Africa has led to calls for government debt management by countries in the region in order to create additional fiscal space to enable them meet their development goals by reducing their budget deficits and ensuring that long-term public financial sustainability is achieved. This paper, using panel data analysis, provides answers to whether fiscal consolidation improves the current account balance of the countries in Sub-Saharan Africa. The results obtained showed a positive relationship between budget balance and current account balance in Sub-Saharan Africa; giving credence to the twin deficit hypothesis. The paper therefore concluded that fiscal consolidation is indeed a veritable tool to achieving stability of the external balance. Hence, it was recommended that governments in Sub-Saharan Africa should explore avenues that would boost their revenue generation towards financing their budget expenditures rather than over-relying on debt. To this end, measures including the widening of the tax base through targeting of the informal sector where perceived revenue leakages abound and enhancing their tax administration would increase government revenues.*

**Keywords:** Fiscal Consolidation, Budget Deficit, Current Account Balance, Twin Deficits Hypothesis, Sub-Saharan Africa

**JEL Classification:** E62, F14, F32.

## **INTRODUCTION**

Rising public debt has been a major concern in Sub-Sahara African countries. This is often fueled by relatively high fiscal deficits in the countries. While the underlying factors behind the deterioration in fiscal balances vary across countries, most times, fiscal deficits are justified by arguments of increased public investment to fill infrastructure gap and the limited scope of

monetary policy to stimulate economies during periods of economic downswing. Consequently, debt levels have remained high for SSA countries. Contrary to past trends where fiscal policy in Sub-Saharan Africa was mostly procyclical, the adoption of structural reform programmes in the 1980s saw most Sub-Saharan African countries pursue countercyclical policies (Lledó, Yackovlev & Gadenne, 2009). The countercyclical fiscal policy could be seen implemented during the 2008/2009 global financial crisis and the 2020 COVID-19 pandemic when pressure was mounted on the fiscal balances of most economies.

From a considerably high public debt position in the early 2000s (110 per cent debt to GDP ratio in 2001), Sub-Saharan African countries' debt to GDP fell to an average of 35 per cent in 2012. This followed the debt relief initiatives, including the Heavily Indebted Poor Countries (HIPC) initiative to address debt overhang in the poorest countries of the world and Multilateral Debt Relief Initiative (MDRI) for outright forgiveness where 29 sub-Saharan African countries benefited from such programmes (Coulibaly, Gandhi & Senbet, 2019). However, since 2013, the region's debt has been increasing. According to the International Monetary Fund (2018), public debt exceeds 50 percent of GDP in half of the region's economies. Besides, the number of the region's low-income countries in debt distress or at high risk of experiencing debt distress rose from 7 in 2013 to 12 in 2016. In 2017, the debt to GDP of 19 sub-Saharan African countries surpassed 60 per cent, at the same time the debt to GDP ratio of 24 countries in the region exceeded 55 per cent (Onyekwena & Ekeruche, 2019). By the end of 2018, the external debt to GDP ratio averaged 36 per cent (Geleta, 2021).

This worrying scenario precipitates the need for fiscal consolidation (of which spending cuts would be made and/or non-commodity revenue mobilized) by the governments of Sub-Sahara African countries in order to create additional fiscal space, to enable them meet their development goals (United Nations Economic and Social Council, 2018). Hence, discretionary fiscal policy changes were required of Sub-Sahara African governments towards reducing their budget deficits and ensuring that a long-term public financial sustainability is achieved. Fiscal consolidation is suggested to improve a country's economy including its current account balance through reducing budget deficits (Bluedorn & Leigh 2011; Ravn & Spange 2014; David 2017; Carrière-Swallow, David & Leigh, 2018). On the other hand, improved current account balance would boost employment that would almost certainly guaranty growth.

Empirical studies that have looked at the relationship between budget deficits and current account deficits are scanty for Sub-Saharan Africa. More so, the empirical literature is divergent on the nature of relationship between budget deficit and current account deficits. Besides, the majority of the studies on the subject matter for sub-Saharan Africa have been

country-specific and have employed only times series analyses (see Amaghionyeodiwe & Akinyemi, 2015; Ngakosso, 2016; Sakyi & Opoku, 2016; and Epaphra, 2017).

This paper examines the effects of fiscal consolidation on current account balance for sub-Saharan African economies. This is done in order to establish whether fiscal consolidation is indeed a veritable tool to achieving stability of the external balance. The paper contributes to the literature in two folds. On the one hand, it employed panel data for 48 Sub-Saharan Africa countries for the period 1980 to 2011 to check the validity or otherwise of the twin deficits hypothesis. This is important given the calls to governments of the region for fiscal discipline in order to achieve macroeconomic stability. On the other hand, panel data methods were followed, thus providing evidence of the joint effects of budget deficit changes on the current account.

Following this introduction, section 2 presents a discussion on the literature related to the subject matter, section 3 discusses the methodology employed in examining the effects of fiscal consolidation on current account balance in Sub-Sahara Africa, while section 4 presents the results and discussions arising from the estimations done. Section 5 concludes the paper.

**LITERATURE REVIEW**

*Theoretical Framework*

The analysis in this paper is based on the Keynesian twin deficits hypothesis. The hypothesis explains the causal link between budget deficit and current account deficits. The twin deficits hypothesis which is built on the Mundell-Fleming framework states that when budget deficit increases there would be an upward pressure on interest rates, inducing capital inflows and causing exchange rates to appreciate. This in turn induces more of imports than exports, hence, worsening the current account balance under a flexible exchange rate system. Under a fixed exchange rate regime, the twin deficit hypothesis will also apply. Real income or prices would increase with a budget deficit which would worsen the current account balance (Epaphra, 2017). To show this link, consider the national income identity below:

$$Y = C + I + G + (EX - IM) \quad - \quad 1$$

Equation 1 measures GDP by expenditures on final products where *Y* denotes Gross Domestic Product (GDP) or national income, *C* is households’ consumption expenditure, *I* represents gross private investment and *G* is total government expenditure. *EX* stands for total exports of goods and services, *IM* denotes total imports of goods and services and *EX-IM* represents net exports or current account balance (*CAB*).

An alternative representation of the national income identity is as follows:

$$Y = C + S + T \quad - \quad 2$$



current account deficits, the twin deficit hypothesis was true only in the long run. The study concluded that the twin deficit hypothesis does not hold in its hard form in the specific case of Bulgaria. Contrary to Ganchev (2010), Bluedorn and Leigh (2011) findings evidently supported the twin deficits hypothesis in their evaluation of the effect of fiscal consolidation on the current account of 17 OECD countries over the period 1978 – 2009. They established that fiscal consolidation in per cent of GDP raises the current account balance-to-GDP ratio.

Vamvoukas and Spilioti (2015) in their evaluation of the effects of budget deficits on current accounts of the 12 European Monetary Union (EMU) countries over the period 1970 – 2008 also corroborated the twin deficit hypothesis. The study divided the sample used into two sub-periods (the pre-Maastricht era and the post-Maastricht era), then followed the panel data estimation techniques. Their results showed a systematic positive effect of budget deficits on the current account of the EMU countries but more so during the post-Maastricht era. Thus, the twin deficit hypothesis was said to be more valid in the after-Maastricht epoch within EMU.

In a study on Nigeria, Amaghionyeodiwe and Akinyemi (2015) sought to verify the long run equilibrium relationship and direction of causality between budget deficits and current account deficits. Employing annual data from 1970 to 2010, they obtained results suggesting that a long run equilibrium relationship exists between budget deficit and the current account deficit in Nigeria. However, the results only indicated a reverse causation between budget deficit and the current account deficit. Similarly, Ngakosso (2016) in analyzing the twin deficits hypothesis for the Republic of Congo during the period 1980 – 2013 only found a long run causal link stepping from the current account deficit to the budget balance deficit. Thus, the study concluded that the consolidation of public finance in Congo would require only a good command of the current account.

Sakyi and Opoku (2016) using data for Ghana over the period 1960 – 2012 assessed the long-run relationship between fiscal and current account deficits. Following cointegration techniques the study attempted to verify whether the twin deficits hypothesis holds for Ghana. The results obtained showed a significant negative relationship between fiscal and current account deficits. Thus, fiscal deficit improves the current account deficit. Hence, the results do not lend support to the twin deficits hypothesis, but the twin divergence hypothesis.

Epaphra (2017) explored the validity of the twin deficits hypothesis in Tanzania using annual time series data for the period 1966 – 2015. Employing the Vector Error Correction Model method and Granger causality test, the study obtained results supporting the conventional theory of a positive relationship between fiscal balance and external balance and a unidirectional causal relationship running from budget deficits to current account deficits. The study thus, validated the existence of the twin deficits hypothesis in Tanzania. Also, Carrière-

Swallow, David and Leigh (2018) while estimating the short-term effects of fiscal consolidation on economic activity in 14 countries in Latin America and the Caribbean (LAC) provided support for the twin deficits hypothesis. Their findings were based on a dataset of fiscal consolidation measures taken by the governments of 14 LAC economies to reduce budget deficits during 1989 – 2016. Specifically, they found that fiscal consolidation has contractionary effects on GDP and on external current account balance.

**METHODOLOGY**

*Data*

Data for 48 Sub-Saharan African countries for the period 1980 to 2011 was sourced from the World Bank’s (2022) African Development Indicators. Data for this period is the most recent available. Specifically, annual data on current account balance, budget balance and gross national disposable income were obtained.

*Model Specification*

From equation 6, the current account balance would rise with increases in the private saving – investment gap and a rise in budget balance. The private saving – investment gap can then be regarded as disposable income. Therefore, the model to be estimated can be specified as follows:

$$CAB = f(INCOME, BD) \tag{7}$$

where *INCOME* is disposable income.

Equation 7 is transformed into a more specific form and represented as in equation 8.

$$CAB_{it} = \alpha + \beta_{1i}INCOME_{it} + \beta_{2i}BD_{it} + U_{it} \tag{8}$$

where *U* is the error term. Subscripts *i* and *t* represent the country and time period respectively.

The variables in equation 8 are defined and measured as follows:

*Current Account Balance (CAB):*

External balance on goods and services equals exports of goods and services minus imports of goods and services. Data are in current local currency.

*Disposable Income (INCOME):*

Gross national income is derived as the sum of GNP and the terms of trade adjustment. Data are in current local currency.

*Budget Balance (BD):*

The excess of current revenue over current expenditure. Data are in current local currencies.

**RESULTS**

*Summary Statistics*

Based on the panel data for SSA countries for the period 1980 – 2011, a summary statistics on the variables used in the analysis is presented in Table 1.

**Table 1: Summary Statistics**

	<b>Variables</b>		
	<i>Current Account Balance</i>	<i>Budget Balance</i>	<i>Gross National Disposable Income</i>
<b>Mean</b>	<b>23.2760</b>	<b>22.9145</b>	<b>20.8460</b>
<b>Maximum</b>	<b>29.8533</b>	<b>38.3785</b>	<b>26.5654</b>
<b>Minimum</b>	<b>-4.6052</b>	<b>1.7011</b>	<b>-7.3641</b>
<b>St. Dev.</b>	<b>5.7531</b>	<b>3.7178</b>	<b>3.9748</b>
<b>No. of Obs.</b>	<b>281</b>	<b>725</b>	<b>1045</b>

*Source: Computations from Study Data (2021)*

From Table 1, the mean of current account balance is 23.28. The deviation around this mean is 5.75. For budget balance, the mean score is 22.91 with a standard deviation of 3.72. The minimum and maximum scores for the natural log of budget balance is 1.70 and 38.38 respectively. In the case of gross national disposable income, the minimum value is -7.36 and the maximum value is 26.57. The average for gross national disposable income is 20.85 with a standard deviation of 3.97. Overall, there was no much deviation from the mean score for all the variable.

*Results of the Panel Unit Root Test*

In processing panel data with a considerable time component ( $T > 10$ ), it is important to ascertain the unit root properties of the variables. Hence, we employed the Augmented Dickey-Fuller (ADF) test for stationarity. The results obtained from the test for stationarity for all variables at levels are as presented in Table 2.

**Table 2: Results of the Augmented Dickey-Fuller Test for Panel Unit Root**

	Test Statistic		Probability
<i>Ln Current Account Balance</i>	<b>Inverse Chi-squared <math>P</math></b>	<b>65.2236</b>	<b>0.0005</b>
	<b>Inverse Normal <math>z</math></b>	<b>-2.4511</b>	<b>0.0071</b>
	<b>Inverse logit</b>	<b>-2.8911</b>	<b>0.0025</b>
	<b>Modified Inverse Chi-squared <math>Pm</math></b>	<b>4.1529</b>	<b>0.0000</b>
<i>Ln Budget Balance</i>	<b>Inverse Chi-squared <math>P</math></b>	<b>414.6482</b>	<b>0.0000</b>
	<b>Inverse Normal <math>z</math></b>	<b>-7.5458</b>	<b>0.0000</b>
	<b>Inverse logit</b>	<b>-13.8466</b>	<b>0.0000</b>
	<b>Modified Inverse Chi-squared <math>Pm</math></b>	<b>24.1979</b>	<b>0.0000</b>
<i>Ln Gross National Disposable Income</i>	<b>Inverse Chi-squared <math>P</math></b>	<b>171.4933</b>	<b>0.0000</b>
	<b>Inverse Normal <math>z</math></b>	<b>-2.4461</b>	<b>0.0072</b>
	<b>Inverse logit</b>	<b>-3.2596</b>	<b>0.0006</b>
	<b>Modified Inverse Chi-squared <math>Pm</math></b>	<b>6.2935</b>	<b>0.0000</b>

*Source: Computations from Study Data (2021)*

From Table 2, the probability values for all the test statistics for current account balance are 0.01 per cent, hence the null hypothesis that all panels contain unit root is rejected. Similarly, given that the probability values for all the test statistics for budget balance are 0, we reject the null hypothesis that all panels contain unit root. Equally, the results for the unit root test for gross national disposable income attest to the fact that there is no unit root among the panels; all the probability values of the tests statistics were less than 0.01. These results suggest that estimating the static model specified in equation 8 would be appropriate.

**RESULTS OF MODEL SPECIFICATION AND MODEL SELECTION TESTS**

Before estimating equation 8, it was necessary to check if the model is correctly specified. Afterwards, it was necessary to determine which estimator would be most appropriate. To verify whether or not the model was correctly specified, we employed the Ramsey regression specification error test (RESET) for which the result is presented in Table 3.

**Table 3: Result of the Ramsey RESET Test**

<b>F-Statistic</b>	<b>1.21</b>
<b>P-value</b>	<b>0.3081</b>

*Source: Computations from Study Data (2021)*

Given that the probability value of the Ramsey RESET test is greater than 0.05, the null hypothesis that the model to be estimated is correctly specified is not rejected.

For static panel data models, a choice of estimator is made between the fixed effects (FE) estimator and the random effects (RE) estimator. To decide among the two estimators, the Hausman test for model selection was carried out and the result presented in Table 4.

