ISA Journal of Business, Economics and Management (ISAJBEM)

Homepage: https://isapublisher.com/isajbem/

Volume 3, Issue 4, Jul-Aug, 2026 ISSN: 3049-1835

The Effect of Population Dynamics on Economic Growth in Nigeria: A Disaggregate Study

Esther Esara, PhD

Department of Economics; Topfaith University, Akwa Ibom State

Received: 05.06.2026 | **Accepted:** 03.07.2026 | **Published:** 10.07.2026

***Corresponding Author:** Esther Esara, PhD

DOI: *10.5281/zenodo.21293584*

Abstract **Original Research Article**

Literature on population dynamics and its effect on economic growth in Nigeria have mostly considered the effect of population growth (change in population) and not the effect of the change in the elements triggering the population growth and change in the characteristic/feature of the population such as the age structure -these are the dynamism. Resulting from this, most of the policy recommendations and decisions of government regarding population and growth lack focus. This study therefore examines the disaggregated effect of each element of population dynamics (birth rate, death rate, net migration and age structure) on economic growth in Nigeria. Annual secondary data on the Nigerian economy was used to carry out the study. Implementing the Auto Regressive Distributed Lag (ARDL) dynamic specification, we found out that in the short run and long run, aged population, birth rate and death rate had negative and significant effect on economic growth while labour population had positive and significant effect. Also, children population had a negative and significant effect in the short run and positive effect in the long run while net migration had a negative and significant effect in the long run. The paper recommends: increased focus on female education to increase the opportunity cost of raising children and reducing birth rate; increased job opportunities for optimal labour population participation; and government resolve to stop massive exodus of Nigerians (especially professionals) to other countries and continents

Keywords: population dynamics, natality, mortality, migration, age structure and economic growth.

INTRODUCTION

The population dynamics of an economy play a crucial role in the achievement of economic growth and other macroeconomic goals such as full employment, improved standard of living, etc. Demographic analyst has highlighted population dynamics as part of the key factor responsible for the success of Southeast Asian development experience (Asian miracle), exemplified by a per capita income that more than tripled between 1950 and 1998(Bloom and Finlay, 2008).

They noted that between 1960 and 1990, a shift in age structure influenced economic growth significantly. Also, that in 1990, fertility rate of the East Asia region was less than 2. The fall in fertility rate automatically resulted in a proportionate rise in the working-age population, so that between 1965 and 1985, the ratio of their population to that of the non-working population in East Asia rose from 1.3 to 2.1. This rise in the working-age population due to

lower fertility led to a higher income per capita (Bloom & Finlay, 2008).

Nigeria, with the highest population in Africa is the most populous black nation and it is the eighth most populous country in the world with a population of over 200 million persons (WDI, 2020) The Nigerian demographic structure reflects that of a growing youthful population. Based on the National Population census carried out in 2006, more than 40% were below 14years, about 29% were between 15-19years and more than 20% were between 30-59 years. About 60% of the population inhabits the rural areas while about 40% live in urban areas. Nigeria's annual population growth rate for 2018 and 2019 averaged 2.28 and it is one of the fastest growing populations in the world. If this population continues to grow at this rate, then the size of the population will double in just 24years (NPC, 2006; 2009; 2013; UN, 2013; WDI). Although, natality (birth rate) and mortality have been decreasing for instance, birth rate dropped from 37.91in 2018 to 37.68 in 2019 and death rate dropped from 11.86 in 2018 to 11.77 in 2019, birth rate is still significantly higher than death rate hence the continuous growth in population (WDI, 2020).

What are the disaggregate effects of these population dynamics on the Nigerian economy? Do Nigeria's population dynamics conform to the view of the 'population pessimists', who support the Malthusian thought about how population growth affects economic growth or the 'population optimists' who hold a contrary opinion to the pessimists, whose belief is that economic growth brings about economies of scale and promotes technological progress which will eventually promote growth, or the 'population neutralists' who contend that population itself, holding other variables constant, has no effect on economic growth? (Sachs, 2008; Hamza, 2015). How does change in the size of population and the structure of population affect economic growth over time?

