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POPULATION AND ECONOMIC GROWTH NEXUS: EMPIRICAL EVIDENCE FROM NIGERIA

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Abstract: The increase in the level of population coupled with current economic challenges in Nigeria without any plausible control is of great concern. Thus, with the mechanics of Autoregressive Distributed Lag Bounds (ARDL) approach this study examined the consequence of soaring population in the country on economic growth using time series data from 1983 to 2021 sourced from Central Bank of Nigeria, World Bank Data Bank and NBS. The preliminary result showed a mean population growth rate of 2.57% and a 4.15 average RGDP growth rate during the period of the study. The empirical results also show a unidirectional causality from population growth to GDP growth. The study revealed that the growth of population with its components exerts a positive impact on the short run and a long run negative impact on economic growth in Nigeria. It was recommended that there should be proactive interventions by the government and NGO's by way of educating the public on the importance and benefits of having a reduced number of children. The government should embark on massive employment generation schemes that will absorb the unemployed through strategic stimulus investments in targeted programmes and projects to checkmate poverty rate, unemployment syndrome and accelerate economic growth for sustainable development.

Keywords: Population, Poverty, Unemployment, ARDL, Modelling

JEL Classification: C22, C51, E27, H63, H81

1.   INTRODUCTION

The soaring population growth in Nigeria has become an important phenomenon and great concern to economists in the midst of current economic challenges. This demographic explosion has essentially occurred in the developing countries. Nigeria belongs to the league of the fastest growing countries in the world with a population of 185 million people as at 2016 and 201 million people in 2019, with a population growth rate of 2.61% (Worldometer 2020). She is the most populous country in Africa endowed with wide range of natural resources (UNDP, 2017).

Africa accounts for the world's second largest and second most densely inhabited continent with Nigeria being the seventh most populous nation in the world. From an estimated population of 38 million in 1950, the population is estimated at over 201 million in 2019 and is projected to reach 263 million by 2030 and 401 million by 2050, making Nigeria the third most populous nation in the world by then (UNDP, 2017). According to Todaro & Smith (2012), over 75 million people are integrated to the world's population every year and about 97% of this net population increase comes from developing countries. Out of this 97%, Nigeria accounts for 7.3% as the population increases by nearly 5.5 million people every year. According to World Population Prospects by United Nations Development Program (UNDP 2017), Nigeria's population could surpass United States by 2050 and by 2100 it could compete and rival China as the second most populous nation in the biosphere. There is no mere saying that, with the demographic structure of any nation, a country which has more dependent population occasioned by rising trend would experience slow or negative economic growth (Bloom 'et al', 2001).

Economic growth in Nigeria remains muted since 2015. Recovering from stagflation in 2016 economic growth averaged 1.9% in 2018 and remained stable at 2% in the first half of 2019 (World Bank, 2020). Domestic demand remains constrained by stagnating private consumption in the context of high inflation (11% in the first half of 2019). Economic Growth is too low to lift the bottom half of the population out of poverty. Despite expansion in some sectors, employment creation remains weak and insufficient to absorb the fast-growing labor force, resulting in high rate of unemployment (23.1% in 2019), with another 20% of the labor force underemployed (World Bank, 2020). Poverty remains widespread. The poverty rate in over half Nigeria's 36 states is above the national average of 69% (ADB, 2020). High poverty reflects rising unemployment and this requires plausible solution. Given that the

economy is expected to grow more slowly or regress occasioned by the current coronavirus pandemic than the population, living standards and economic performance are heading towards imminent challenges that would require urgent attention. This motivated the authors to delve into the subject matter for possible outcomes and policy recommendations that will be beneficial to the government, policy makers and researchers aimed at addressing the current challenges for sustainable economic growth and development.

The first national policy on population was enacted in 1988 and revised in 2004 and 2016. This policy limits the number of children per family to four. However, many families in Nigeria breed more than four children and this call for attention to enable the nation achieve sustainable development goals (SDGs). Nigeria's high population growth rate is likely to have implications for Nigeria's economic growth as it affects a wide range of socio-economic variables. The question that comes to mind is how best to exploit the theoretical and empirical correlation between population and economic growth. Thus, can Nigeria's population growth be used to better advance the economy of the nation and how? Is there a relationship between population growth and economic growth? The main objective of this study is to ascertain the influence of population growth on economic growth (GDP).