**Table 4: Result of the Hausman Test for Model Selection**

<b>Variable</b>	<b>Fixed Effects Coefficient</b>	<b>Random Effects Coefficient</b>	<b>Variance (Difference)</b>	<b>Standard Error</b>
Ln Budget Balance	<b>0.3864</b>	<b>0.4656</b>	<b>-0.0792</b>	<b>0.0318</b>
Ln Gross National Disposable Income	<b>0.9885</b>	<b>0.7837</b>	<b>0.2048</b>	<b>0.1074</b>
<b>Number of Observations</b>	<b>120</b>			
<b>Chi-square statistic</b>	<b>6.72</b>			
<b>Prob&gt; Chi-square</b>	<b>0.0348</b>			

*Source: Computations from Study Data (2021)*

The null hypothesis for the Hausman test for model selection has it that the random effects estimator is appropriate. Otherwise, the fixed effects estimator should be used. From the result in Table 4, the probability value of the Hausman Chi-square statistic is less than 0.05, hence we rejected the null hypothesis and concluded that the fixed effects estimator was appropriate.

***Effect of Fiscal Consolidation on Current Account Balance in Sub-Sahara Africa***

Using the FE estimator, the effect of fiscal consolidation on current account balance in Sub-Saharan Africa was tested. However, prior to the interpretation of the results, the tests for autocorrelation and heteroskedasticity were conducted to ensure statistical soundness of the results. The results for these tests are as shown in Table 5.

**Table 5: Results of the Tests for Autocorrelation and Heteroscedasticity**

<b>Wooldridge Test for Autocorrelation in Panel Data</b>	
<b>F – Statistic</b>	<b>16.861</b>
<b>Prob&gt; F</b>	<b>0.0011</b>
<b>Modified Wald Test for Groupwise Heteroskedasticity</b>	
<b>Chi – square</b>	<b>4.6e+28</b>
<b>Prob&gt; Chi – square</b>	<b>0.0000</b>

*Source: Computations from Study Data (2021)*

The result of the Wooldridge test for autocorrelation had a probability value of 0.0011. Thus, the null hypothesis that there is no autocorrelation is rejected. Likewise, the Modified Wald test result for groupwise heteroscedasticity had a probability value of 0. Therefore, the null

hypothesis of homoscedasticity was rejected. To cater for these problems, the robust standard errors option was employed in the fixed effects estimation.

The result of the fixed effects estimation is presented in Table 6.

**Table 6: Parameter Estimates of the Effect of Budget Balance and Gross National Disposable Income on Current Account Balance**

Independent Variable	Dependent Variable: Current Account Balance	
	Coefficient	t – Statistic from Robust Standard Errors Estimation
<b>Ln Budget Balance</b>	<b>0.3864*</b>	<b>2.72</b>
<b>Ln Gross National Disposable Income</b>	<b>0.9885**</b>	<b>4.99</b>
<b>Constant</b>	<b>-6.7738*</b>	<b>-2.27</b>
<b>Number of Observations</b>	<b>120</b>	
<b>F – Statistic</b>	<b>58.57</b>	
<b>Prob (F – Statistic)</b>	<b>0.0000</b>	
<b>R<sup>2</sup></b>	<b>0.7803</b>	

*Note: \*\* significant at 1%; \* significant at 5%.*

*Source: Computations from Study Data (2021)*

From Table 6, the probability values of the overall F – statistic is 0. Therefore, the null hypothesis that the coefficients of the independent variables are simultaneously equal to zero is rejected. More so, the measure of the goodness of fit for the estimated model showed that 78 per cent of total variations in current account balance were attributable to the independent variables included in the model. From the result, as expected, the coefficient of the natural log of budget balance was positive and statistically significant at 5 per cent level. The coefficient of the natural log of budget balance shows that an increase in budget balance by 1 per cent would lead to a rise in current account balance equal to 0.39 per cent. This result gives credence to the twin deficit hypothesis where the current account balance and budget balance are said to move in the same direction. This finding concurs with those of Ganchev (2010), Vamvoukas and Spilioti (2015), Epaphra (2017) and Carrière-Swallow, David and Leigh (2018).

Following *a priori* expectation, the result showed that there is a positive and significant relationship between gross national disposable income and current account balance. Specifically, a 1 per cent increase in gross national disposable income would improve the current account balance of Sub-Saharan African countries by 0.99 percent. This finding contradicts that of Epaphra (2017) and Sakyi and Opoku (2016).

## **CONCLUSION AND POLICY IMPLICATION**

The analysis in this paper has established a positive relationship between budget balance and current account balance in Sub-Saharan Africa. That is, higher fiscal surpluses imply lower current account deficits and vice versa. Thus, employing measures geared towards fiscal consolidation would improve the current account balance of Sub-Saharan African countries. This finding demonstrates that the twin deficit hypothesis is evident in Sub-Saharan Africa.

Accordingly, governments in Sub-Saharan Africa should explore avenues that would boost revenue generation towards financing their budget expenditures rather than relying so much on debts. In this regard, widening of the tax base through targeting of the informal sector where perceived revenue leakages abound would increase government revenues. Management of government debt is important for the sustenance of external balance of Sub-Saharan African countries. A rise in public investment should not lead to any further fiscal deficits to Sub-Saharan African countries. Alternative measures at consolidating their fiscal position should be sought, especially in the area of enhancing the tax administration system. Also, deliberate shifting of emphasis from primary commodities exports for which prices and demand are volatile to export of manufactured/processed products would raise stable and vital additional finance for public spending.

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## **Appendix**

### **List of Sub-Saharan African Countries used in the Analysis**

Angola	Madagascar
Benin	Malawi
Botswana	Mali
Burkina Faso	Mauritania
Burundi	Mauritius
Cameroon	Mozambique
Cape Verde	Namibia
Central African Republic	Niger
Chad	Nigeria
Comoros	Rwanda
Congo, Dem. Rep.	Sao Tome and Principe
Congo, Rep.	Senegal
Cote d'Ivoire	Seychelles
Equatorial Guinea	Sierra Leone
Eritrea	Somalia
Ethiopia	South Africa
Gabon	South Sudan
Gambia, The	Sudan
Ghana	Swaziland
Guinea	Tanzania
Guinea-Bissau	Togo
Kenya	Uganda
Lesotho	Zambia
Liberia	Zimbabwe

**LIVELIHOOD DECISION AND ENVIRONMENTAL DEGRADATION IN MINING:  
THE VALUE-ACTION GAP IN THE ARTESINAL BARYTES  
MINING OF AZARA, NASARAWA STATE.**

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**ABSTRACT**

*Anthropogenic activities like mining are products of rational human decisions that are informed by socio-economic motives, belief and value systems of the concerned. This study examined livelihood decision and environmental degradation associated with mining in Azara. Existing researches show that although small-scale mining operations are fraught with adverse socio-economic and physical environmental impact, they are however regarded as both the last and first resort for the poor, landless, and unemployed who hope to break away from the yoke of poverty and social marginalization by partaking in it. Qualitative data were collected from the local miners as well as other mining stakeholders within and outside the mines on issues like the nature of the operation, occupational justifications; hope and fears in the operations, and the way forward. 61.6% of the respondents engaged in mining activity as a result of unemployment, the need for daily income and the lack of well-paying jobs. 68% of the respondents believed that mining causes both environmental and socio-economic problems in the area. The results suggest that decisions about barytes mining are rational in nature, given the facts that barytes mining is a free for all affair that offers instant gratifications (in ready employment and cash) for willing hands, and that the miners are either unaware or oblivious of the environmental and health hazards of the operation. The need for environmental education/awareness on mining operation which should be intensified with proper legislation.*

**Key Words:** Azara; Barytes; Environment; Mining; Impact.

**JEL Classification:** Q20, Q53, I31.

## **INTRODUCTION**

### **The Azara Barytes Mining Operation**

At least 80 percent of the world's baryte is consumed in drilling mud for oil and gas wells; the remainder is used largely in the chemical, glass, paint, and rubber industries (Donald, 1970). Worldwide, small-scale mining has gained prominence despite its informal nature. It employs a huge number of people (in the neighborhood of 13-15million) and affects the livelihoods of a further 80- 100million. And this number is sure to rise as the global economy falters. The number of miners also fluctuates with increasing global demand for minerals, as shown by the recent global increase in the use of mobile phones, which has caused a surge in the informal mining of coltan (a mineral of tantalum and columbite family) (MMSD, 2002). This mining also contributes to the livelihoods of many people other than the miners themselves, their dependents, and the local economy, since these miners do not complete the processing of the minerals themselves but instead, sell the ore to intermediaries, who transport it to the product markets.

In Nigeria, organized mining started around 1939 (Osuntokun, 1998). This was succeeded by small scale and artisanal mining operation as obtained in the study area. The collapse of the big mining companies in the 1970s and the introduction of Structural Adjustment Program (SAP) in the 1980s (whose objective was to diversify production base of the economy, increase competition through market system that promotes small scale businesses and enhance rapid economic growth) led to the proliferation of small-scale and illegal mining activities in the country as well as increased environmental devastation (Dabi & Nyagba, 1999). In Nigeria also, artisanal and small-scale mining is virtually a free for all affair and unregulated activity that all manner of people, including school-aged children, pregnant and breast feeding mothers engage in. The law guiding its operations are mere legacy of the nation's colonial past that underwent little or no changes in statutes up to the early 1980s, a development that is largely responsible for the myriads of problems associated with the activity (Dahiru, 2017). As at 1970s and 1980s when barytes and lead-zinc mining activities were at their peak in Nigeria, there were neither active environmental laws and regulations, nor any consciousness on the part of the people for environmental best practices in the operations. The need therefore for environmental education and proper legislations to guide and regulate mining operation in the country cannot be over emphasised (Dahiru, 2017). This is in view of the fact that the international community which is largely behind most of these operations view the natural resources and environmental quality issues of growing economies as secondary to their mission of improved internal growth and development, which is antithetical to the immediate deserving needs and interest of the poor nations and their people, and responsible for most of the environmental problems in such areas (Dahiru, 2017).

Small-scale mining has gained global importance both as a source of subsistence (for the

poor) and environmental degradation (UN, 1996). This is true for Azara barytes mines, where it is a small scale, privately-owned primitive activity that proceeds with little or no regard for environmental best practices and sustainability (Chaanda, Moumouni, Goki, and Lar, 2010; Dahiru, 2017). Recent global and indeed national socio-economic challenges have stimulated the growth of small-scale mining in Nigeria. This is true for this study area, where the operation employs all manner of people like the aged, child bearing women and school-aged children, who perform different kinds of tasks in the mines, with far reaching implications on the economy. This operation is the ready means of livelihood through instant employment and gratification for the poor unskilled and uneducated that see it as a last resort for escaping from the excruciating weight of poverty and social marginalization (Heemskerck, 2001).

Although the current scale of barytes mining operation in this study area is much lower than it was previously, the operation nonetheless adversely impacts the environment in many complex ways. This may be as a result of the crude and rudimentary implements being used, poor technical knowhow of the operators, and the use of mere intuition in locating and exploiting the material from the ground (Dahiru, 2017).

### **Statement of the Problem**

Azara barytes mining is an age long activity, and the second most important economic activity after agriculture. This activity seems to be progressively pulling the youths out of agriculture, education and other worthwhile endeavors and turning them into hired hands on the mine fields, with the implications of depriving the other sectors of the source of labor and momentum, increased challenges of food security and social vices, and brewing a mass of uneducated population. It also seems to be pushing the farmers off their lands through the lucrative sale of their farm lands that are turned into mining plots, thereby ravaging the poor and the environment the more, and creating large scale wastelands in the end. This is not only another disincentive to enhanced and sustained agricultural productivity and food security, but also a disincentive to environmental sustainability and well-being of the people on the long run.

Though catalytic in national growth and development, this activity is however associated with accelerated environmental degradation as is the case with the proposed extensive and lush 'Rafin Paa' forest reserve area of the State, and the danger of the release of lead associated toxic elements (like Ar, Cd, Sb, etc., as in Zamfara gold mines) to the environment, with the potential of killing people in droves (especially children, who are used extensively in some of the mine operations). This area is also deficit in literacy and skills with the belief that its

barytes deposit is infinitely abundant and available to all, and hence its indiscriminate exploitation in a sort of ‘frontier mentality’ by virtue of which the people are unwittingly destabilizing the very fabric of their survival and wellbeing on the long run.

Therefore, this study seeks to investigate the motives behind the activity and the perceptions of the various mining stakeholders of this very activity (e.g the active and passive miners, the locals, traditional rulers, the youths, market women, and the elders) on the ways to efficiently employ the best mining operation techniques without endangering the environment and adversely affecting the livelihoods of the people. This study seeks to examine the motives behind Azara barytes mining operations of Nasarawa State with the aim of analyzing its driving forces and socio-economic implications.

The first section of this work is the introduction, section 2 explains the conceptual and theoretical framework, section 3 discusses mining environmental impact and sustainability. Section 4 expounds the methodology employed in the study while 5 presents the results and discussions arising from the analysis. Section 6 concludes the paper.

## **CONCEPTUAL AND THEORETICAL FRAMEWORK**

This work is anchored on the “ecosystem service” concept, which is described as the benefits people derive from utilizing ecosystems, as well as the “environmental sustainability” paradigm, which is the long-term maintenance of ecosystem components and functions (Neville et al, 2010 and Doris et al, 2005). With regard to this work, it is expected that all mining environmental impacts (MEI) are positive in nature, and if otherwise, they are at least within acceptable limits, as well as basing all development policies on the comparison of cost and benefit principles to the environment for sustainable welfare and development.

This concept regards environmental sustainability as a balance between the desired ends and the costs involved, as well as a balance between the sustainability tripod (i.e environmental, economic, and social) which are important and indispensable in the overall sustainability equation (World Bank, 2006). The people of Azara area were purely agrarian before the commencement of barytes mining in the 1970s, which diversified their socio-economy and adversely affected their natural environment and well-being (Dahiru, 2017). The ecosystem service concept is focused on the links between ecosystem services and well-being of man, since human demands and consumption of natural resources have grown with escalating impact on the environment. This problem is compounded by the increasing reduction in the capacity of ecosystems to continue to sustainably provide their services and the corresponding increasing demand for its resources by the growing population of the earth. In most part of the world, ecosystem degradation is exacerbated by the poor understanding of its workings, lack of environmental best-practice, and the belief that environmental resources are

infinitely available for all to use and pass on to the coming generation. But the growing demands on the increasingly degraded global ecosystems diminish and jeopardize this prospect. The importance of this concept to this study therefore cannot be overemphasized because, while the ecosystem in Azara area provides barytes and other benefits, the increasing demand on this ecosystem for uses such as farming, grazing, and fishing, has resulted rather in drastic fall in its stock and pay offs; it's ability to continuously provide for its dependants on a sustainable basis, as well as the degradation and pauperization of the area at the end. Hence sound ecosystem management is very important, and should involve steps to address the utilitarian links of people to it (MEA, 2005).

### **MINING ENVIRONMENTAL IMPACT AND SUSTAINABILITY**

One of the most poignant paradoxes in life is that man's livelihood activities pose the most potent dangers to his survival and well-being, and it is why regulatory measures are necessary in order to guide and reduce the adverse impact of such activities on the ecosystem as well as help in achieving environmental sustainability (Dahiru, 2017). Though mining adversely impact the environment, it is however catalytic in national growth and development (Bell, 2001).