The main objective of this study therefore is to examine the disaggregate effect of population dynamics (death rate, birth rate, migration and age structure) on economic growth in Nigeria. Most of the research work done on this considered the aggregative effect of population growth on economic growth. This study, however, examines how the key elements of population dynamics (death rate, birth rate, migration and age structure) affect economic growth, so policy makers can know the exact aspect to direct their policies to achieve the desired goal.

This paper is structured as follows: section two describes conceptual issues, relevant theories and the findings of previous related studies; section three explains the data sources and methodology; section four presents and discusses the empirical findings and finally; section five gives the concluding remarks.

LITERATURE REVIEW

Conceptual Framework

Population dynamics is the study of how populations change in size and structure over time. The effect of population dynamics on economic growth is influenced by birth rate, death rate and net migration. Therefore, the statistics mostly considered in population dynamics are natality (birth rates), mortality (death rates), migration and age distribution. It has to do with population growth, age structure, urbanization and migration (IPPF, 2013).

Economic Growth is the increase in a country's real gross domestic product (GDP adjusted for inflation). GDP is the monetary value of all goods and services produced in a country in a particular time (Aghion and Howitt, 2009). Maddison's estimates revealed that economic growth took place at a glacial pace during most of human history since GDP per capita in the world economy was not higher in 1000 than in year1 and only 53 percent higher in 1820 than in 1000, meaning that the average growth rate was only 1/19th percent over those 820 years.

However, growth increased to 0.5 percent from 1820 to 1870, and it kept increasing to achieve a rate of nearly 3 percent from 1950 to 1973. Resulting from this growth, the world is substantially richer today than it has ever been before (Maddison, 2001). Some of the exemplary dramatic changes in economic growth were in many formerly poor Asian countries, during the final decades of the century. From the 1960s until now, countries like South Korea, China,

and India have grown much faster than the rest of the world, and they are continuing to close the gap in per capita income that separates them from the richest nations (Aghion and Howitt, 2009). It is what mainly determines the material well-being of billions of people. Growth can bring about virtuous circles of wealth and opportunities.

Economic Growth provides job opportunities and higher demand for labour (Aghion & Howitt, 2009). Growth in GDP leads to growth in GDP per capita and increases standard of living (Stone, 2017). In economically advanced countries, economic growth has made it possible for almost the entire population to live in a way that only a privileged handful could have been able a hundred years ago, when per capita GDP was a small fraction of what it is today while lack of it in the poorest nations of the world has meant a miserable condition of living for millions of people (Aghion and Howitt, 2009).

Therefore, as in many countries, especially the developing nations, the primary focus of economic policies and programmes in Nigeria is to have sustainably high economic growth. This is important for broader development. Resulting from this, individuals and societies will be able to achieve other objectives that will improve their living conditions (Anyanwu, 2014).

The effect of population dynamics on economic growth is delivered through several mechanisms. It affects labour Supply which goes a long way to determine output, especially when the production is labour intensive. During the peak working years of 20 to 54, this effect is especially strong (Bloom, Canning & Sevilla, 2003). It could also influence domestic demand and consumption. When there is increase in working population it could bring about greater domestic demand and consumption, especially if they are gainfully employed, because their income will afford them the purchasing power for effective demand. Increase in effective demand could imply increase in aggregate demand that eventually leads to economic growth.

Population dynamics affects savings, capital and wealth accumulation. Working-age population earns more and can save. This tends to favour greater personal and national savings. The ability to save money is even greater when these working individuals are appropriately educated and trained. Increased savings serve as a partial resource for industrial investments that fuel economic growth. It can also serve as resources that households and governments can invest to boost productivity. Additionally, private household savings can provide the capital accumulation needed to finance growth, as seen in East Asia (Krugman, 1994; Young, 1994, 2005; Kelley and Schmidt, 1995, 1996; Asian Development Bank, 1997; Higgins, 1998). Also, people between ages 40 and 65 tend to save more since they probably spend less on children and need to prepare for retirement (Bloom, Canning & Sevilla, 2003). The accumulation- driven productivity gain of the East Asia development has been explained in literature over the years to be partly as a result of demographic factors. (Higgins, 1998; Higgins and Williamson, 1997).