Other parts of this paper are organized into four sections. Section two contains review of relevant literature, while section three will discuss the methodology; Section four is the presentation and analysis of results. Finally, section five contains summary, recommendations and conclusion.

2.   LITERATURE REVIEW

2.1. Theoretical Literature

There are various theories that explain the relationship between population growth and economic growth. These include the Malthusian theory and economic growth theories.

Malthusian theory of Population: Malthus (1798) articulated his view about population in his book, '*Essay on the Principle of Population*' regarding the effects on the future improvement of society. The Malthusian theory explains the link between the growth in food supply and in population. The theory states that population increases faster than food supply and if unchecked, it will lead to vice or misery. In his theory, he states that population increases at a geometrical progression while food supply increases arithmetically in

progression due to the forces of the law of diminishing return. This growth would lead to an imbalance which leads to over population as shown in figure 1 below.
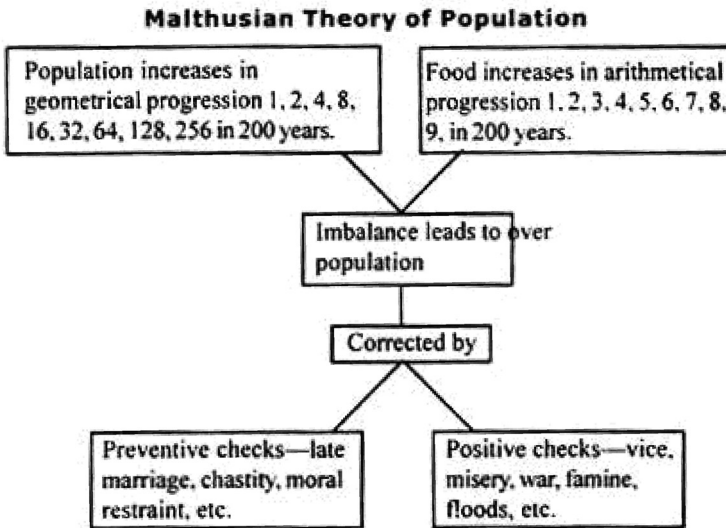
Malthusian Theory of Population

Population increases in geometrical progression 1, 2, 4, 8, 16, 32, 64, 128, 256 in 200 years.

Food increases in arithmetical progression 1, 2, 3, 4, 5, 6, 7, 8, 9, in 200 years.

Imbalance leads to over population

Corrected by

Preventive checks—late marriage, chastity, moral restraint, etc.

Positive checks—vice, misery, war, famine, floods, etc.

Figure 1: Malthusian Theory of Population

Source: hingan and Sharama (2011).

Malthus postulates that to curtail this over population, preventive checks and positive checks should be put in place. Preventive checks that need to be applied are delayed marriage, celibacy, abstinence, and guided birth. Otherwise, a nation which has an unchecked population growth is likely to experience an unfavourable economic growth, due mainly to the presence of limited resources with which economies are endowed. However, the Malthusian theory is pessimistic with misery, poverty, epidemics, gloomy picture of economic growth, amongst others and failed to recognize the role of technological advancement in food production.

Economic Growth Theories: Several theories of economic growth abound in literature. Some of these theories are summarized thus: Classical growth theory propounded by Adam Smith placed emphasis on the role of increasing returns to scale (economies of scale/specialization) in the economic growth process. The Harrod-Domer model, Solow growth model and the exogenous model are examples of the Neoclassical theory. Keynesian theory argued that aggregate demand plays key role in influencing economic growth

in the short and medium term as propounded by Lord John Maynard Keynes. Limit-to-Growth theory emphasized that due to climate change and environmental perspectives, long run economic growth will be constrained by resource degradation and global warming.

Endogenous growth theory explained that the rate of economic growth is strongly influenced by human capital, knowledge and rate of technological innovations advanced by Paul Romer and Robert Lucas. The endogenous growth theory argues that economic growth is generated by forces within a system rather than external forces. It specifically argues that economic growth is a result of policies, internal processes and investment in human capital. Economic growth of a country therefore on the basis of endogenous growth is on account of government policies promoting innovation, investment in human capital and acquisition of knowledge which constitutes internal technology driving economic growth. In the context of the present study therefore, Nigeria government policies on population growth controlling population growth through birth rates and death rates, capital formation and employment will affect achievement of significant levels of economic growth of Nigeria. Hence, the endogenous growth theory is appropriate as the framework of this study.