Most of the environmental problems today are not necessarily due to deliberate intents or disregard for the environment, but are bye products of genuine efforts at worthwhile goals as shown by Noggard (1994), According to him, man influences the ecosystem in manners not likely to result in precisely the very outcomes he initially planned for, and hence capable in principle of inducing real catastrophes at the end. For instance, the farmer who applies Nitrates or other forms of fertilizers on his field which run down the land and add to pollution problems in adjoining lands and water bodies is only trying to make it more productive. The housewife who uses phosphate detergent for her laundry only hopes to make her clothes cleaner and ease up her chores, and so also those who mine materials by surface and other methods attempt to produce their ores at the lowest practicable unit cost possible. Since all mineral production involves some costs and benefits, a logical corollary is that increased demand for these materials will result in corresponding change in the magnitude of their impact on the environment (Dahiru, 2017).

Mining causes significant changes on the nation's socio-economic and physical terrains. For instance, surface mining affects an entire ecosystem, leading to changes in marginal lands and soil fertility/productivity, and perhaps, it has the greatest impact on the land environment in terms of its utility/functionality. For instance, it is a well-known fact that pre 1930, the defunct Plateau State (comprising the study area) was a thickly forested

area with huge potentials for quality arable lands and rich biodiversity that are completely lost to mining today (Mallo, 1999).

Also, some of the abandoned paddocks now serve as means of livelihood for dry season and fish farmers as exemplified by the “Joe Garba” Rock water fish farm, Jos. In the same vein, some of the un-reclaimed pits around the Federal University of Agriculture Makurdi now provide water to the host community in the dry season when the resource is very scarce and highly sought after. In many other cases too, mining has led to the development of rural roads and other infrastructures that serve both the miners and the wider communities alike. Also, mining communities have contributed to the growth and development of strategic towns and cities in Nigeria such as Enugu, Jos and Port Harcourt (Odeku, 2001; Dahiru, 2017).

## METHODOLOGY

### The Study Area

The study area is Azara; an area within Awe Local Government Area (LGA) of Nasarawa State that is about 110 km South-East of Lafia. It lies within the famous economic mineral-rich Benue trough of the north central Nigeria, on an approximately, 1,535.5km<sup>2</sup> expanse of well drained land (Offodile, 1976; Obaje, 2006) within 08<sup>o</sup> 15’ and 08<sup>o</sup> 30’E Longitude, and 09<sup>o</sup> 04’, and 09<sup>o</sup> 23’ N Latitude, on the Northern tip of Awe LGA. The area is also an important agrarian community that is endowed with Rivers, Lakes and Ponds, large forest land and other resources, with a population of 120,000 people according to the 2006 census.

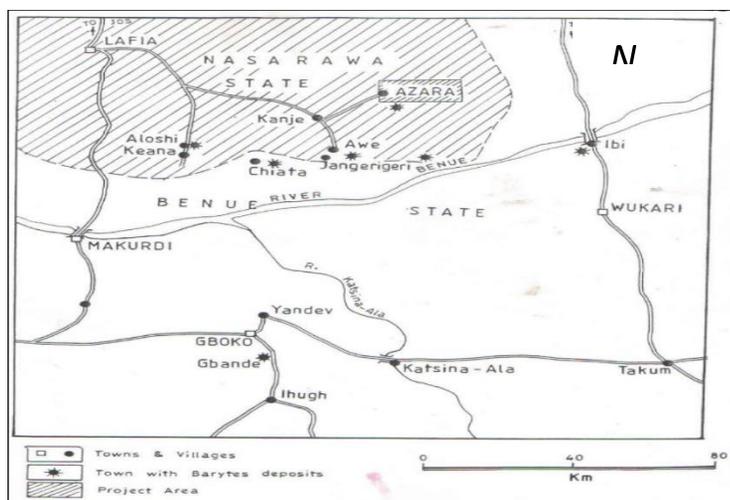


Figure 1: Map showing project and barytes rich areas

Source: Offodile, et al., (1997)

Figure 1 depicts areas with barytes deposits in Azara and other locations (Kanje and Alosi) within Awe logal government area and Keana.

### **Methods of Study**

This work is explorative and descriptive in nature, and hence a causal comparative research design was adopted for it in order to investigate existing relationship between the variables of interest, and using its findings to establish a relationship conclusion especially where none of the variables of interest has been manipulated before. The following approaches are therefore adopted for it:

1. Observations of the geophysical conditions of the mines and adjoining areas, with the intent that any significant anomaly (relative to the mines) may be attributed to the mining activities therein;
2. Interviews with respondents on the impact of mining, their perceptions, and the way forward.

### **Types and Sources of Data**

Two types of data were used in this study, which consist of stakeholder awareness and public perceptions of the activity and its environmental impact. The main sources of data are the primary (through field observation of the mines and oral interviews with target respondents), and secondary sources (through the review of relevant literature materials). The study population consist of 300 respondents as miners and other stakeholder groups (within and outside the mines).

### **Sampling Technique and Study Respondents**

Purposive sampling technique was used in interviewing respondents in order to accommodate the heterogeneous nature of the respondents (which comprise the miners, community leaders, the elites, market people, the porters, and the youths). The opinion/perception of this group was sought on barytes mining, its advantages and disadvantages to the people/environment, the role of the state government, mining decisions and motive, and the way forward (See Table 1).

**Table 1: Sample Size Distribution of Respondents**

<b>Respondents</b>	<b>No</b>	<b>%</b>
<b>Miners</b>	<b>150</b>	<b>50.0</b>
<b>Farmers</b>	<b>69</b>	<b>23.0</b>
<b>Nomads</b>	<b>27</b>	<b>9.0</b>
<b>Civil Servants</b>	<b>21</b>	<b>7.0</b>
<b>Traders</b>	<b>15</b>	<b>5.0</b>
<b>Community Leaders</b>	<b>09</b>	<b>3.0</b>
<b>Youths</b>	<b>05</b>	<b>1.7</b>
<b>Women group</b>	<b>04</b>	<b>1.3</b>
	<b>300</b>	<b>100</b>

*Source:* Field work

**RESULTS AND DISCUSSION**

**The Products of Mining, Mining Decisions and Motives**

Azara barytes mining is a lucrative activity with low entry requirements. It offers more instant benefits than many other primary activity, as one does not have to invest one’s money in the business, and therefore, one does not have to wait for any set period to earn any return on his money/investment, but needs only to be healthy/strong and ready to work. Its products are important aspects of life and the environment that are represented by the six major groups of solid minerals, namely: metallic, precious, gemstones, specialty metals, mineral fuels, and industrial minerals (Ogezi, 2008). These products support the very foundation of our economies and development; from the stones and gravels for building our roads, houses and other structural edifices, to fossil fuels in the form of oil and gas that are used as forms of energy and in the generation of revenue and Foreign Direct Investment (FDI) (Dahiru, 2017).

On the other hand, mining motives and decisions are the underlining reasons for engaging in mining by its practitioners as ‘instant gratification and ready employment’. The miners, though deficient in skills and literacy believe that, their decisions about the activity is more rational than meet the eyes, as none of them denied the inherent problems associated with the operation. All the miners and the non- miners alike are in the business to cater for their immediate needs; its guarantee to offer instant (daily) income, free access to the mines, and lack of alternative/better paying jobs amongs others.

Azara barytes mining is environmentally intensive, extensive, devastating, and unsustainable in nature, given its nature, scale and the implements used. 100 to 200 people work daily in the mines depending on the season of the year. This number gets closer to 300 or more in the dry season and fewer than 100 in the rainy season. Economic reasons dominate the motives behind the activity. The miners are aged between 13-65 years. They are mostly illiterate, semi-skilled and unskilled; some are married with children. Able-bodied youths and child-bearing women constitute over 50% of the miners. The miners are mostly rural folks and poor, who work seasonally in the mines. Even though they are not necessarily involved in full-time mining activities, they nonetheless come from communities with long history of small-scale mining, thereby bringing their long standing experiences to bear on the various aspects of the operation they are involved in.

### **Findings**

Though artisans, the respondents are aware of the adverse impact of mining, and hence they do not wish to continue with it forever, or for their children to be perpetually engaged in it. All the responses agreed that mining was 'an activity in disharmony with the desires and realities of the people and the environment' (Solomons, 1995). The main motive for mining according to the people is 'Poverty' (71%); the 'need for daily income' (57%); 'lack of (other) well paying jobs' (49%); 'poor farm land/yields' (46%); 'meeting immediate needs' like family health, shelter and others, (31%); and 'other problems' like bankruptcy/debts, natural disasters, civil strife, (22%), and others (11%).

The Azara barytes endowment is regarded as an ancestral blessing that outlives all, and hence its wanton exploitation and the phenomenal devastation of the environment. Also, health and environmental risks are clearly down played or completely disregarded issues in this area, with the people taking both for granted. The miners are a very high self indulgent group that employ all manner of intricate schemes and ad hoc measures to mitigate their health conditions, like returning to the town after months of hard work to rest and build up their strength; self medication and extensive use of herbs and devouring of all sorts of food items believed to be body building/health enhancing; fetishisms, or spiritualism among others. Also according to the people, barytes mining is a risky activity that one cannot engage in for long. One only does it for a short period in order to set up other jobs/business, with earnings from the activity regarded as quick money that easily fretter away, and hence the manner the miners spend it out in the field, with the belief of immediate replenishment on return to the pits. These and similar comments are common in the mines, suggesting the life styles of the miners and the perception that mining is only a short term sacrifice to resolve immediate problems and eliminate larger structural

problems affecting the people (Ibro, 34, a pit worker). These views suggest that mining decision and impact are not driven by ignorance or carelessness, but by clear insights and expectations for accruable benefits from the operation.

**Perception of Respondents on Mining**

As a way of life, barytes mining will continue to take place in this area for as long as barytes exist (Table 2), because of the benefits it affords the people as well as the belief and value system of the people. The respondents’ perception of mining environmental impact (MEI), where questionnaire Items 1-10 were used to answer questions on the subject of the study, with decision per item arrived at based on the total response type. From the table also, barytes mining can be seen to adversely impact its locality. The respondents generally perceive the activity as unsustainable, and hence the need, according to about 54% of them, for it to be regulated by the state government. About 52 % of the respondents were of the view that periodic environmental audit of the mines and surrounding areas be conducted to ascertain the extent of changes by the operation on the areas, with a view to putting appropriate measures to ameliorate its adverse impacts and enhance the favorable ones.

**Table 2: Summary of Responses on Mining Decision/Future Goals in the Mines**

<b>Responses</b>	<b>% (Yes)</b>	<b>% (No)</b>
<input type="checkbox"/> Mining cause both environmental and socio-economic problems in an area	68	32
<input type="checkbox"/> Miners desire better and less strenuous jobs outside the mines	64	36
<input type="checkbox"/> Miners want to quite mining as soon as they make enough for their dream jobs	61	39
<input type="checkbox"/> Miners don’t mind their children becoming miners in the future	34	66
<input type="checkbox"/> The people (farmers in particular) are worried about mining induced devastation on the environment	6	26
<b>Total</b>	<b>301</b>	<b>199</b>

**Source:** Field Work

**Mining Decision/Future Goals in the Mines**

68% of the respondents believed that mining causes both environmental and socio-economic problems in the area. They (64%) also desire better and less strenuous jobs, an

indication that they do not enjoy the activity since 66% of the people do not wish to see their children become miners in the future.

**Table 3: Analysis of Mining Motives**

<b>Motive</b>	<b>No of Respondents</b>	<b>%</b>
<input type="checkbox"/> Poverty/unemployment.	71	24.7
<input type="checkbox"/> Daily income	57	19.8
<input type="checkbox"/> Lack of other well paying jobs	49	17.1
<input type="checkbox"/> Poor farm yields	46	16.0
<input type="checkbox"/> Family needs	31	10.8
<input type="checkbox"/> Bankruptcy	22	7.7
<input type="checkbox"/> Others (vacation jobs, adventure)	11	3.8
Total	287	100.

**Source:** Field Work

### **Mining Motives**

Table 3 shows the percentage distribution of the motives behind mining activity in the study area. 61.6% of the respondents engage in mining activity as a result of unemployment, the need for daily income and the lack of well paying jobs. 16% attributed poor farm yields as the motive behind their involvement in mining activity. Family needs constitute 10.8% responses.

**Table 4: Perceptions of Respondents/Stakeholders on Mining**

<b>Perception Options</b>	<b>Yes</b>	<b>%</b>	<b>No</b>	<b>%</b>	<b>Not sure</b>	<b>%</b>
<b>&gt; Degradation of the environment</b>	<b>176.0</b>	<b>63.5</b>	<b>79.0</b>	<b>28.5</b>	<b>23.0</b>	<b>8.3</b>
<input type="checkbox"/> <b>Loss of environmental aesthetics</b>	<b>147.0</b>	<b>53.1</b>	<b>97.0</b>	<b>35.0</b>	<b>33.0</b>	<b>11.9</b>
<input type="checkbox"/> <b>and value Water quality disturbance</b>	<b>143.0</b>	<b>51.6</b>	<b>93</b>	<b>33.6</b>	<b>41.0</b>	<b>14.8</b>
<input type="checkbox"/> <b>Loss of biodiversity and livelihoods</b>	<b>109.0</b>	<b>43.4</b>	<b>119.0</b>	<b>41.0</b>	<b>49.0</b>	<b>16.6</b>
<input type="checkbox"/> <b>Land-use problems and other</b>	<b>117.0</b>	<b>47.2</b>	<b>121.0</b>	<b>41.6</b>	<b>39.0</b>	<b>11.1</b>
<input type="checkbox"/> <b>Conflicts Environmental sustainability</b>	<b>127.0</b>	<b>54.8</b>	<b>107.0</b>	<b>33.6</b>	<b>43.0</b>	<b>13.2</b>
<input type="checkbox"/> <b>Food security risk</b>	<b>139.0</b>	<b>52.1</b>	<b>83.0</b>	<b>30.0</b>	<b>55</b>	<b>16.8</b>
<input type="checkbox"/> <b>Practice regulation</b>	<b>137.0</b>	<b>52.5</b>	<b>89.0</b>	<b>31.1</b>	<b>51</b>	<b>17.4</b>
<input type="checkbox"/> <b>Increased social vices</b>	<b>129.0</b>	<b>46.6</b>	<b>114.0</b>	<b>41.1</b>	<b>34.0</b>	<b>12.3</b>
<input type="checkbox"/> <b>Environmental audit &amp; impact Assessmen</b>	<b>147.0</b>	<b>52.1</b>	<b>87.0</b>	<b>31.4</b>	<b>43.00</b>	<b>16.5</b>

**Source:** Field Work

**Perceptions of Respondents/Stakeholders on Mining**

More than half of the respondents were of the view that mining leads to the degradation of the environment, loss of environmental aesthetics and value, hampers environmental sustainability, and affects water quality. They also support environmental audit and impact assessment and believe that mining operation threatens food security.

**CONCLUSION AND RECOMMENDATIONS**

Barytes mining is an important driver of environmental and socio-economic changes in the study area especially because of its nature/scale, the technology employed, socio-cultural and value system of the people and, ability to offer ready employment and income to the people. The findings of this study have shown the significance of mining environmental impact, the need for environmental best practices in mining; mining environmental regulations, as well as sound developmental policies. Its findings have also shown that Azara baryte mining will continue to adversely impact the environment if cogent measures are not put in place to curtail its adverse effects, especially because of its free for all and primitive nature.