Population dynamics can also bring about change in productivity that could lead to economic growth. There is a boost in economic productivity that occurs when there are growing numbers of people in the workforce, relative to the number of dependents, although this has to be accompanied by sustained investments in education, skills development, health, job creation and good governance. This boost in economic productivity will certainly lead to economic growth, ceteris paribus (Bloom, Canning & Sevilla, 2001).

Theoretical Literature

There are numerous economic theories that have attempted to assess the effect of the different aspects of population dynamics on economic growth. These theories include: the Malthusian population theory (population growth), microeconomic theory of fertility (birth rate/fertility), Harris-Todaro theory of rural -urban migration (urbanization/migration) and neoclassical growth theory.

The Malthusian Population Theory used the concept of diminishing returns to explain population growth. It states that as a result of diminishing returns to fixed factors (such as land in this case), food supply grow at arithmetic rate while population grow at geometric rate because of high fertility rate resulting from lack

of moral restraints. Since growth in population is higher than growth in food supply, per capita incomes (defined in this case as per capita food production) will fall to a subsistence level and to a level where the food supply is not sufficient to feed the population (Malthusian population trap). The theory suggested "moral restraint" as the only means to reduce population growth and prevent the population trap (Todaro & Smith, 2011; Gupta, Bongaarts & Cleland, 2011).

Microeconomic theory of fertility was founded on the premise that family considers costs and benefits in determining family size formation. This theory sees children as a kind of consumption commodity (in low-income countries, investment). It sees fertility as a family's rational economic response. In this case, the demand for children is relative to other goods with the application of income and substitution effect. This means that the number of children demanded (desired) by a family can be expected to vary directly with the family's income, ceteris paribus. However, this direct relationship may not hold for poor societies especially if the source of the increased income is from the woman's employment. It also depends on the strength of demand for children compared to demand for other goods. The demand for children varies indirectly with cost (price) of children and the strength of taste for other commodities compared to taste for children (Todaro &Smith, 2011).

The Todaro migration theory explains that rural-urban migration is an economically rational process. It postulates that migration is as a result of difference in expected income rather than actual income, that is, migrants estimate the present value of urban expected income or its equivalent and move if it is higher than the average rural income. Harris-Todaro Theory predicts that expected income will eventually be equal across rural and urban sectors, especially when the activities of the informal-sector and unemployment are considered. It is an equilibrium version of the Todaro migration theory. This migration model was developed using industrialized economies and therefore implicitly assumes full employment. Unfortunately, such an analysis does not hold true in developing countries (Todaro and Smith, 2011).

Neoclassical growth theory: It holds that growth in total productivity or output can be achieved either via increase in saving or reduction in the rate of growth of population. This model emphasizes capital accumulation and exogenous rates of change in population and technological progress. It predicts that all market-based economies will eventually reach the same constant growth rate if they have the same rate of technological progress and population growth
(Aidi, Emecheta and Ngwudiobu, 2016).

The standard exposition of the model uses an aggregate production function.

$Y = K^{\alpha}(AL)^{1-\alpha}$

Where,

Y = the gross domestic product,

K = the capital stock,

L= the labour force

A = productivity of labour

α = elasticity of output with respect to capital

It sees production function as having constant returns to scale, so when input doubles, output will double, but if one input is held constant, the doubling of the other will yield less than double of the output. This is one of the distinguishing characteristics of this model and it is called the law of diminishing marginal returns. By extension, a reduction in one of the inputs, say labour while holding capital constant will bring about less output (Todaro and Smith, 2011). In Solow' s opinion, an increase in the population growth rate will increase the amount of labour and thus the absolute level of output and the steady state output growth rate. Conversely, it could reduce physical capital stock per worker; bringing about a decrease in productivity and output per worker (Peter and Bakari, 2018).