2.2. Theoretical Framework

This study used the endogenous growth model. The essence of using this model is because it looks deeply into the sources of growth and explains the long run growth rate of an economy based on endogenous technical progress in growth model. It maintains that economic growth is mainly as a result of internal factors rather than external factors. It specifically argues that economic growth is a result of policies, internal processes and investment in human capital.

Romer (1994) model was adopted which involves human capital alongside with the stock of knowledge to produce concepts of new technology. In the Romer's model, to integrate endogenous technological change, the production function is adapted as:

$$Y_t = F(K_t, N_t, A_t) \tag{2.1}$$

From equation (2.1) it can be seen that the level of aggregate output depends on the quantities of capital (K_t), labour (N_t) and technology (A_t), which is treated as endogenous factor. In this model, the production function of an individual firm represented by the subscript i is:

$$Y_{it} = F(K_{it}, N_{it}, A_t) \tag{2.2}$$

In the production function listed above, the technology input subscript t appears along with subscript i because this technology may be copied from others. The technology grows endogenously.

2.3. Empirical Literature

Several empirical studies exist on the influence of population growth on economic growth both in developed countries and developing countries with both positive and negative research outcomes. Prominent amongst these are summarized in table 1:

Table 1: Summary of literature Reviewed in Developed and Developing Countries

S. N.	Reviewed Author	Summary of Study Reviewed	Developed Countries	Developing Countries	Positive Result Outcomes	Negative Result Outcomes
1	Garza-Rodriguez 'et al' (2016)	The dynamic relationship between population growth and economic growth, through a structural break cointegration analysis for the period 1960-2014 in Mexico		Mexico	Population growth has positive effect on Economic growth	
2	Todaro & Smith (2012)	The relationship between population growth and per capita economic growth in United States using endogenous model	U.S. A.		There is a positive relationship between population growth and per capita economic growth in contrast to the predictions of the neoclassical growth models.	
3	Banerjee (2012)	The relationship among population and per capita GDP growth in Australia using ECM	Australia			There is a negative relationship between population and per capita GDP growth in Australia
4	Yao, Kinugasa & Hamori (2013)	The relationship among population and per capita GDP growth in Australia using empirical analysis	China			There is a negative relationship between population and per capita GDP growth in China

S. N.	Reviewed Author	Summary of Study Reviewed	Developed Countries	Developing Countries	Positive Result Outcomes	Negative Result Outcomes
5	Chang 'et al' (2014)	The Relationship between Population Growth and Economic Growth Over 1870 – 2013. The study applies the bootstrap panel causality test which accounts for both dependency and heterogeneity across countries	Canada, Germany, Japan, Norway and Switzerland		There exist positive relationship between population growth and economic growth in these countries	
6	Ali, Ali, and Amin (2013)	The impact of Population growth on Economic Development of Pakistan for period of 1975-2008 using the ARDL technique		Pakistan	The result of the model shows that the impact of population is positive and significant.	
7	Shah, Sargani, Ali and Siraj (2015)	The Effect of Increase in Population on the Economic Growth of Bangladesh from 1980 and 2005. The study adopted multiple linear regression model.		Bangladesh		Population growth has negative consequences on the process of economic growth as far as Bangladesh is concerned.

Source: Adapted from Author's Reviewed Work

Reviews of empirical works done in Nigeria are stated as follows: Onwuka (2006) empirically investigated the relationship between population growth and economic development in Nigeria between 1980 and 2003 by employing the OLS technique. His study empirically found out that growth in population outweighed that of output and that this had negatively affected development in the country because a considerable proportion of the nation's resources were consumed rather than being accumulated for development purposes.

Kotani and Kotani (2012) embarked on an empirical research to understand the effect of net migration on population-economic growth relationship in Indonesia between 1993 and 2005 using ordinary least square (OLS) regression techniques on annual time series data obtained on variables

listed in the model such as GDP, population growth, lagged value of fertility rate and net migration. The study revealed that lagged fertility does not affect the economic growth in the two-variable regression; however, the study further revealed a significant negative relationship between population growth and economic growth upon the inclusion of net migration as a variable in the model. The researcher therefore concluded that net-migration is a key determinant of economic growth.