The principal issues with this mining activity include land disturbance, poor farm yields and quality of crops; belief and value systems of the people; heavy metals in the soils and waters; diminished common property resources, and poor safety of the operation, which all have real implications for environmental sustainability, utility, and well being of the people (Dahiru, 2017). Although mining requires much less land space than other primary

activities, it however has the harshest environmental consequences that are hard to mitigate, and hence the need for the following:

1. Concrete mitigation measures to ameliorate its adverse social and physical environmental effects.
2. Environmental education/awareness, best practice and appropriate regulations, without which mining areas will be faced with increased ecological liabilities and backwardness.
3. Deliberate policies and programs for balanced and equitable development that will ease the pressure on the environment, stem down the need for artisanal mining and its adverse effects, as well as provide alternative and more rewarding livelihood pathways for the people.
4. The state should as much as possible discourage the prevailing small scale and primitive baryte mining in Azara area by transforming and formalizing it in order to bring its benefits to the reach of both the State and the public, and encourage more efficient large scale operation by wooing corporate sector led investments into the operation.
5. Proactive measures for effectively curtailing adverse MEI and safeguarding the areas' overall integrity.

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## ANALYSIS OF INSTITUTIONAL QUALITY, HUMAN CAPITAL AND ECONOMIC GROWTH IN NIGERIA

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## **Abstract**

*The importance of human capital as well as quality of institutions in the growth process cannot be overemphasized. This study investigated the relationship amongst institutions, human capital and economic growth in Nigeria from 1996 to 2018 using time series data. Autoregressive Distributed Lag (ARDL) model was used to analyze the data. The findings from the study revealed that there exist a positive and statistically significant relationship amongst institutions (political stability), human capital and economic growth in Nigeria at 5% level of significance in the short-run, while control of corruption is statistically not significant both in the short-run and in the long-run in its relationship with economic growth in Nigeria at 5% level of significance. The study recommends among others that government should increase its expenditure on education because of its strategic importance in economic growth; the current stability in the polity should be maintained since it is growth-enhancing and agencies responsible in the fight against corruption should be strengthened.*

**Keywords:** ARDL, Economic growth, Human capital, Institutions, Nigeria.

**JEL Classification:** O09, O11

## **INTRODUCTION**

The importance of human capital in economic growth in both developed and developing economies cannot be overemphasized. Also, human capital is important in a country's socio-economic development (Sankay, Ismail & Shaari, 2010). According to Osoba & Tella (2017), human capital contributes to economic growth. This is because skilled workers as well as the formation of human capital raise production and bring about economic growth. Unfortunately, between 1999 and 2003, an average of 5.84% of the budget was devoted to education against the 26% recommended by the United Nations. On the other hand, studies by Amassoma & Nwosa (2011) and Bosworth & Collins (2003) showed that human capital has no positive and significant impact on economic growth. The data for many developing economies, Nigeria inclusive, are consistent with the prediction of both the endogenous and exogenous growth models which suggested that a permanent change in a key variable like human capital can cause a permanent change in an economy's growth rate. In fact, economies like Japan, Taiwan, China, and a few Asian countries have shown the importance of human capital in economic growth.

However, studies using both cross-country data pooling and country-specific data have suggested that the quality of institution matters in achieving economic growth (Acemoglu & Robinson, 2008; Kaufman, Kraay & Mastruzzi 2009). For instance, good institutions create an environment that promotes economic activity, inventiveness, growth, and development, whereas bad institutions result in economic stagnation. Similarly, institutional quality in the form of control of corruption and political stability have also received the attention of scholars. Whereas Leff (1986) and Huntington (1968) emphasized that corruption eliminates administrative bottlenecks and promotes growth in the economy while Shuaib, Augustine & Frank (2016) and Ajie & Gbenga (2015) argued that corruption hinders economic growth.







To achieve the objective of the study, the mathematical model is re-written as follows:

$$LGDP_t = \beta_0 + \beta_1 LCCT + \beta_2 LPSt + \beta_3 LHKt + U_t \quad - \quad - \quad - \quad - \quad 6$$

Where the parameters,  $\beta_i = 1, 2$  and  $3$  are the coefficient of the explanatory variables,  $U_t$  stands for stochastic disturbance term. From a priori expectation, all the variables have positive sign since effective control of corruption, political stability and improved human capital contribute to economic growth.

**Technique of Estimation**

The data collected for this study was analyzed using Autoregressive Distributed Lag (ARDL) model. The model by Pesaran, et al. (2001) was used in testing the existence of cointegration when the series are of mixed order; I(0) and I(1). The ARDL unrestricted error correction model is as follows:

$$\Delta LGDP_t = \alpha_0 + \sum_{i=1}^n \alpha_{1i} \Delta ICC_{t-i} + \sum_{i=1}^n \alpha_{2i} \Delta LPSt_{t-i} - 1 + \sum_{i=1}^n \alpha_{3i} \Delta LHK_{t-i} + \beta_1 lCC_{t-1} + \beta_2 lPS_{t-1} + \beta_3 lHK_{t-1} + \lambda ECT_{t-1} + \varepsilon_{t-1} \quad - \quad - \quad - \quad - \quad 7$$

Where;

$\Delta$  represents the first difference operator,  $l$  represents log-transformation,  $\varepsilon_{1-t}$  is the residual,  $\alpha_0$  is the drift component,  $\alpha_1, \alpha_2$  and  $\alpha_3$  denote the short-run coefficient, the  $\beta$ s symbolize the long-run coefficient, and  $\lambda$  is the speed of adjustment parameter.

**Unit Root Test**

The augmented Dickey-Fuller (ADF) test proposed by Dickey & Fuller (1979) and Phillip-Perron (1988) were used to determine the order of integration of the series. In order to avoid estimating spurious regression, the stochastic properties of the series were tested. Therefore, ADF test is given as:

$$\Delta y_t = \alpha + \gamma y_{t-1} + \sum_1^n a_1 \Delta y_{t-1} + \varepsilon_t \quad - \quad - \quad - \quad - \quad 8$$

In equation 8, lagged first difference terms of the dependent variable is added in order to ensure no autocorrelation is contained in the residuals.

**RESULTS AND DISCUSSIONS**

**Table 1: Augmented Dickey Fuller Unit Root Test**

Series	Intercept without trend		Intercept with trend	
	Level	1 <sup>st</sup> Difference	Level	1 <sup>st</sup> Difference
CC	-3.279894**	-5.49061***	-3.169341	-5.334327***
LGDP	- 3.888355***	-0.161971	0.392708	-2.595973
LHCD	- 11.37322***	-4.823276***	-1.969237	-5.107494***
PS	-2.249800	-11.73781***	-1.177308	-7.552047***

Note: \*\*\* and \*\* represent significance level at 1% and 5% respectively. The figures are the *t*-statistics for testing the null hypothesis that the series has unit root. The lag length is determined and fixed at 2 based on Schwarz (1987).

Source: Authors' Computation.

**Table 2: Phillip-Perron Unit Root Test**

Series	Intercept without trend		Intercept with trend	
	Level	1 <sup>st</sup> Difference	Level	1 <sup>st</sup> Difference
CC	-2.388071	-5.378326***	-2.389539	-5.241983***
LGDP	-1.999234	-2.248283	1.152648	-3.626751**
LHCD	-2.527852	-4.890280***	-1.576515	-6.702575***
PS	-1.393421	-11.66282***	- 3.645835***	-39.40169***

Note: \*\*\* and \*\* represent significance level at 1% and 5% respectively. The figures are the *t*-statistics for testing the null hypothesis that the series has unit root. The lag length is determined and fixed at 2 based on Schwarz (1987).

Source: Authors' Computation

The results of the unit root test depicted in table 1 and table 2 showed that the series are integrated of mixed order; that is I(0) and I(1). This confirmed the relevance and justification for the use of the ARDL cointegration approach.

Table 3: Bound Cointegration Test

Model	F-Stat.	Sig. Level.	Critical Value	
			I(0)	I(1)
LGDP =F(CC, PS, LHCD)	8.282676***	10%	2.72	3.77
CC= F(LGDP, PS, LHCD)	0.854968	5%	3.23	4.35
PS= F(LGDP, CC, LHCD)	14.76330***	2.5%	3.69	4.89
LHCD= F(LGDP, CC, PS)	11.44071***	1%	4.29	5.61

Note: \*\*\* represent significance level at 1% level.

Source: Authors' Computation

The ARDL Bounds test in table 3 indicated long-run cointegration relationship among economic growth proxied by gross domestic product (GDP), institutional quality proxied by control of corruption, political stability (PS) and human capital (HK) in Nigeria from 1996 to 2018. Thus, the null hypothesis of no long-run relationships among the variables is rejected (shown in the first row of table 3).

Table 4: Long Run and Short Run Coefficients

Variables	Long Run Coefficients	Short Run Coefficients	
LHCD	3.549845*** (0.0106)	LHCD	0.553516*** (0.0052)
CC	0.080672 (0.4304)	CC	0.012579 (0.4261)
PS	-0.222706*** (0.0017)	PS	0.026984*** (0.0078)
CONSTANT	-1.649993 (0.01724)	CointEq(-1)	-0.155927*** (0.0000)
<b>Diagnostic Test</b>	<b>LM</b>	<b>JB</b>	<b>HET</b>
<b>Chi-Square</b>	0.9279	1.038458	0.6357
<b>P-value</b>	0.8779	0.594979	0.5454

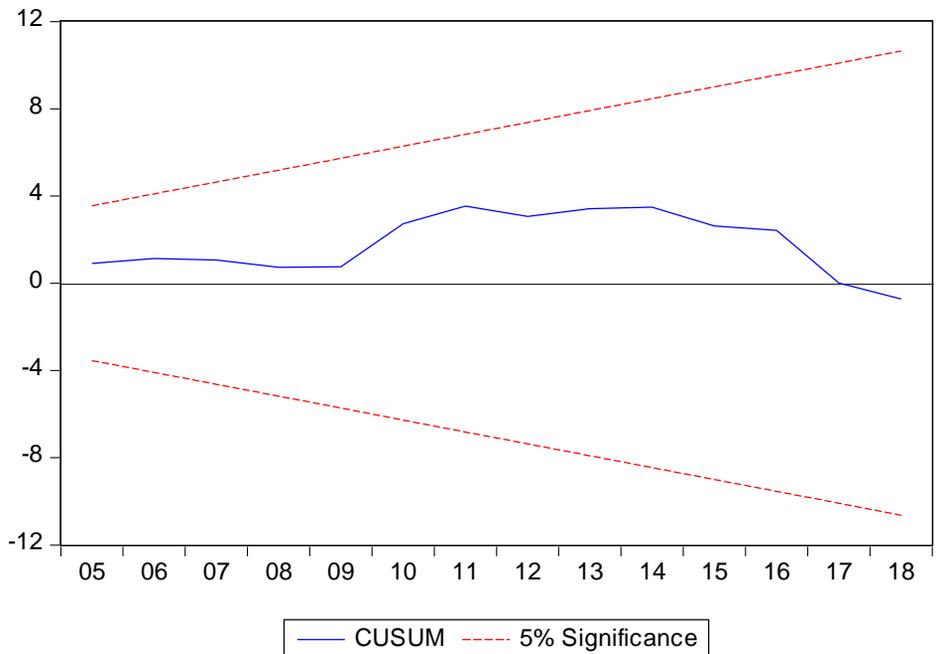
Note: \*\*\* denote statistical significance at the 1% level. The figures in parentheses are the T-statistics. Serial correlation was examined using Lagrange Multiplier test of residual (LM), functional form was based on Ramsey's RESET (RESET) test, normality test is based on skewness and kurtosis (JB) while Heteroscedasticity was based on squared residuals on squared fitted values (HET).

Source: Authors' Computation from output of Eviews version 9.

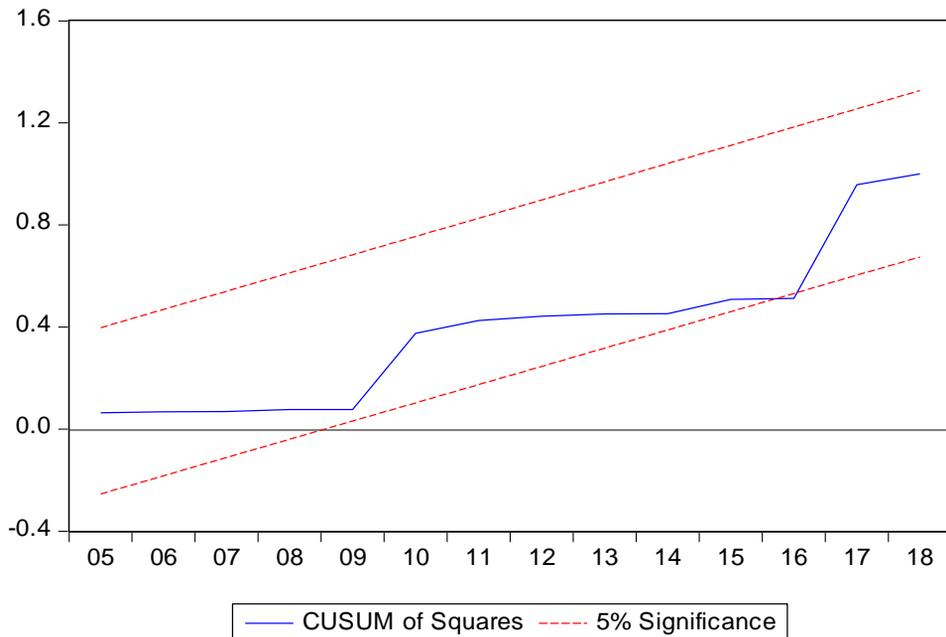
From table 4, there exist a positive and statistically significant relationship between human capital and economic growth both in the long-run and short-run at 5% level of significance, while political stability has positive and statistically significant impact on economic growth in the short-run but negatively and statistically significant impact on economic growth in the long-run at 5% level of significance. These suggest that human capital and institutions are important contributors to economic growth in Nigeria. The finding in this study is consistent with the findings of the studies by Sankay, et al. (2010); Mba, Mba, Ogbuabor & Ikpegbu (2013); Osoba & Tella (2017); Johnson (2011) and Dauda (2010) who established a positive and significant relationship among human capital and economic growth. However, the finding in this study is inconsistent with the findings of the studies by Easterly & Levine (2001); Temple (2001); Bosworth & Collins (2003); and Amassoma & Nwosa (2011) who found a negative relationship between human capital and economic growth. On the other hand, control of corruption is statistically not significant in influencing economic growth, both in the short-run and long-run. This is inconsistent with the findings by Zhuang, De Dios & Lagman-Martin (2010); Acemoglu & Robinson (2008) and Kaufman, et al. (2009) who found a positive and significant effect of institutional quality on economic growth.

However, a unit change in human capital leads to an increase in GDP by 0.6% in the short-run and about 3.5% in the long-run. Also, a unit change in effective control of corruption will lead to an increase in economic growth by approximately 0.1% both in the short-run and in the long-run. Similarly, a unit change in political stability increases economic growth by 0.03% in the short-run but reduces economic growth by -0.2% in the long-run. This implies that in the long-run, political stability does not conform with the a priori expectation of a positive impact of political stability on economic growth. The value of Error Correction Term of -0.155927 showed that disequilibrium in the short-run adjusted back to equilibrium in the long-run at an average speed of approximately 16%.