Empirical Literature

Empirical literature presents varying effects of the various aspect of population dynamics on economic growth depending on the variables used as proxy for the study. For

instance, Aidi, Emecheta and Ngwudiobu (2016) used life expectancy at birth as a proxy for mortality rate in their assessment of population dynamics and economic growth in Nigeria. They also included variables such as fertility (birth rate) and net-migration. Their results revealed that fertility (birth rate), mortality and net-migration have an indirect relationship with economic growth while Tartiyus, Dauda and Peter (2015) found a direct relationship between birth rate and GDP growth using data from 1980 to 2010. Also, Rutger and Jeroen (2011) examined the impact of age-structure on economic growth in developing countries. They used asset index as proxy for district GDP and included GDP per capita growth, growth rate of working-age share, urbanisation rate and life expectancy. Their result showed a direct relationship between working age population and growth rate of GDP.

There are also conflicting opinions in empirical literature as regards the influence of migration on economic growth. Mann (2015) presented a case against immigration. The author argued that it brings about population that is not sustainable in advanced countries. He was of the opinion that native- born workers are displaced by immigrants who accept lower wages (Frum, 2015) while other analysts found that immigration generally has positive effects on income growth and productivity (Boubtane, Coulibaly and Rault, 2013; Mason 2014; Peri, 2012). Some are also of the opinion that immigrants that are highly skilled have more positive effect than unskilled or semi- skilled migrants (Chojnicki and Ragot, 2016; Kerr, Kerr, Ozden and Parsons, 2016).

Mierau and Turnovsky (2014) argued that reduced mortality makes the people save more, knowing that they will have longevity of life and this stimulates growth while increases in fertility have a negative effect on aggregate savings. Olabiyi (2014) studied how population dynamics affected the Nigerian economy and found that economic growth increases with decrease in fertility. Akintunde et al (2013) assessed the relationship between population dynamics and economic growth in thirty-five (35) sub-Saharan African countries. The results revealed that fertility has a negative effect on economic growth.

Empirical literature has also shown that researchers have used varying methodology to assess the population dynamics and economic growth. Dao (2012) employed the use of panel data regression analysis to study population and economic growth in Africa. The study used data covering selected forty-five (45) African economies and found that fertility rates have a negative effect on economic growth. When Kotani and Kotani (2012) embarked on empirical research to understand the effect of net migration on population-economic growth relationship in Indonesia, they used OLS regression techniques and discovered a negative and significant relationship. They therefore concluded that net-migration is a major factor among variables influencing economic growth. Bloom, Canning and Finlay (2010) empirically assessed the effect of aging population on economic growth in Asia using descriptive statistics and a panel regression model. They found a negative relationship between aging population and economic growth.

Meanwhile, when Liddle (2003) used OLS regression, the study found that there is no significant effect between age specific growth and economic growth stability in Latin America and the Caribbean nations. Also, Ogunleye, Owola, and Mubarak (2018) used the ordinary least squares method to assess the effect of population growth on the economic growth of Nigeria between 1981 and 2015. The study shows that crude death does not have a significant effect on economic growth, but population growth and fertility have a positive and negative significant effect respectively.

However, the more consistent result from empirical literature is that age structure, especially a high working age group that are productively engaged influences the economy positively. Anand Jeon (2006) used fully modified ordinary least squares (FMOLS) and found that the age structure in Korea has improved the economic performance in that country. Bloom et al (2006) used descriptive statistics to explain the effect of mortality, fertility and age structure on the income per capita in China and India. They concluded that a fall in fertility would improve

economic growth in India.

Summary/ Evaluation of Reviewed Literature/Justification for the study

Contradictory findings on the effect of population dynamics on economic growth have led several analysts to consider the possibility that the effect of population dynamics on economic growth may not be uniform but, rather, varies with particular circumstances in different nations.

In 2018, Ahmad and Khan conducted a disaggregated study of the role of change in age structure and human capital in the economic growth of 67 developing economies between 1960 and 2014 using Difference Generalized Method of Moments (Diff-GMM). The study found that age-structure has a positive effect on economic growth. The disaggregation of the study considered the categorisation of the various nations into regions and income groups and age structure, but this study is not only solely on the Nigerian economy; its disaggregation is on the effect of most of the key aspects of population dynamics. The authors also carried out a study on the effect of demographic transition with dynamics of human capital on economic growth using 5-year interval data from 1960 to 2014 and dynamic panel System-Generalized Method of Moments (Sys-GMM) estimator. The study confirmed that demographic transition, especially the economically active population, affects the economic growth of developing countries positively.