Olabiyi (2014) studied the influence of population dynamics on economic growth of Nigeria using VAR model (1980 – 2010). The study found that reduction in fertility rate increased economic growth; and established a positive correlation between infant mortality rate and economic growth. Tartiyus, Dauda and Peter (2015) examined the influence of population growth on economic growth in Nigeria from 1980 to 2010. The data were analyzed using descriptive and regression analysis. The results indicated that there were positive correlations between economic growth and population; fertility and export growth while negative relationships existed between economic growth, crude death rate and life expectancy.

Aidi 'et al' (2016) studied the link between population and economic growth in Nigeria from 1970 to 2013 using Granger-Causality technique. They found that none of the variables under survey does not Granger-Cause each other during the period understudied. Lawanson (2016) examined the effect of rapid population growth on economic development in Nigeria using the ordinary least square technique. The study showed that population has a positive but insignificant effect on economic growth (at first difference) and a negative but significant effect on economic growth (at first difference lagged) in Nigeria.

Ogunleye, Owola and Mubarak (2018) carried out an appraisal of Population Growth and Economic Growth in Nigeria over the period of 1981 to 2015 with Ordinary least squares regression. The study revealed that population growth exhibited significant positive influence on economic growth.

In the same vein, review of empirical works done in Africa is stated as follows: Dao (2012) examined the relationship between population and economic growth in Africa using data that covered selected forty-five (45) African economies. The researcher employed the used of panel data regression analysis for the study, among the variables listed in the model include fertility rate, per capita GDP growth, trade openness, dependency ratio (old and young) among others. The researcher deduced from the findings that the relationship between population growth and per capita GDP growth is linear and negative.

The findings further revealed that fertility rates have a negative impact on economic growth and also that old dependency ratio positively affects per capita GDP growth.

Thuku 'et al' (2013) investigated the link between population change and economic growth. They employed the Vector Auto-regression Estimation Technique using annual time series data between 1963 to 2009. Their study revealed that population growth has a positive influence on economic growth and subsequently promotes development in Kenya.

Crist, Mora and Engelman (2017) found a negative influence of population increase on economic growth in Sub-Sahara Africa and on food security as well as biodiversity using descriptive statistics in the form of graphs to show the linkage between population and its impact on nature. However, they found that life expectancy has a positive impact on economic growth on Sub-Sahara Africa.

Peterson (2017) studied the relationship between population growth and growth of economic output generally for the period 2000 to 2015. The findings showed that Population growth slowed slightly during the periods in all regions except Sub-Saharan Africa, where population growth showed negative influence on economic growth. The study also showed that in low-income countries, rapid population growth is likely to be detrimental to economic growth in the short and medium term because it leads to large numbers of dependent children.

2.4. Gaps in Literature

Several researches have been conducted on population growth and economic growth in various countries especially in Asian countries, Europe, the Middle East and Sub Saharan African countries; however such researches are not so much in the Nigerian case especially in recent years. Also, some of the reviewed studies used OLS, ECM, VAR, and VECM as witnessed in (Onwuka, 2006); (Olabiyi, 2014); Thuku et al 2013; Oguneleye, Owola and Mubarak, 2018, providing gap in the methodology used. This study uses ARDL techniques. The variables used in the studies reviewed are different from the current research variables. The current study updated the following: (Onwuka, 2006; Olabiyi, 2014; Aidi et al, 2016 and Oguneleye, Owola and Mubarak, 2018) to 2020 providing time gap.

The aim of this research is to fill the gap in literature on the impact of population growth on the Nigerian economy using data range of years 1980-

2018, specifically looking at its impact of some social- economic indicators like poverty and unemployment as well as economic growth.

3.   METHODOLOGY

Model Specification

The model specified in this section is based on theoretical framework of the study on endogenous model that considers growth as a function of labour capital and other efficiency factors. Moreover, economic growth in this study is considered as overall economic performance; hence growth is captured by three variables: GDP growth rate, poverty rate, and unemployment. These are the main indicators of economic performance for a developing country (Todaro and Smith, 2012).