The results from Breusch-Godfrey test for serial correlation and from Breusch-Pagan-Godfrey test for heteroskedasticity revealed that there is no problem of serial correlation and heteroskedasticity respectively (see table 4). Similarly, the CUSUM of recursive residuals and CUSUM of squares presented in Figures 1 and 2 show that the data are stable during the period under study since the statistics is confined within the 5% critical bounds of parameter stability.

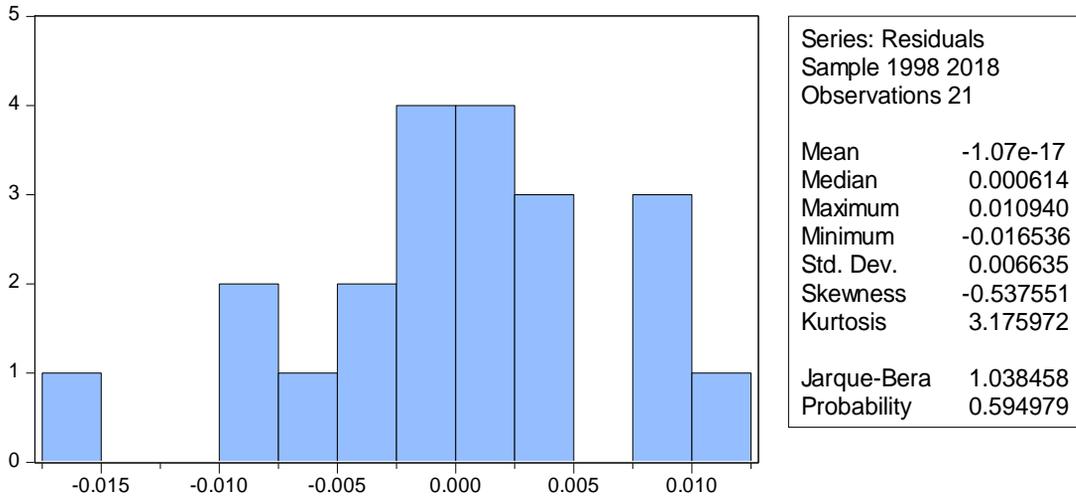


**Figure 1: CUSUM TEST**



**Figure 2: CUSUM OF SQUARE TEST**

Finally, result from Jarque-Bera normality test indicated that the data are normally distributed within the period under study (see figure 3).



**Figure 3: JARQUE-BERA NORMALITY TEST**

### Conclusion and Recommendations

This study investigated the relationship among institutions, human capital and economic growth in Nigeria from 1996 to 2018 using time series data. Autoregressive Distributed Lag (ARDL) model was used to analyze the data. The findings from the study indicated that there exist a positive and statistically significant relationship among institutions (political stability), human capital and economic growth at 5% level of significance in the short-run, while control of corruption has no significant impact on economic growth both in the short-run and long-run at 5% level of significance. Therefore, this study concludes that increased investment in human capital development is a viable option in achieving economic growth in the long-run. On the basis of this, the study recommends that government should increase its expenditure on human capital development because of its strategic importance in economic growth. This can be done by increasing public spending on health and education. Also, the current stability in the polity should be maintained since it is growth-enhancing, and the fight against corruption should be intensified.

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# IMPACT OF TRADE LIBERALIZATION ON NON-OIL SECTOR OUTPUT IN NIGERIA (1980-2020)

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## **Abstract**

*The study examines the impact of trade liberalization on non-oil sector's (agriculture, industrial and solid minerals) output in Nigeria using time series data spanning 1980-2020. The study employed Generalized Method of Moment (GMM) estimator for data analysis. The result of unit root test shows that data were stationary at level and first difference. The findings of structural breaks also show various years of break by the variables. The GMM estimates of the agriculture sector model show that trade liberalization had positive and statistically significant relationship with agriculture and industrial output. However, though significant, it is negatively related with solid minerals output. The degree of linkages among sectors is limited as agriculture seems to have linkages with industrial sector and neither of the sectors seems to relate with the solid mineral sector. The study then suggests that policy makers should as a matter of necessity fashion out policies that can harness the sectoral linkages and potentials in agriculture, industrial and solid minerals. Provide requisite infrastructure (hard and soft) required to tap into the productive activities of the sectors in this age of technology. Also policies that promote local production and discourage importation of certain essential products for trade are desirable in order to enhance the performance of the sectors and promote economic growth in the economy.*

**Keywords:** Trade liberalization, Non-oil Sector, Generalized Method of Moment, Nigeria.

**JEL Classification:** F 18, O20, C50

## **INTRODUCTION**

Trade liberalization has become a driving force of globalization and an important source of growth and development because of its potential spill-over effect on the economy. It is a channel through which export-led growth strategy has been pursued by emerging economies.

Whether regional, bilateral or multilateral agreements, trade liberalization has been recognized as a veritable engine of economic growth. This is because it creates a competitive environment, permits the diffusion of knowledge and transfer of technology, enhances competitiveness of export, increases access to international market, expands the domestic market and creates marketing networks. It provides managerial and technical skills, enhances the transformation of technology, promotes industrialization, improves productivity, creates jobs, enhances economic growth, and provokes the expansion of the export sector. Tubor & Michael (2018) observed that trade liberalization promotes efficiency by reducing cost of production, and increasing international confidence in market mechanism.

The phenomenal performance of East Asian economies that took advantage of trade liberalization holds great growth potentials for emerging economies like Nigeria. The fast industrialization and development in high-growth economies of Hong Kong, Taiwan, South Korea and Singapore tagged East "Asian Tigers", is attributed to gains or benefits of trade liberalization strategies. The economies of China, India, Malaysia and Mexico experienced faster economic growth than advanced economies because of their trade openness in the 1980s, whereas countries that pursued trade protectionist regime experienced deterioration in the trade balance according to Dollar & Kraay (2003).

Prior to the discovery of oil in commercial quantity in Nigeria, agricultural sector was the main stay of the economy providing food, employment and income for the populace, raw materials for the industrial sector, generating huge revenue for government, and foreign exchange earnings with an industrial sector emerging alongside. However, the discovery and subsequent oil boom of the 1970s led to growth distortion from a relatively prosperous agrarian and emerging industrial economy to a major exporter and now largely dependent on oil.

The performance of the Nigeria economy since the advent of the covid-19 pandemic has been abysmal. The real gross domestic product (GDP) growth rate in the first quarter of 2021 was 0.51%. Agriculture growth rate was 2.28% in the first quarter of 2021 compared to 3.42% in 2020. The manufacturing sector recovered from the recession, rising at a rate of 3.4%. Construction increased by 1.42% in the first quarter of 2021 compared to 1.21 % in 2020. Telecommunications and information services sector grew at a real-term pace of 6.47 % year over year. In addition, the industry contributed 14.91 % to aggregate real GDP in first quarter of 2021 compared to 14.07% in 2020. The mining and quarrying sector grew by -2.19% (year-on-year) in the first quarter of 2021. Its contribution to real GDP in the first quarter was 9.28%, lower than the rate of 9.54% in 2020 «NBS, 2021).

Thus, trade liberalization has the potential for long term growth and development in Nigeria. The government policies in the real sector like agriculture, manufacturing and solid mineral

(non-oil sectors) are yet to yield significant impact as seen in their contribution to GDP. This study therefore seeks to investigate the impact of trade liberalization on non-oil output in Nigeria with focus on agricultural, manufacturing and solid minerals sectors. To achieve this, the paper is organized into five sections. Following the introduction in section one, section two is literature review, section three is methodology, section four is empirical results and discussion of findings while section five is conclusion and recommendations.

## **LITERATURE REVIEW**

Trade liberalization entails significant reduction in participation of governments in marketing, production, fixed rates abolition, export taxes abolition, foreign exchange and import regulations relaxations; and ensuring that private sector incorporation into the economy is strengthened (Anderson & Babula, 2008). Government aims at achieving and sustaining high growth rate (Manni & Afzal, 2012). In a globalized world, trade liberalization comes with incentives to attract trade and capital flows (Mufti, Nahar & Muhammad, 2018).

There are three strands of theories that explains the gains associated with trade liberalization for economies (Thindwa & Seshamani, 2014). These include theories of comparative advantage (David Ricardo), Heckscher-Ohlin (H-O) theory and the new growth theory or the endogenous growth theory (Romer, 1990; Grossman & Helpman, 1991 and Barro & Sala-i- Martin, 1997). David Ricardo's model of comparative advantage suggested that specialization by individual countries in the production of a commodity based on area of their comparative advantage is essential for trade gains (Salvatore, 2007). Effective use of resources can be enhanced through trade by allowing the importation of goods and services that would have been produced at a higher cost at home. The theory emphasized trade as fundamental for the attainment of static efficiency in production, improved access to market and international competitiveness that result in economic growth (Thindwa & Seshamani, 2014). Economic growth is enhanced through foreign exchange gain, new knowledge and technology, and increased labour productivity.

The Heckscher-Ohlin (H-O) theory builds on Ricardo's comparative advantage theory. It supports the idea that countries can participate in international trade by exporting commodities based on their comparative advantage. Furthermore, it sees comparative advantage from the perspective of factor endowment or abundance and intensity in a given economy. Thus, a nation has a comparative advantage if a particular resource is in abundance and has a high ratio in production (factor intensity) comparative to others in the economy. Salvatore (2007) observed that any resource in abundance and intensity that a country utilizes for production of a commodity has a comparative advantage. When countries specialize in production and trade on basis of endowment and intensity, it leads to improve living standard. Nigeria is a labour-abundant country with rich deposits of natural resources such as arable lands, crude oil, and

solid minerals like gold, bauxite, etc., which provides great advantage that Nigeria is yet to take advantage of.

The new growth theory according to Romer (1990) endogenises change in technology as important factor that explains growth. The theory postulates that economic growth results from innovation, knowledge and human capital investment which are considered as internal factors in an economy. Economies of scale stem from the development of human capital besides investment in research and development (R&D) (Thindwa & Seshamani, 2014). The reduction in price distortions according to the theory ensures efficient allocation of domestic resources across different sectors of the economy. Once advanced technology is deployed in the production process, externalities are generated leading to economic development (Howitt, 1998).

Relating these theories to the Nigerian economy indicates that Nigeria has the potential to gain from trade liberalization despite poor infrastructure. Nigeria has comparative advantage in agriculture and solid minerals both in endowment and factor intensity. The country needs to invest in R&D to drive innovation and capacity in the value chain. Adaptation of modern technology in production processes is required to gain according to the endogenous growth theory where learning-by-doing, access to technologies and better management practices lead to more efficiency gains (Romer, 1990; Lucas, 1988; Krugman, 1987).

The nexus between trade liberalization and non-oil sectors performance has been investigated across regions using different techniques with mixed results. For instance, Dao (2014) used panel data technique and pooled Ordinary Least Square (OLS) regression to examine the relationship between trade liberalization and growth for 71 countries for the period 1980-2010. The results showed that trade shares had a positive and significant link with growth. Qazi (2015) examined the effect of financial and trade liberalization on growth in Pakistan using ARDL covering the period 1971-2013. The findings revealed that capital stock, financial liberalization index (banking and stock market) and labour force representing skills were positively linked to economic growth. The results further revealed that de facto financial openness index and trade openness had negative impact on growth.

On studies that relate to African economies, Manwa (2015) examined the effect of trade liberalization on growth in five Southern African Customs Union (SACU) economies (Botswana, Namibia, South Africa, Swaziland and Lesotho) using ARDL Bounds testing method for the period 1980-2011. The study utilized fixed-effects panel data estimations as well for testing the strength of empirical findings among the five countries. The results revealed that in the case of Lesotho, Botswana, Swaziland and Namibia, liberalization of trade measured through trade ratios, tariffs, the real effective exchange rate and adjusted trade ratios exerted insignificant impact on growth. However, in South Africa, trade liberalisation had significant

impact on growth

Dabel (2016) used Autoregressive Distributed Lag (ARDL) method and data covering 1986-2015 to investigate the nexus between trade openness and growth in Ghana. The results indicated that Composite Trade Index (CTI) , and openness to trade had a positive and significant impact on growth. The real effective exchange rate, labour force, foreign direct investment, and capital stock had positive and significant effects on growth. The Granger causality test showed a unidirectional causality running from trade openness to growth. Moyo, Nwabisa, & Hlalefang (2017) investigated the long run relationship between trade openness and growth in Ghana and Nigeria using the ARDL model from 1980-2016. The results revealed that trade openness exerted a positive and significant effect on growth in Ghana but negative and insignificant in Nigeria. Moyo & Khobai (2018) examined the nexus between trade openness and growth in 11 Southern African Development Cooperation (SADC) economies over the period 1990-2016 using the ARDL Bounds test method and Pooled Mean Group (PMG) model. The findings showed that trade openness exerted a negative impact on growth in the long-run.

On studies that are specific to the Nigerian economy, Asongo & Jamala (2015) investigated the impact of trade liberalization on the performance of manufacturing sector in Nigeria covering the period 1989-2012 using OLS. It revealed that there is a positive relationship between domestic credit to private sector and the foreign private investment on the manufacturing output on one hand, and between the manufacturing output and openness product on the other hand. Kalu, Nwude & Nnenna (2016) examined the impact of trade openness on growth in Nigeria using Classical Linear Regression Model (CLRM) for the period 1991-2013. The results revealed that imports, exports and net export had positive and significant relationships with growth.

Ojeyinka & Adegboye (2019) examined the impact of trade liberalization on performance in the Nigerian economy, with special reference to the agricultural and manufacturing sectors. Simultaneous models were used to capture the joint effects of trade liberalization on the two sectors. The Generalized Method of Moment technique was used to estimate the impact of trade liberalization on sectoral performance. The study showed a significant positive impact of trade liberalization on the output of agricultural sector, while a negative but significant relationship exists between measures of trade liberalization and manufacturing output in Nigeria. The study also revealed that exchange rate exerts a positive but insignificant impact on agricultural output while the effect of inflation on agricultural output is positive and significant within the study period. Both exchange rate and inflation had negative impact on manufacturing sector's output. The study confirmed possibility of substantial economic linkage between the two sectors, as their magnitudes were positive and significant suggesting significant level of interdependence.

Elijah & Musa (2020) investigated the dynamic effect of trade openness on Nigeria's economic performance from 1980-2017 using Error Correction Model (ECM). The short-run and long-run results showed that trade openness hurt growth. Ajayi & Araoye (2020) used VECM to determine the impact of trade openness on growth in Nigeria for the period 1970-2018. The findings revealed that trade openness had a negative link with growth. Uchechukwu, Bartholomew, Friday, & Franklin (2021) examined the relationship between trade liberalization and economic performance in Nigeria covering the period 1981-2018. The study used the Autoregressive Distributed Lag Bounds technique to cointegration. The results showed that trade liberalization did not support growth in Nigeria. Furthermore, the results showed the presence of unidirectional causality from real GDP to trade liberalization in Nigeria.

This study differs from the previous works, especially on the Nigeria economy, for the following reasons. First, the impact of trade liberalization is often examined in aggregate form with a major focus on economic growth. However, this study attempts to examine the impact of trade liberalization in a disaggregated form, that is, at sectoral level including solid minerals sector. The role of trade liberalization on sectoral development in Nigeria has not received adequate attention. Hence, the study examines the effect of trade liberalization on the three leading non-oil sectors which are agriculture, industrial and solid minerals. In addition, the study adopts a different methodology compared to other studies. Specifically, linear simultaneous equation models were developed due to interdependence and joint effect among the three sectors. Such interdependence is formally estimated by linear simultaneous equation system (Ojeyinka & Adegboye, 2019; Ullah, Khan, Ali & Hussain, 2012).