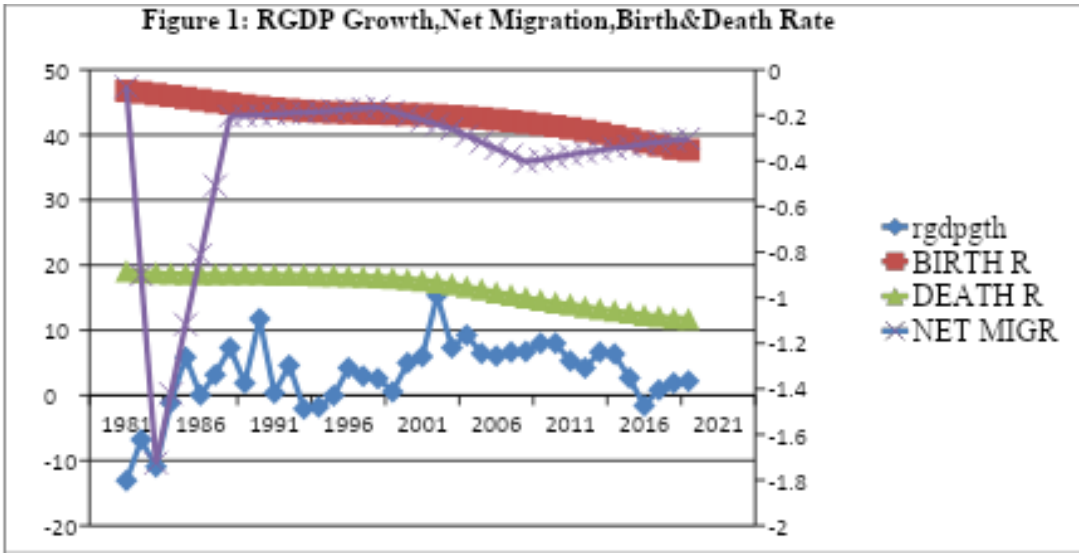
Gatsi and Appiah (2020) studied the relationship between economic growth, population growth, gross savings and energy consumption in Ghana from 1987 to 2017 using autoregressive distributed lag (ARDL) bounds test. The study found that population growth has a negative effect on economic growth.

There are several studies that has been conducted on the effect of population dynamics on economic growth, but there is sparse recent research on the Nigerian economy. The methodology of study of some of these research works (Liddle, 2003; Onwuka, 2006; Adewole, 2012; Kotani & Kotani, 2012; Aidi, Emecheta, & Ngwudiobu, 2016), specifically the ordinary least squares method necessitated this study. The ordinary least squares method can give spurious results when the variables have varying stationality. This research has shown that some of the variables are stationary at level while others are stationary after first difference, confirming that the ordinary least squares method is not quite appropriate for the study, therefore this study will attempt to bridge this methodological gap.