Taking cognisance of the demographic factors that affect population which in turn affect economic growth; the functional form of the endogenous model that used in this study is stated as:

$$RGDPG = f (PGR, CAP, POV, UNEMPL.) \qquad (3.1)$$

Where RGDPG = real GDP growth rate

PGR = population growth rate

CAP = capital accumulation

POV = Poverty rate

UNEMPL = Unemployment rate

Given the dynamic nature of population growth and economic growth in this study, the Autoregressive Distributed Lags (ARDL) approach is adopted. The main advantage of this procedure is that it can be applied regardless of the stationary properties of the variables in the sample and allows for inferences on long-run estimates, which is not possible under alternative cointegration procedures. The ARDL/Bounds Testing methodology of Pesaran 'et al' (2001) has a number of features that give it some advantages over conventional cointegration testing. The technique (ARDL) provides unbiased and efficient estimates of the long-run model and valid t-statistics even in situations when the variables are endogenous. This is possible because it avoids the problems of serial correlation and endogeneity (Afzal et al., 2009). In relation to the current study, the expanded ARDL specification that explains dynamic relationship between the variables of the above model is stated below;

$$\Delta RGDPG_t = \alpha_0 + \lambda RGDPG_t + \delta_1 PGR_t + \delta_2 CAP_t + \delta_3 POV_t + \delta_4 UNEMPL_t$$

$$+ \sum_{i=1}^{p-1} \psi_i \Delta PGR_{t-i} + \sum_{i=1}^{q_1-1} \varphi_2 \Delta CAP_{t-i} + \sum_{i=1}^{q_1-1} \varphi_3 \Delta POV_{t-i}$$

$$+ \sum_{i=1}^{q_1-1} \varphi_4 \Delta UNEMPL_{t-i} + \theta ECM_{t-1} + \xi_t$$

$$(3.2)$$

Apriori expectation: $\delta_1, \delta_3, \delta_4 < 0$; $\delta_2, > 0$; also, $\varphi_1, \varphi_3, \varphi_4 < 0$; $\varphi_2, > 0$

Where θ is the error correction term that is expected to be negative and lie between 0 and 1 in absolute values The coefficients δ_is are the short run coefficients, while φ_is are the long run coefficients. α_0 is the constant parameter (Bahmani-Oskooee. & Fariditavana 2016; Ohiomu & Oluyemi 2019).

The secondary data from 1983 to 2021 (39 years) for this research were collected from the World Bank, National Bureau of Statistics (NBS), National Population Commission and CBN Statistical bulletin.

4.   RESULTS AND DISCUSSION

Descriptive statistics: The annualized summary statistics of the data used in the empirical analysis are presented in Table 2.

Table 2: Descriptive statistics

Variable	Mean	Max.	Min.	Std. Dev.	Skew.	Kurt.	J-B	Prob.
RGDPG	4.15	14.60	-7.58	4.42	-0.06	3.14	0.05	0.97
UNEMPL	8.90	19.70	1.80	4.97	0.50	2.31	2.36	0.31
POV	55.47	63.50	52.90	2.81	1.62	4.93	22.55	0.00
PGR	2.57	2.71	2.49	0.07	0.09	1.71	2.70	0.26

Average RGDP growth rate was 4.15 percent over the study period. Considering that maximum value was 14.6 percent for the period, there is clear indication that the economy has not performed too well over a longer period of time in Nigeria. The minimum RGDP growth rate is -7.58. This indicates that there was a lot of variability in growth rates over the period, with certain periods having large declines and others having relatively high growth. The population dynamics in the study could have contributed to the unsteady growth path of the Nigerian economy. The skewness values for GDP growth is however very low, which suggests that the mean value is largely representative of the performance of the growth rate The average unemployment rate in the study for the period is 8.9, which is very high, with a low standard deviation value of 4.97, suggesting that unemployment in Nigeria has been relatively

high over the years. The average proportion of individuals in poverty (living on less than 1.9 dollars a day) is 55.47 percent over the period over the entire period of the study. The J-B value of 0.05 is not significant at the 5 percent level which shows that the variable is normally distributed.