## **METHODOLOGY**

### *Model Specification*

This study is premised on the Heschel-Ohlin and New growth model theoretical frameworks. Basically, the theories postulate that the expansion of trade is beneficial to all trading partners on the basis of factor endowment and intensity, and capacity to use knowledge and innovation to improve trade capacities. The implication of the theories is that overall economic growth and development would be optimised when an economy allows for free trade with other economies by removing trade barriers with trade partners (Kazungu, 2009). The study adopts the model from the work of Ojeyinka & Adegboye (2019). To capture the effect of trade liberalization on the performance of the three sectors (agriculture, industrial and solid minerals), we formulate simultaneous equation system as follows:

$$\begin{array}{lcl}
 AGRQ = (TRDL, FDI, EXR, INFL, INDQ, SDM Q) & - & - & - & - & 1 \\
 INDQ = (TRDL, FDI, EXR, INFL, AGRQ, SDM Q) & - & - & - & - & 2 \\
 SDM Q = (TRDL, FDI, EXR, INFL, AGRQ, INDQ) & - & - & - & - & 3
 \end{array}$$

Where: AGRQ is agricultural output or productivity (contribution of Agriculture to GDP); INDQ is industrial output or productivity (contribution of industrial sector to GDP); TRDL is trade liberalization used as degree of openness proxied by ratio of total trade (import plus export) to GDP; FDI is foreign direct investment as ratio of GDP; EXR is real exchange rate; INF is inflation proxied by consumer price index (CPI).

Specifically, models 1-3 can be explicitly presented as:

$$AGRQ = \beta_0 + \beta_1 TRDL + \beta_2 FDI + \beta_3 EXR + \beta_4 INFL + \beta_5 INDQ + \beta_6 SDM Q + \mu_{1t} \quad 4$$

$$INDQ = \delta_0 + \delta_1 TRDL + \delta_2 FDI + \delta_3 EXR + \delta_4 INFL + \delta_5 AGRQ + \delta_6 SDM Q + \mu_{2t} \quad 5$$

$$SDM Q = \lambda_0 + \lambda_1 TRDL + \lambda_2 FDI + \lambda_3 EXR + \lambda_4 INFL + \lambda_5 AGRQ + \lambda_6 INDQ + \mu_{3t} \quad 6$$

Where  $\mu_{1t}$ ,  $\mu_{2t}$  and  $\mu_{3t}$  in the models are the stochastic (error) terms that capture unobservable variables. The variables are transformed into log linear form to moderate their magnitude except variables in rates, the above equations become:

$$\ln AGRQ = \beta_0 + \beta_1 \ln TRDL + \beta_2 \ln FDI + \beta_3 EXR + \beta_4 INFL + \beta_5 \ln INDQ + \beta_6 \ln SDM Q + \mu_{1t} \quad 7$$

$$\ln INDQ = \delta_0 + \delta_1 \ln TRDL + \delta_2 \ln FDI + \delta_3 EXR + \delta_4 INFL + \delta_5 \ln AGRQ + \delta_6 \ln SDM Q + \mu_{2t} \quad 8$$

$$\ln SDM Q = \lambda_0 + \lambda_1 \ln TRDL + \lambda_2 \ln FDI + \lambda_3 EXR + \lambda_4 INFL + \lambda_5 \ln AGRQ + \lambda_6 \ln INDQ + \mu_{3t} \quad 9$$

The impact that trade liberalization would have on performance of agriculture, industrial and solid minerals sectors are respectively captured in equation (7), (8) and (9).

### **Apriori expectation**

Model 1:  $\beta_0 > 0$ ;  $\beta_1 > 0$ ;  $\beta_2 > 0$ ;  $\beta_3 > 0$ ;  $\beta_4 < 0$ ;  $\beta_5 > 0$ ;  $\beta_6 > 0$

Model 2:  $\delta_0 > 0$ ;  $\delta_1 > 0$ ;  $\delta_2 > 0$ ;  $\delta_3 > 0$ ;  $\delta_4 < 0$ ;  $\delta_5 > 0$ ;  $\delta_6 > 0$

Model 3:  $\lambda_0 > 0$ ;  $\lambda_1 > 0$ ;  $\lambda_2 > 0$ ;  $\lambda_3 > 0$ ;  $\lambda_4 < 0$ ;  $\lambda_5 > 0$ ;  $\lambda_6 > 0$

### **Estimation Techniques**

The Generalized Method of Moment (GMM) is the estimation technique used in the study. The GMM estimator was adopted in order to deal with potential endogeneity bias due to omitted variables, simultaneity and measurement error usually associated with simultaneous equation, in which the exogenous variables are interdependent and jointly determined. The basic principles in the application of GMM show that it avoids the need to specify distributional assumptions such as normal errors; it provides a unifying framework for the analysis of many familiar estimators such as ordinary least squares (OLS), other instrumental variable (IV), etc; and it affords the opportunity to specify an economically interesting set of moments believed to be robust to misspecifications of the economic or statistical model (Gujarati,2004).

### **Data Source and Measurement**

The study used annual time series spanning 1980-2020 for Nigeria. Specifically, data on agricultural output (AGRQ), industrial output (INDQ), solid mineral output (SDMQ), trade liberalization (imports plus exports) and foreign direct investment (FDI) were obtained from World Development Indicators of World Bank (2020 Edition). Exchange rate and inflation rate (CPI) were obtained from Central Bank of Nigeria's Statistical Bulletin (2020 Edition). All variables were taken as ratio of GDP except the ones in rates (EXR and IFR). The choice of the period is to cover the pre and post trade liberalization era in Nigeria.

## **EMPIRICAL ANALYSIS AND DISCUSSION OF RESULTS**

### **Unit Root Test Results**

The unit root tests statistical properties of all variables employed were obtained using the Augmented Dickey-Fuller (ADF) test to identify the stationarity or otherwise of variables. The results of the unit root show that two of the variables solid minerals output and exchange rate are stationary at level and thus 1(0). Other variables such as lnGRQ, lnINDQ, lnTRDL, lnFDI and INF are stationary at their first difference indicating that they are 1(1) variables (Table 1).

**Table 1: Unit Root (Stationarity) Test (ADF)**

Variables	Level		First Difference		Order of Integration
	Test statistics	Critical value	Test statistics	Critical value	
lnAGRQ	-3.412	-D.673	-3.412	-3.675*	I(1)
lnINDQ	-3.556	-2.457	-3.554	-5.821 ***	I(1)
lnSOMQ	-3.556	-4.901**	-3.556	-9.005**	I(0)
lnTRDL	-3.556	-1.674	-3.556	-7.483***	I(II)
lnFOI	-3.556	-3.866	-3.556	-6.516**	UII
EXR	-3.554	-5.134*	-3.554	-11.229*	IIOI
INF	-3.553	-2.689	-3.554	-4.608**	II11

*Source: Authors' Computation;*

*Note: \*\*\*, \*\*, and \* are significant at 1%, 5% and 10% respectively*

To account for Structural break or policy changes, the study adopted the structural break unit root test proposed by Zivot and Andrews (1992) as presented in Table 2. The result is similar to that of Table 1 showing the unit root without structural break. The break dates as presented in the last column show different dates for break.

**Table 2: Unit Root with Structural Breaks**

Series	Level		First Difference		Order of Integrati	Break Date
	Test statistics	Critical value	Test statistics	Critical value		
lnAGRQ	-3.452	-5.423 .	-5.723**	-5.423	\(1)	1998
lnINDQ	-4.136	-5.423	-6.895***	-5.423	1(1)	2003
lnSDMQ	-4.894	-5.423	-8.167*	-5.346	1(11)	2015
TRDL	-7.675*	-4.458	-9.597*	-4.457	1(01)	2000
FOI	-4.028	-4.458	-5.990**	-4.457	1(1)	2004
EXR	-4.910***	-5.348	-7.251 *	-5.423	II01	2010
INF	-4.741	-4.458	-6.634**	-5.423	1(11)	1999

*Source: Authors' Computation; Note: respectively Note: \*\*\*, \*\*, and \* are significant at 1%, 5% and 10% respectively*

**Empirical Results of GMM Techniques**

The estimates of the three models using GMM approach is presented in Table 3 in which column 1 is the regression results for agriculture output; column 2 presents estimated results for industrial output; and column 3 presents results for solid minerals output. From the agriculture output mode (lnAGRQ), the coefficient of trade liberalization (degree of openness) was positive and statistically significant. It shows that a unit increase in trade openness leads to approximately 2.80% increase in agricultural output in Nigeria. This is in conformity with apriori expectation and the work of Ojeyinka & Adcbgoye (2019) for Nigeria, De'Silva, Malaga and Johnson (2014) for Sri Lanka, and Ullah, Khan, Ali & Hussai (2012) for Pakistan. However, it is in contrast to the findings of Anowor, Ukwani & Martins (2013). The exchange rate is negative and statistically significant.

However, the coefficient of industrial output and solid minerals are positive but not statistically significant. This shows lack of linkage or synergy among sectors of the economy. This may not be unconnected with the high dependence of the economy on advanced economies for capital goods and some raw materials. A well-developed industrial sector has potential to promote agricultural sector's productivity and solid minerals, whereas agricultural sector and solid minerals can provide raw materials for industrial sector.

**Table 3: GMM Estimated Results (1980-2020)**

Independent Variables	Denendent Variables		
	InAGRQ	InINDQ	InSDMQ
Intercept	-2.5201*** (-2.983)	0.1563** (3.834)	-1.0067 (-0.905)
InTRDL	2.8032* (2.756)	0.6124*** (2.097)	-1.2258*** (-4.643)
InFO!	0.0045 (1.213)	0.9426** (2.754)	0.0013 (0.219)
EXR	-2.3721 *** (-4.563)	-0.0348* (-6.021)	0.0008 (0.733)
INF	2.8947 (1.007)	-1.7838 (-3.264)	0.1056 (1.032)
InAGRQ	-	0.0408** (2.653)	1.7879 (1.516)
InINDQ	0.2953 (1.714)	-	-0.0645** (3.834)
InSDMQ	0.0049 (0.273)	0.0728 (1.112)	-
R-Square	0.9745	0.9832	0.9446
Adjusted R-Square	0.9319	0.9407	0.9168
Durbin Watson Stats	1.9216	1.9310	1.9241
Prob (j-Statistics)	0.5021	0.5143	0.5009

**Source:** Authors' Computation; **Note:** respectively Note: \*\*\*, \*\*, and \* are significant at 1%, 5% and 10% respectively

The industrial output model (INDQ) estimation is presented in column 2 in Table 3. The estimate suggests that a positive and statistically significant relationship exists between trade liberalization and industrial growth. A unit increase in degree of openness would generate an increase of 0.61 o/~in industrial sector's output. This result contradicts the findings of the study by Ojeyinka & Adebgoye (2019) and Tubor & Michael (2018). The impact of agricultural sector's output was positive and statistically significant (0.04%). The variable of FDI was positive and statistically significant (0.94%), while EXR was negative and statistically significant (0.03%). The finding suggests linkage between agriculture and industrial sectors as source of raw materials and food.

The solid mineral output model (SDMQ) estimation is presented in column 3 in 'table 3. The estimate suggests that negative and statistically significant relationship exists between trade liberalization and solid minerals growth. A unit increase in degree of openness would generate a decrease of solid mineral output by 1.22%. The industrial sector also has a negative and statistically significant relationship with solid mineral output. A unit increase in degree of openness will retard solid minerals growth by 0.06%. This finding suggests that there is robust linkage among agriculture, industrial and solid mineral sectors in Nigeria. The inflow of FDI

has not also benefitted the sector.

### ***Diagnostic Test***

The Hansen J-test is the most commonly used diagnostic in GMM estimation to assess the suitability of the model (Buam, 2006). It tests the null hypothesis of correctness of model specification and validity over identifying restriction. As estimated in Table 3, the Hansen test of over identifying restrictions does not reject the null hypothesis at the level of significance (p-value = 0.5021, 0.5143 & 0.5009) for model, 2 & 3 respectively. Therefore, it is an indication that the three specified models have valid instrumentation. Furthermore, the value of Durbin Watson (DW) statistics suggests absence of serial correlation in the three models. The test of goodness of fit measured by R -square is validated in addition to the fact that GMM is robust for autocorrelation and heteroscedasticity which further validates the regression results.

### **CONCLUSION AND POLICY RECOMMENDATION**

The study indicates that trade liberalization has potential to spur growth in the economy because of its impact on sectoral output in the economy, especially the productivity for exports in the non-oil sectors. This shows great potential for job creation, income generation, poverty reduction, revenue generation and economic growth. The positive and significant impact of trade liberalization on agricultural output and industrial output suggests that through trade openness Nigeria can boost output in the sectors. However, the solid mineral sector does not seem to have benefitted from trade openness despite factor abundance and intensity.

The study suggests that policy makers must as a matter of necessity be proactive in implementing industrial policies that promote value addition in agricultural and solid minerals productivities for exports to take advantage of global markets. Government should provide requisite infrastructure requisite skills, social capital and quality education (hard and soft) required to tap into the productive activities of the sectors in this age of technology. Also policies that promote local production and discourage importation of certain essential products for trade are desirable to enhance performance of the sectors and promote economic growth in the economy.

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# UNEMPLOYMENT AND ECONOMIC GROWTH IN NIGERIA

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## ABSTRACT

*This paper is motivated by the worrisome phenomenon of joblessness of thousands of Nigerian youths who are qualified to work but have no job to do. The paper investigated the relationship between unemployment and economic growth in the light of Okun's law using the autoregressive distributed lagged model ARDL model. Findings revealed that unemployment has positive and insignificant impact on economic growth in Nigeria. The study therefore recommended, that an alternative policy be formulated and applied to the Nigeria unemployment situation. Such a policy should take care of the peculiarities of the unemployment situation in Nigeria since Okun's law has proved not to be relevant and applicable in Nigeria based on the findings of this study. This study also recommended a well-balanced application of monetary and fiscal policies which should checkmate each other.*

**Key Words:** Unemployment, Economic Growth, Okun's Law

**JEL Classification:** E24, O40, E12.

## INTRODUCTION

Despite being endowed with diverse and infinite resources both human and material, unemployment in Nigeria is one of the most critical problems the country is facing. This is attributed to years of negligence and adverse policies that have led to the under-utilization of these resources. These resources have not been effectively utilized in order to yield maximum economic benefits (Adesina, 2013).

Prior to 1970 when crude oil was discovered in commercial quantities, Nigeria was an agrarian economy with agricultural sector accounting for over 60% of the total gross domestic product (GDP) of the economy. Agricultural sector was highly depended on for growth and development and also as a means of creating employment opportunities to unemployed labour force in the country. With the oil boom in the 1970s, the contributions of the agricultural sector to growth and development of the economy began to drop as a result of overdependence on the oil sector, resulting to neglect of critical sectors of the economy. The shift from popular agricultural activities to the oil sector led to wasteful expenditures, dislocation of employment factors and distortion in the revenue bases for policy planning in the national economy. This development led to higher unemployment and worsened the economic situation of the country (Eze, Atuma & Egbeoma, 2016).

In Nigeria, the unemployment situation has become more severe due to the laying off of workers in the banking sector, fall in outputs of most companies, civil service retrenchment and the fact that large-scale employment creation has not occurred in spite of the non-oil sector impressive growth rates of over 7% since 2002 (Billetoft, Powell & Treichel, 2008). Furthermore, this situation is worsened by the high rate of population growth as well as the rising number of people entering into the labour market for the first time. Also in Nigeria, the problem of youth unemployment has been

aggravated by the global financial crisis. As a result, the increasing unemployment rate amongst the Nigerian youths has discouraged most of them from taking part in labour market activities thereby increasing the pool of unemployed youths. In 2011, an analysis on the unemployment situation in Nigeria showed that of the total number of unemployed individuals, 43.7% were university graduates, 23.8% were polytechnic graduates and 15.5% were college undergraduates (CBN, 2012). Factors like Boko Haram insurgency, banditry, flooding and government policies on service sector, and in recent times technological innovations which favour capital-intensive methods and internet services (online business activities) have contributed to rise in unemployment rate. The resultant effect is that unemployment creates more burden as government becomes responsible for providing the public amenities and facilities which the populace cannot afford. This leads to increased expenditure (leakages) and reduced productivity, with attendant implication on economic growth. Employment generation is a significant drive of the growth rate of GDP in Nigeria (Iyoha, 1978). However, in the Nigerian economy, most employment is in the informal sector. A large proportion of the population is under self-employment with very low income (Jodie & Ogunrinola, 2011). Total unemployment level in Nigeria in 1970 stood at 4.3% and rose to 6.4% in the 1980s (Akintoye, 2003). Odusola (2001) revealed that the national unemployment rate of Nigeria was around 6%, and increased to 7% in 1987. By 1995, the national unemployment rate declined to 1.9%, after which it increased to 2.8% and 13.1% in 1996 and 2000 respectively. Total unemployment rates in Nigeria are 8.1% and 9.01% in 2019 and 2020 respectively (World Bank, 2021) while real gross domestic product (RGDP) growth rate in 2019 and 2020 stood at 2.208% and -1.8% respectively (World Bank, 2021). Besides, Nigeria has overtime claimed strong real gross domestic product (RGDP) growth rate which measured at 6% or 6.5% from 2002 till 2015 (Kayode, Samuel & Silas, 2014). This is contrary to reality, because, while the country was recording strong growth rate of 6.5%, unemployment rate was at the same time rising and annual unemployment rate rose from 11.9% in 2005 to 19.7% in 2009, and over 37% in 2013 (Kayode, et al, 2014). In 2016, Real gross domestic product (RGDP) growth rate was -1.6% and stood at 0.8%, 1.9%, 2.2% and -1.8% in 2017, 2018, 2019 and 2020 respectively (World Bank, 2021). A situation of high growth rate accompanied with high unemployment rate is theoretically paradoxical.

Interestingly, the trend of unemployment and economic growth in Nigeria has attracted scholars who investigate the relationship between these two economic factors in what is popularly known as the Okun's law. Okun's law is an empirically observed relationship between unemployment and losses in a country's production (Ball, Griffiths, Rafferty, Lindquist, Murrells & Tishelman, 2016). Okun's law looks at the statistical relationship between GDP and unemployment. It demonstrated that when unemployment fell, the production of a country will increase. In Okun's law, an economy experiences a 1 percentage point increase in unemployment for every 3 percentage point decrease in GDP from its long-run level (also called potential GDP). Potential GDP is the level of output that can be achieved when all resources (land, labour, capital and entrepreneurial ability) are fully employed. Similarly, a 3 percentage point increase in GDP from its long-run level is associated with a 1 percentage point decrease in unemployment (Kenton, 2020). Scholars have evaluated the

link between unemployment and economic growth by either regressing output on the unemployment rate or regressing unemployment on output growth.

Therefore, this paper aims at investigating the relationship between unemployment and economic growth, a phenomenon called Okun's law. To achieve the objectives of this paper, it is structured into five sections with introduction as section one. Section two deals with conceptual, theoretical and empirical review. Section three specifies the methodology and data analysis. Section four presents the results and its interpretation, while section five concludes the paper and proffers policy recommendations.

## **LITERATURE REVIEW**

### **Conceptual Review**

#### *Concept of Unemployment*

While the International Labour Organization (ILO) defined the unemployed as the number of the economically active population who are without work but available for and seeking work, including people who have lost their jobs and those who have voluntarily left work (World Bank, 1998); Adebayo (1999) defined it as a state in which people who can work are without jobs and are seeking for pay or profit. According to Fajana (2000), unemployment refers to a situation where people who are willing and capable of working are unable to find suitable paid employment. Unemployment exists where persons capable of and willing to work at the prevailing rate of pay are unable to find work (Ogboru, 2010). Unemployment refers to a situation in which people who are capable of working and who are qualified by age to work cannot find employment (Abefe & Nwankpa, 2012). According to Mai-lafia (2016), unemployment is a situation in which people who are capable of working on wage employment or self-employment and who are qualified by age to work legally but cannot secure employment. Therefore, unemployment is considered in this paper as a situation where people who are qualified to work, are searching for work but cannot find one to do. This definition is adopted as the working definition of unemployment for this paper because it is the definition that more closely describes the situation of unemployed persons in Nigeria as assessed in this paper.

#### *Concept of Economic Growth*

Economic growth as seen by Gadrey (2002) is the rate of increase from one period to another in the flow of goods produced and/or consumed within a given institutional space, which may be a firm, an industry, a national or regional territory. It is the quantitative change or expansion in a country's economy and is conventionally measured as the percentage increase in Gross Domestic Product (GDP) or Gross National Product (GNP) during one year (The World Bank Group, 2004). To Jhingan (2010), economic growth is a quantitative sustained increase in a country's per capita output or income accompanied by expansion in its labour force, consumption, capital and volume of trade. Haller (2012), defines economic growth as the process of increasing the sizes of national economies, the macro-economy indicators especially the GDP per capita with positive effect on the socio-economic sector. Economic growth is an increase in the production of goods and services

over a specific period (Amadeo, 2021). The concept of economic growth according to Jhingan (2010) is adopted for this study. This definition according to Jhingan (2010) is adopted as the working definition of economic growth for this paper due to the fact that it captures the concept of economic growth which is suitable for Nigeria as reflected in this paper because it is largely more encompassing.

### ***Concept of Okun's Law***

In economics, Okun's law is an empirical observed relationship between unemployment and losses in a country's production. It is named after Arthur Melvin Okun, who first proposed the relationship in 1962 (Ball, et al, 2016). The "gap version" states that for every 1% increase in the unemployment rate, a country's GDP will be roughly an additional 3% lower than its potential GDP. The "difference version" (Abel & Bernanke, 2005) describes the relationship between quarterly changes in unemployment and quarterly changes in real (GDP).

### **THEORETICAL REVIEW**

Several theoretical orientations exist to intellectualize the situation of unemployment and economic growth. They include Keynesian and Okun theories and Endogenous Growth Theory. However, the focus of this study is on Okun's theory.

The Keynesian theory of unemployment was propounded by John Maynard Keynes in his work, *The General Theory of Employment, Interest and Money* published in 1936. The Keynesian theory of unemployment is also known as cyclical, demand deficient theory of unemployment and explains unemployment which occurs when there is inadequate aggregate demand in the economy. The theory explained that ineffective demand in an economy is the primary cause of unemployment in which those that are willing to work at prevailing wage rate are unable to find job at a given time (Obadan & Odusola, 2010). The theory argued that employment depends on effective demand which brings about increased output, output generates income and income creates employment. Employment is considered as a function of income. Effective demand is determined by aggregate demand and supply functions. The aggregate supply function depends on the technical or physical state which in the short run does not change, thus remaining stable. Therefore, employment depends on aggregate demand which in turn is influenced by consumption and investment demand respectively. The Keynesian theory also emphasized that since the number of unemployed work force would always exceed job vacancies, so that even if full employment is attained some labour force will still remain unemployed. Lack of effective demand for jobs can be resolved by intervention of government through deficit spending which can boost employment level and increases aggregate demand in the economy (Keynes, 1936).

One of the most prominent strengths of this theory is higher employment levels. In recessionary periods, businesses cut down on the size of their workforce. Lack of employment then decreases consumer demand for products and services. When government steps in to financially stimulate businesses, those companies begin to hire once again. While Keynesian theory allows for increased government spending during recessionary times, it also calls for government restraint in a rapidly

growing economy. This prevents the increase in demand that spurs inflation. It also forces the government to cut deficits and save for the next down cycle in the economy. A major weakness of the Keynesian theory is that borrowing causes higher interest rates and financial crowding out. For a government to borrow more in a recession, interest rate on bonds rises. Higher interest rates discourage investment by the private sector. Another limitation of the Keynesian theory is that if government borrows to finance higher investment, it is borrowing from the private sector and therefore, the private sector has fewer resources to finance private sector investment. Another weakness of this theory is that fiscal expansion often comes too late when the economy is recovering and, therefore causes inflation.

Okun's theory was propounded by Arthur Melvin Okun in 1962. The theory is based on the explanation of the relationship between unemployment and economic growth in an economy. It argued that unemployment has negative correlation with economic growth in any given economy. It believed that a percentage decrease in unemployment rate leads to 3 percent increase in economic growth (Okun, 1962). When the growth rate of unemployment rises by 1% above the trend of growth, it can only result to 0.3% reduction in unemployment. Output depends on the amount of labour used in the production process, so there is a positive relationship between output and employment. Total employment equals the labour force minus the unemployed, so there is a negative relationship between output and unemployment conditional on the labour force (Furhmann, 2020). Okun's law is in essence a rule of thumb to explain and analyze the relationship between jobs and growth. That rule of thumb describes the observed relationship between changes in the unemployment rate and the growth rate of real gross domestic product (GDP). Okun noted that because of ongoing increases in the size of the labour force and in the level of productivity, real GDP growth close to the rate of growth of its potential is normally required, just to hold the unemployment rate steady. To reduce the unemployment rate, therefore, the economy must grow at a pace above its potential (Bernanke, 2012). A major strength of the Okun's theory is that it was able to give precise figures in percentage in describing the inverse relationship between unemployment and economic growth. A major weakness in Okun's law is that besides unemployment, there are many other factors that affect the output of a nation. Many studies revolving around the relationship between unemployment and growth consider a wider set of variables such as the size of the labour market, working hours of employed workers and worker's productivity rates (Gordon, 2021). The Nigeria economic situation is such that indicates a high growth rate and high unemployment level with over dependence on oil as its major source of revenue. A few proportion of the country's labour force makes up this sector thereby promoting the nation with its high unemployment growth. Okun's law is therefore relevant to the Nigerian situation because it will determine whether GDP will fall when unemployment rate rises. It will investigate whether a 1% increase in unemployment rate in Nigeria will result in the lowering of its potential GDP by 3%.

The Endogenous growth theory was developed by Kenneth Arrow, Paul Romer and Robert Lucas, among other economists. The theory emerged in the 1980s and it questioned how gaps in wealth

between developed and underdeveloped countries could persist if investment in physical capital like infrastructure is subject to diminishing returns. The Endogenous growth theory stated that economic growth is mainly the outcome of endogenous and not external forces (Romer, 1994). It also stated that investment in innovation, knowledge and human capital is important because they are contributors to economic growth. In addition, it focuses on positive externalities and spillover impacts of a knowledge - based economy which leads to economic development. Essentially, this theory maintains that policy measures determine long run growth rate of an economy. For instance, education or subsidies for research and development increases the growth rate in a few endogenous growth models by raising the incentive for innovation. A major advantage of the Endogenous growth theory is that it provides a model in which all variables, in particular savings, investment and technical knowledge are the outcome of a nation's decision. The endogenous growth model or approach argues that there should be an additional effect of human capital over and above the static effect on the level of output. One of the biggest criticisms against at the endogenous growth theory is that it is impossible to validate it with empirical evidence. The theory has been criticized for being based on assumptions that cannot be accurately measured (Liberto, 2020). The endogenous growth theory is also relevant to this study and to Nigeria because it traces growth of output per capita to two main sources: savings and efficiency. In other words, it is not only factor accumulation that drives growth but also efforts to utilize it. However, this study is anchored on Okun's theory which stipulates the relationship between unemployment and economic growth in an economy with particular reference to the Nigerian economy.

## **EMPIRICAL REVIEW**

Zaglar (2006) examined the relationship between unemployment and economic growth in the United Kingdom using microeconomic evidence and fixed-effect regression methods. Findings revealed that there was a significant and negative relationship between unemployment and economic growth in the United Kingdom. Yousefat (2011) examined the relationship between unemployment and economic growth in the Algerian economy from 1970 to 2009 employing the correlation matrix, causal and test, simultaneous integration methodology and error correction model. The findings showed the existence of a slight and inverse causal relationship between unemployment and economic growth, as well as the absence of a long or short-term balancing relationship between unemployment and economic growth rates, while the causality test revealed the existence of a causal relationship in one direction from unemployment to growth. Muhammad, Oye & Inuwa (2011) examined the impact of unemployment on gross domestic product in Nigeria over the period of nine years (2000 – 2008) using a regression analysis. Findings showed that unemployment has a significant effect (over 65%) on the making of the Nigerian GDP, and there is an inverse relationship between unemployment and gross domestic product, which implies that as unemployment increases, gross domestic product falls. Amassoma and Nwosu (2013) examined the impact of unemployment on productivity growth in Nigeria using an error correction modeling approach and co-integration technique to analyze the data used from 1986 to 2010. The regression estimate based on the short run and long run models showed that unemployment rate had an

insignificant impact on productivity growth in Nigeria over the study period. Onwanchukwu (2015) examined the impact of unemployment on economic growth in Nigeria from 1985 to 2010, using Ordinary Least Squares regression technique. His findings revealed that unemployment does not have a significant impact on the economic growth of Nigeria.

Ogueze and Odim (2015) examined the cost of unemployment and GDP growth in Nigeria. The study used annual time series data from 1970 to 2010. The variables used for the study included real GDP (RGDP), unemployment rate (UNP), interest rate (INT), investment (INV), import (IMP) and money supply (M2). The study employed Ordinary Least Square (OLS). The results showed that unemployment rate had negative impact on economic growth in Nigeria. Banda (2016) studied the relationship between unemployment and economic growth in South Africa from 1994 to 2012. The results of Johansen co-integration showed that the variables had a long run relationship. The findings revealed a favourable association between GDP and unemployment in South Africa. Eze, Atuma & Egbeoma (2016) used the cointegration test, the Vector Error Correction Model (VECM) technique, and the Granger Causality test to investigate the relationship between long-term economic growth and unemployment in Nigeria from 1980 to 2013. The results demonstrated that unemployment has a detrimental and significant effect on GDP, and that there is a unidirectional relationship between unemployment and GDP with causality extending from economic growth to unemployment.