The other economic performance variables in the study are unemployment rate and poverty rate. This also indicates a high poverty rate in the economy since 1983. Thus, with all the economic indicators combined (i.e., low growth rate of GDP, high poverty and unemployment rates), the Nigerian economic environment appears to be quite unstable and relatively weak.

Population growth rate is 2.57 percent is high on average over the period, with a maximum value of 2.71 and minimum value of 2.49. This shows that population growth rate has remained high for all the years and this high rate can be devastating for the economy, especially in years when growth rate of GDP was either low or negative.

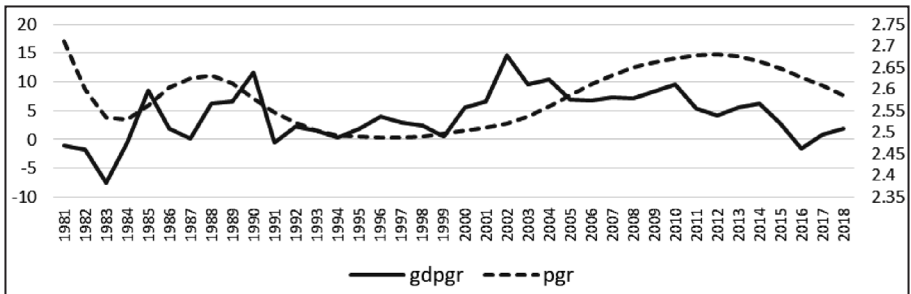## Trend in Population and Economic Indicators

Figure 2: Population and Real GDP growth Rates

The trends in population and economic indicators in the economy are also presented in the Chart above. Figure 1 shows the trend movement in economic growth and population growth for Nigeria over the years. Both rates appear to be moving in the same direction, especially when there are large swings in the business cycle. The poor performance has stagnated for long periods precisely because population growth has been so rapid in recent years.

4.1. Unit roots analysis

Generally, unit root test involves the test of stationarity for variables used in regression analysis. The importance of stationarity of time series used in regression borders on the fact that with a non-stationary time series, it is not possible to generalize to other time periods apart from the present. This makes

forecasting based on such time series to be of little practical value. Moreover, regression of a non-stationary time series on another non-stationary time series may produce spurious result (Gordon, 2005). Two tests of stationarity were employed in this study in order to analyse unit roots. The results are presented in levels and first differences. Table 5 presents results of Augmented Dickey Fuller (ADF) and Philip-Perron (PP) tests in levels and first differences without taking into consideration the trend in variables. The results indicate that, apart from population growth rate, each of the other variables possesses insignificant ADF and PP values for the levels test. Based on the test on the first differences, ADF and PP values for each of the variables are significant at the 5 percent level. All the variables, except population growth rate are therefore integrated of order one, while PGR is integrated of order zero. It is therefore appropriate to use the ARDL approach to cointegration to estimate the relationships between the variables since the technique does not consider the pattern of integration among the variables.

Table 3: Unit Root Test Results

Variable	ADF Test			Phillip-Perron Test		Order of Integration
	Levels	First Difference		Levels	First Difference	
RGDP	-2.67	-4.95**		-1.34	-6.32**	I[1]
POV	-2.077	-3.740**		-1.753	-3.676**	I[1]
UNEMPL	-1.36	-5.69**		-2.034	-6.002**	I[1]
PGR	-2.967**	-2.971**		-2.31	-4.267**	I[0]
CAP	0.739	3.113**		2.421	3.459**	I[1]

Note: ** indicates significance at the 5 percent level'

Having established that the series in the analysis are all either I(1) or I(0) variables, possessing unit roots, we move on to determine if they are cointegrated. This involves examining whether a long run relationship exists between dependent variables and independent variables. This involves the use of bounds test.

4.2. Bounds Test Results

Table 6 shows the result of the Bounds test of long run effects for the ARDL specification for the specified equation for analysis. The evaluation of the results is based on the critical F-statistic values for the lower and upper bounds as also reported in the results. If at any significance level, the estimated F-value is lower than both the lower test (I0 Bounds) and the upper test (I1 Bounds) values, then there is no cointegration among the variables. The test becomes inconclusive, if

the F-statistic falls into the bounds. However, there is cointegration among the variables, if the estimated value falls above both Bounds test values.

Table 4: Bounds Test Results

Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	5.189573	4
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

From the Table 4, it is seen that the computed F-value falls above both the lower and upper bounds. These results show that there is cointegration among the variables. This is because the critical F-value is greater than the I0 Bounds and I1 bounds values. Thus, a long run relationship can be estimated between the economic growth variables and other variables.

4.3. Granger causality test results

Table 5: Causality Test Results

Null Hypothesis:	Obs.	F-Statistic	Prob.
LPGR does not Granger Cause LRGDPG	36	4.05**	0.03
LRGDPG does not Granger Cause LPGR		0.61	0.55
LPOV1 does not Granger Cause LUNEMPL	36	0.86	0.43
LUNEMPL does not Granger Cause LPOV1		4.92*	0.01
LPGR does not Granger Cause LUNEMPL	36	0.25	0.78
LUNEMPL does not Granger Cause LPGR		3.21**	0.05
LPGR does not Granger Cause LPOV1	36	0.46	0.64
LPOV1 does not Granger Cause LPGR		15.21*	0.00

Note: * indicates significance at the 1 percent level; ** indicates significance at the 5 percent level

There could be reverse effects of population growth on economic growth in Nigeria. Hence, the Granger causality test between population growth rate and RGDP growth rate is performed in this section. It can be seen from table 7 that PGR granger causes RGDPG, but RGDP growth rate does not Granger cause PGR. Also, causality also runs from unemployment to poverty, which shows that it is poverty that mainly causes unemployment in Nigeria. Causality

also runs from unemployment to population growth. Poverty also tends to Granger cause population growth. There is no bidirectional causation in the result. Hence, the results of the estimates are reliable.

4.4. ARDL results

The Bounds test for long run relationships shows that the selected independent variables in the study actually move together with economic growth in the long run. This gives the mandate to estimate the long run ARDL models that were specified. The optimum lag length of one period for the model was selected based on the Schwarz-Bayesian Information Criterion (SIC).

Given that the long run stable relationship between population growth and economic performance is the goal of this study, we focus on the co-integrating equations from the estimation of the ARDL. This show us the long run estimates, as well as the path to attaining long run using the error correction mechanism.

Table 6: ARDL estimation for economic growth

Short run co-integrating coefficients			
Variable	*Coefficient*	*t-Statistic*	*Prob.* **
D(PGR)	8.103**	2.876	0.022
D(PGR(-1))	6.156	1.771	0.017
D(PGR(-2))	-4.924*	-3.789	0.011
D(PGR(-3))	-2.529*	-3.981	0.007
D(LCAP)	0.034**	2.629	0.020
D(LCAP(-1))	0.074	1.987	0.081
D(LCAP(-2))	0.148*	2.983	0.012
D(POV)	-1.039	-1.954	0.065
D(UNEMPL)	-8.261	-1.677	0.103
ECM(-1)	-0.512*	-2.871	0.012
Long Run Coefficients			
Variable	*Coefficient*	*t-Statistic*	*Prob.*
PGR	-1.60*	-4.326	0.001
LCAP	0.344*	3.356	0.003
POV	1.941*	2.711	0.001
UNEMPL	-1.892**	-2.215	0.044
C	102.253	3.681	0.003
Cointeq = LRGDP - (1.6014*LPGR + 0.3443*LCAP + 1,941*LPOV − 1.892*LUNEMPL + 102.2533)			

Note: * indicates significance at the 1 percent level; ** indicates significance at the 5 percent level

In Table 6, the results of the co-integrating equations are presented. A close look at the individual coefficients of the variables for the short run results reveals that the coefficient of population growth is significant and positive in the current period. However, the coefficient of lagged population growth after two periods (PGR_{t-2}) is significant at the 1 percent level and negative as well as the third periods (PGR_{t-3}). This result therefore shows that initially population may have positive impact on the economy, but after a while, if such growth in population is maintained, the effect becomes negative on economic growth in Nigeria. For the other variables, the result shows that the coefficient of capital accumulation is positive at both current period and lagged periods with level of significance at 5% and 1% respectively. Poverty rate exhibits mixed effects on growth showing negative effect at current period and positive significant effect on the long run at 1% level of significance. Unemployment has negative impact on economic growth in Nigeria both at short run and long run dynamics with 5% level of significance on the long run.