Many studies on the Nigeria's employment situation have been devoted to unemployment and its determinants and/or its impact on economic growth (Adebayo & Ogunrinola, 2006; Oladeji, 1994; Omotor and Gbosi 2006). Also, most studies on unemployment and economic growth in Nigeria have not been able to link it to Okun's law, that is to say to determine the existence of Okun's law in Nigeria as it relates to unemployment and economic growth. This study investigates the relationship between unemployment and economic growth using a more recent data. The study also investigates the relationship between unemployment and economic growth as it relates to Okun's law. In other words, it intends to determine if Okun's law holds true for Nigeria as it concerns unemployment and economic growth using a more recent data.

## **METHODOLOGY**

### **Types and Sources of Data**

In an attempt to empirically analyse the relationship between unemployment and economic growth in Nigeria in the light of Okun's law, data were obtained from secondary sources such as CBN Statistical Bulletin and Index Mundi from 1981 to 2020.

### **Method of Data Analysis**

To measure the impact of unemployment on economic growth in Nigeria, this study applied the autoregressive distributed lagged model (ARDL). The justification for the application of ARDL is because some of the variables were integrated of order I(0) or I(1) (Pesaran & Shin, 1999; Pesaran, Shin, & Smith, 2001).

**Model Specification**

The basic form of an ARDL regression model is:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \dots + \beta_k Y_{t-p} + \alpha_0 X_t + \alpha_1 X_{t-1} + \alpha_2 X_{t-2} + \dots + \alpha_q X_{t-q} + \varepsilon_t \dots \quad - \quad 1$$

where  $\varepsilon_t$  is a random "disturbance" term.

Which becomes;

$$\Delta y_t = \beta_0 + \sum \beta_i \Delta y_{t-i} + \sum \gamma_j \Delta x_{1t-j} + \sum \delta_k \Delta x_{2t-k} + \phi z_{t-1} + e_t \dots \quad - \quad - \quad 2$$

Then,

$$RGDP_t = \alpha_0 + \alpha_1 \Delta RGDP_{t-i} + \alpha_2 \Delta UNEM_{t-i} + \alpha_3 \Delta GEXP_{t-i} + \alpha_4 \Delta MOSU_{t-i} + \beta_1 RGDP_{t-i} + \beta_2 UNEM_{t-i} + \beta_3 GEXP_{t-i} + \beta_4 MOSU_{t-i} + \phi z_{t-1} + U_t \quad - \quad - \quad - \quad - \quad 3$$

Where:

$RGDP_t$  = Real Gross Domestic Product in Time t.

$UNEM_t$  = Unemployment Rate in Time t.

$GEXP_t$  = Government Expenditure in Time t.

$MOSU_t$  = Money Supply in Time t.

$\Delta$  = Difference Factor

t-i = Lag Period

t = 1981, 1982, 1983...2020

$U_t$  = Error Term

$\Phi$  = Coefficient of the Error Correction Term

$z_{t-1}$  = Error Correction Variable

$\alpha_0$  = Constant Intercept

$\alpha_1$  and  $\beta_1$  = The Coefficients of Real Gross Domestic Product

$\alpha_2$  and  $\beta_2$  = The Coefficients of Unemployment Rate

$\alpha_3$  and  $\beta_3$  = The Coefficients of Government Expenditure

$\alpha_4$  and  $\beta_4$  = The Coefficients of Money Supply

*apriori expectation*

$\alpha_1$  and  $\beta_1 > 0$

$\alpha_2$  and  $\beta_2 < 0$

$\alpha_3$  and  $\beta_3 > 0$

$\alpha_4$  and  $\beta_4 > 0$

On apriori basis, it is expected that as Real Gross Domestic Product RGDP increases signifying increased growth, it should cause a reduction in Unemployment Rate. It is also expected that when there is increased growth, Government Expenditure should also increase. Again, it is expected that increased growth should also bring about increase in Money Supply.

## RESULTS AND DISCUSSION OF FINDINGS

In the first stage, the descriptive analysis of the variables is done in order to comprehend the nature and the characteristics of the variables. This study applied the Zivot and Andrews (1992) method of unit root structural break, because it is a sequential test which utilizes the full sample and uses a different dummy variable for each possible break date. The choice of the unit root technique is also to take care of structural breaks especially structural breaks that happened during economic policies implementation or during economic crisis. The structural break change in time series can influence the results of tests for unit roots. Stationarity tests are required in order to select the estimation technique to be deployed in the estimation stage.

**Table 1: Descriptive statistics**

	<b>RGDP</b>	<b>UNEM</b>	<b>MOSU</b>	<b>GEXP</b>
<b>Mean</b>	<b>34087.79</b>	<b>10.03450</b>	<b>7321.040</b>	<b>1809.865</b>
<b>Median</b>	<b>7648.622</b>	<b>8.420000</b>	<b>1073.889</b>	<b>982.8433</b>
<b>Maximum</b>	<b>154252.3</b>	<b>25.10000</b>	<b>36014.88</b>	<b>5469.077</b>
<b>Minimum</b>	<b>139.3105</b>	<b>1.800000</b>	<b>14.47117</b>	<b>9.636500</b>
<b>Std. Dev.</b>	<b>45875.59</b>	<b>6.822940</b>	<b>10834.10</b>	<b>1970.505</b>
<b>Skewness</b>	<b>1.265728</b>	<b>0.874262</b>	<b>1.385651</b>	<b>0.650783</b>
<b>Kurtosis</b>	<b>3.351861</b>	<b>2.797040</b>	<b>3.604644</b>	<b>1.780559</b>
<b>Jarque-Bera</b>	<b>10.88680</b>	<b>5.164216</b>	<b>13.40951</b>	<b>5.301854</b>
<b>Probability</b>	<b>0.004325</b>	<b>0.075614</b>	<b>0.001225</b>	<b>0.070586</b>
<b>Sum</b>	<b>1363512.</b>	<b>401.3800</b>	<b>292841.6</b>	<b>72394.60</b>
<b>Sum Sq. Dev.</b>	<b>8.21E+10</b>	<b>1815.548</b>	<b>4.58E+09</b>	<b>1.51E+08</b>
<b>Observations</b>	<b>40</b>	<b>40</b>	<b>40</b>	<b>40</b>

**Source:** Authors' computation using Eviews 10

Table 1 shows the result of the descriptive statistics for the variables of interest in this study. It revealed the location of the centre of distributions of the series via the average values (mean), the minimum values, maximum values as well as how individual variable values are spread on each side of the centre via the standard deviation, thus revealing the uniformity of the items in the distribution of each variable. The peakedness of each variable is given by the kurtosis statistics, the symmetric nature of the series given by the skewness value while the normality condition of each of the series is given by the Jarque-Bera statistics. The table showed average values of 34087.79, 10.034, 7321.04, and 1809.865, for RGDP, UNEM, MOSU and GEXP respectively. The implication is that at this period, the average of 34087.79 of RGDP was achieved as a result of the effects of unemployment, money supply and government expenditure. The minimum and maximum values of RGDP were 139.31 and 154252.3 respectively. This shows that the growth in RGDP has been consistent. For UNEM, the table revealed minimum and maximum values of 1.8 and 25.1 respectively implying that the unemployment rate has consistently increased over time. Minimum and maximum values of MOSU reported in table 1 stood at

14.47 and 36014.88 respectively indicating that despite the consistent increase in money supply, it has not really increased in volume compared to RGDP. The table reported minimum value of 9.64 for GEXP performance while the maximum value stood at 5469.07. From the table, it was observed that all the variables are skewed to the right, given the corresponding positive skewness statistics of 1.26, 0.87, 1.38, and 0.65 for RGDP, UNEM, MOSU and GEXP respectively. Their positive values of skewness show that the coefficients of the variables are positive and their means are more than median values. Also, the positive skewed distribution indicates that there is high risk than what the standard deviation measures. As regard Kurtosis, a kurtosis with distribution greater than 3 is a leptokurtic distribution. A leptokurtic distribution (greater than 3) has a sharper peak with lower probability than a normal distribution of kurtosis whose value is equal to 3. A kurtosis with less than 3 is a platykurtic distribution which has a lower and wider peak with higher probability than leptokurtic and normal distribution. Notably, the kurtosis statistics revealed that RGDP, UNEM, and MOSU are normal but GEXP is platykurtic, since it is less than 3.

**Table 2: Correlation Analysis**

	<b>RGDP</b>	<b>UNEM</b>	<b>MOSU</b>	<b>GEXP</b>
<b>RGDP</b>	1.000000			
<b>UNEM</b>	0.425223	1.000000		
<b>MOSU</b>	0.995860	0.381153	1.000000	
<b>GEXP</b>	0.956621	0.624137	0.937072	1.000000

**Source:** Author’s computation using Eviews 10

Table 2 shows the correlation analysis of the relationship for RGDP, UNEM, MOSU and GEXP. The result revealed UNEM, MOSU and GEXP positively correlate to RGDP. Despite being positive to RGDP, UNEM has the least positive effect on RGDP, while MOSU and GEXP positively and highly correlate to RGDP.

**Table 3: Unit Root Test**

<b>Series</b>	<b>Critical value (5%)</b>	<b>Break Date</b>	<b>ADF (Prob)</b>	<b>Order of integration</b>
<b>RGDP</b>	<b>-4.44</b>	<b>2017</b>	<b>-4.73 (0.0220)</b>	<b>I (0)</b>
<b>UNEM</b>	<b>-4.44</b>	<b>1997</b>	<b>-11.68 (0.00)</b>	<b>I (1)</b>
<b>MOSU</b>	<b>-4.44</b>	<b>2015</b>	<b>-5.15 (0.00)</b>	<b>I (1)</b>
<b>GEXP</b>	<b>-4.44</b>	<b>2004</b>	<b>-6.85 (0.00)</b>	<b>I (1)</b>

**Source:** Authors' computation using Eviews 10

Table 3 shows the results of the Augmented Dickey-Fuller unit root test with structural break on the series which confirms that all the series are stationary at first difference for UNEM,

MOSU and GEXP. But for RGDP, it is stationary at level. The Justification for the application of ARDL is that there is a mixture of I(0) and I(1). ARDL is important to assess the long run and short-run relationship between the variables.

**Table 4: The F – Bounds Cointegration**

<b>Test Statistics</b>	<b>Value</b>	<b>K</b>
<b>F – Statistics</b>	<b>7.404</b>	<b>3</b>
<b>Critical Values Bounds</b>		
<b>Significance</b>	<b>I(0) Bound</b>	<b>I(1) Bound</b>
<b>10%</b>	<b>2.72</b>	<b>3.77</b>
<b>5%</b>	<b>3.23</b>	<b>4.35</b>
<b>2.5%</b>	<b>3.69</b>	<b>4.89</b>
<b>1%</b>	<b>4.29</b>	<b>5.61</b>

**Source:** Authors Computation Using Eviews 10

From Table 4, the F-statistics value is greater than the upper bounds critical value at 5% significance level which suggests there is a long run relationship among the variables as we reject the null hypothesis of no cointegration among the variables. Having established a long run relationship, the error correction table below shows the short run behaviour of the variables using the Error Correction Model as proposed by Engle and Granger. The results are shown on table 5.

**Table 5: Results of Error Correction Model (ECM)**

<b>Variable</b>	<b>Coefficient</b>	<b>Std Error</b>	<b>t statistics</b>	<b>pvalue</b>
CointEq (-1)*	-0.0819	0.0139	-5.856	0.0000

**Source:** Authors Computation Using Eviews 10

Table 5 summarizes the results of the ECM. The error correction term (ECT) describes the short-run dynamics or adjustments of the cointegrated variables towards their equilibrium values. It is obvious that the coefficient of ECM is negative and statistically significant at 5%. This result indicated that there is a short-run relationship between unemployment, economic growth, money supply and government expenditure. The error-correction term is negative and significant with an adjustment coefficient of -0.0819, indicating that changes in growth rate (Real GDP) adjust to its long-run equilibrium level with 5% of the adjustment taking place within the next period by 8.19%, which implies a slow adjustment speed.

**Table 6: Short-run and Long-run ARDL Estimation**

<b>Variable</b>	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Prob.*</b>
<b>Short-Run</b>				
<b>RGDP(-1)</b>	<b>-0.081947</b>	<b>0.117633</b>	<b>-0.696636</b>	<b>0.4945</b>
<b>UNEM</b>	<b>122.8657</b>	<b>70.01392</b>	<b>1.754875</b>	<b>0.0954</b>

<b>MOSU</b>	<b>-0.021088</b>	<b>0.359648</b>	<b>-0.058636</b>	<b>0.9539</b>
<b>GEXP</b>	<b>-2.060561</b>	<b>0.369530</b>	<b>-5.576168</b>	<b>0.0000**</b>
<b>C</b>	<b>-1160.986</b>	<b>545.5720</b>	<b>-2.128016</b>	<b>0.0466**</b>
	<i>Long-Run</i>			
<b>UNEM</b>	<b>3509.930</b>	<b>5369.057</b>	<b>0.653733</b>	<b>0.5211</b>
<b>MOSU</b>	<b>13.84126</b>	<b>15.84582</b>	<b>0.873496</b>	<b>0.3933</b>
<b>GEXP</b>	<b>-34.12861</b>	<b>60.76779</b>	<b>-0.561623</b>	<b>0.5809</b>

**Source:** Authors Computation Using Eviews 10

In the short run, unemployment has a positive significant impact on economic growth in Nigeria. Previous year’s RGDP negatively influenced economic growth in Nigeria. However, money supply and government expenditure depict a negative significant relationship on economic growth in Nigeria.

Similarly, in the long-run, unemployment depicted a positive insignificant effect on economic growth in Nigeria. Money supply equally showed a positive insignificant effect on economic growth in Nigeria. But government expenditure has a negative insignificant impact on economic growth in Nigeria.

### **Discussion of Findings**

The results of this study did not meet the *apriori* expectation. This is because unemployment was found to be positive instead of negative, money supply negative in the short-run and positive in the long run but insignificant, while government expenditure was negative instead of positive. From the result, it is shown that both in the short-run and long-run, the relationship between unemployment and economic growth in Nigeria is positive and insignificant. This result does not support the Okun’s law which stated that for every 1% increase in unemployment rate, a country’s GDP will be roughly an additional 3% lower than its potential GDP. The result is inconsistent with the findings of Ogueze and Odim (2015), who found that there is a negative relationship between economic growth and unemployment rate in Nigeria.

Again the result is similar to the outcome of Banda (2016) who found that unemployment rate positively affected economic growth in South Africa. The implication in the differences in the outcome of these findings could be attributed to time difference when the researches were conducted in Nigeria and the methods of analyses. Again, application of the theory adopted for this study (Okun’s theory) in the Nigeria economy is not feasible.

### **CONCLUSION AND RECOMMENDATIONS**

This study examined the relationship between unemployment and economic growth in Nigeria as it relates to Okun’s law with a more recent data coverage. The results indicated that both in the short-run and long-run, the relationship between unemployment and economic growth in Nigeria is positive and insignificant. This does not conform to Okun’s law which stipulates a

negative relationship between Real GDP and unemployment. Again, the other variables included in the model money supply and government expenditure were not in conformity with the apriori expectation.

Therefore, based on the findings of this study, it is recommended that an alternative policy be formulated by the scholars and technocrats in Nigeria so as to tackle the problem of unemployment in the country. Such a policy should take care of the peculiarities of unemployment situation in Nigeria. Again from the result, there should be a well-balanced application of the monetary and fiscal policies which should checkmate each other. This is because the effect of government expenditure and money supply were found to contrast their influences on economic growth in Nigeria.

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