The coefficient of the error correction term (ECM) is expected to be significant and possess a negative sign. In the estimated equation, the coefficient of the error correction term has the expected negative sign and is significant at the 1 percent level. The significant and negative coefficients indicate that there is capacity for restoring long run stability following any short run deviation of the economy from equilibrium. The coefficient of the ECM term is moderate at -0.512, which indicates that 51.2 percent of the long run adjustment to equilibrium is completed within the first year. The ECM term tends to suggest that population growth gradually or asymptotically wears off on economic performance over time in Nigeria.

4.5. Discussion of findings

The main findings of the study highlight the negative role of rising population on economic growth in Nigeria on the long run while the short run dynamics exhibited positive effect on economic growth. Human population, human capital or people are the most important factor of production. Hence, one can expect that the more the growth of population, the more the growth of RGDP and this is what showed up in the short run. But where population grows without growth in human capital to match; or growth in per capita income; or without growth in productivity as it is in the case of Nigeria, then in the long run population growth will have inverse relationship with growth in RGDP. In this scenario, there is low income and there is poverty; low productivity

and hence, population growth will impact negatively on RGDP in the long run. This is the case of Nigeria and many other sub Saharan countries where similar scenarios play out. This result supports the findings from a report by Dao, (2012 where it is shown that population growth and explosion in most African economies limits growth in the continent. Our study has shown that population growth which is supposed to be an asset to any nation turned out to be a liability and problem in this study, perhaps due to low productive capacity and poor capacity utilization. This is the case in many developing countries with low productive capacity. The findings also showed that population growth intensifies the unemployment and poverty problems in the region including Nigeria. Indeed, population growth affects unemployment, household savings, investments and ultimately economic growth.

Also, the social dimensions of high population growth are also observed in this study. This result confirms the findings by Peterson (2017) who found that high population growth in low-income countries may slow their development. Planned population policy and income policy could help to regulate these imbalances.

5.   SUMMARY, CONCLUSION AND RECOMMENDATIONS

The study established the impact population growth has on the economic growth in Nigeria. Amongst the findings are: (1) The coefficient of population growth showed significant positive relationship with economic growth in the current period (short run) while population growth in Nigeria exerts significant negative long run effect on economic growth. (2) unemployment exerts negative effect on economic growth. (3) Capital formation exerts positive effect on economic growth. (4) Poverty rate exhibits mixed effects on growth showing negative effect at current period and positive significant effect on Economic growth on the long run at 1% level of significance. The result of this finding corroborates most of the reviewed literature.

Interestingly, growing economies need growing populations with increasing the supply of both workers and consumers, although the precise nature of this relationship is complex and multi-dimensional in nature. Population growth poses challenge if it outpaces increases in productivity. The study also x-rayed the relationship between population dynamics and economic growth within broad considerations. It was established that for Nigeria, population has slowed down the growth process. Also, persistent increase in population would increase relative and absolute poverty.

From the analysis so far, certain policies recommendations can be made on the appropriate means of checking population growth, boost capital formation and employment generation for economic improvements in Nigeria. Our results highlighted the mixed relationship that population growth has with economic growth in Nigeria. There should be regular and meaningful interventions in population-related projects and programmes such as census, database management system and the provision of socio-demographic indicators in all geographical areas in Nigeria for accurate and realistic management of population data rather than relying on estimated data on population. The last census was held in 2006 while estimation and forecast are currently adopted for reality. The government, policy makers and other population analysts should revisit the population policy of 1988 revised in 2004 and 2016 which stipulated 4 children per family to handle the nation's soaring population and related issues by embarking on specific training and programmes that highlight evidence-based policy crafting as applicable to developing countries such as Nigeria. Capital formation exerts positive effect on economic growth. The government should provide the enabling business environment and better policies that will encourage savings and investment for capital accumulation that will accelerate economic growth. The government should embark on massive employment generation schemes that will absorb the unemployed through strategic stimulus investments in Agricultural transformation, communication, construction, entrepreneurial education, hospitality industry, manufacturing, mining, real estates, and railway networks amongst others. This has triple action tendency to checkmate poverty rate, unemployment syndrome and accelerate economic growth for sustainable development as well as control population indirectly, because when people are meaningfully engaged, there is less tendency for procreation.

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