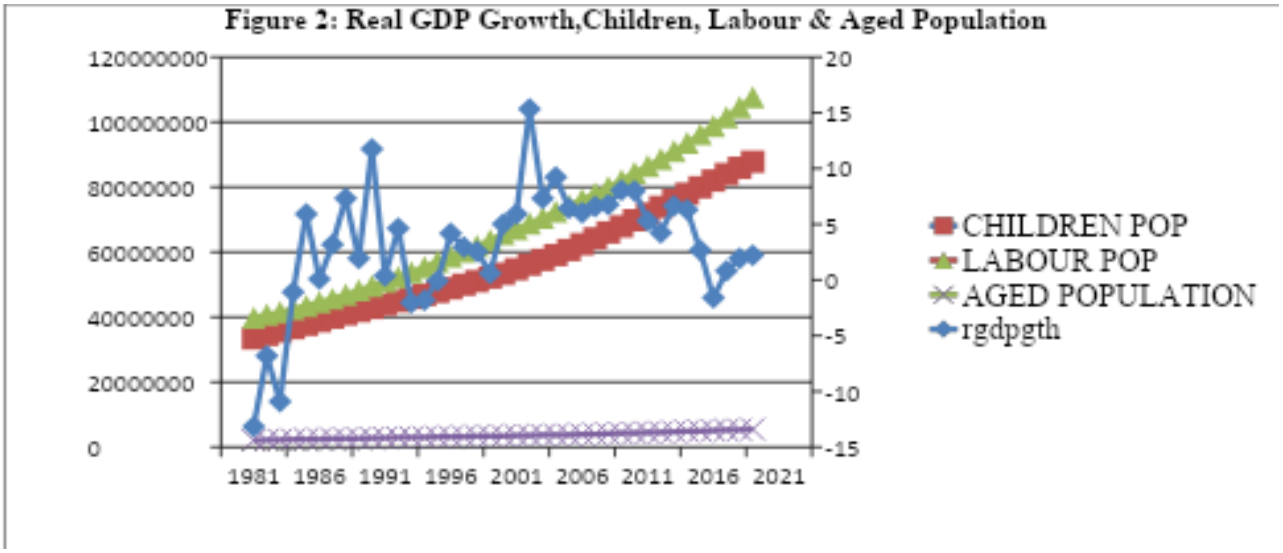
Also, the studies carried out on Nigeria mostly considered population size and the aggregate effect of population growth on economic growth (Nwosu, Dike and Okwara, 2014; Onwuka, 2006; Adewole, 2012). Population dynamics involve not only the change in the size of the population, but also the structure of that population. This could result in misleading policy recommendations or at best government decisions regarding population and economic growth that lack focus. It is therefore imperative for a study like this to be carried out to assess the disaggregate effect of the major elements that bring about change in the size and structure of the population and hence the population dynamics. This will enable the government and policy makers to know the aspect of population dynamics that will most effectively drive economic growth in the desired direction. This study will therefore attempt to bridge this research gap by considering the disaggregate effect of the core elements/components of population dynamics such as fertility, mortality, migration and age structure on economic growth.

Stylized Facts

Net Migration, Death rate, Birth Rate and Economic Growth: In figure 1, it is clear that there has been a steady decline in both birth rate and death rate since 2001, but the rate of decline in death rate is higher than that of birth rate thereby giving rise to population growth in Nigeria, while the net migration has no obvious effect on the Nigerian population. Unfortunately, the erratic nature of the growth in real gross domestic product in Nigeria makes it difficult to track the direct effect of the decline in birth and death rate on economic growth.



Source: Author, Using Data from World Bank's World Development Indicators.



Source: Author, Using Data from World Bank's World Development Indicators.

Children Population, Labour Population, Aged Population and Economic Growth: Figure 2 shows that labour population is higher than the population of the children and the aged. Though they have all been increasing, the rate of increase in labour population is leading. Regrettably, the change in real gross domestic product is almost negligible compared to these demographic changes. Little wonder why there has been high rate of unemployment and more Nigerians are daily sinking below the poverty line.

METHODOLOGY

Model Specification

The main objective of this study is to examine how population dynamics affects economic growth in Nigeria. To attain this objective, the disaggregate effect of each of the major elements/components of population dynamics (death rate, birth rate,

migration and age structure) on economic growth was considered. This is a significant study because research on population dynamics and economic growth in Nigeria before now have either considered the effect of growth in population and economic growth or selected elements of population dynamics as proxy (Ukpolo, 2002; Onwuka 2006; Adewole, 2012; Nwosu, Dike & Okwara, 2014; Ewugi and Yakubu, 2012; Olabiyi, 2014; Tartiyus, Dauda and Peter, 2015; Aidi, Emecheta and Ngwudiobu, 2016).

This study adapted the model of Aidi, Emecheta and Ngwudiobu (2016) who employed an augmented neoclassical growth model. This study included other relevant variables such as age structure (to capture the change in the structure of the population as population dynamics does not only involve change in size but also change in the structure of the population). Since this study is considering a growth model, inflation, secondary school enrolment as proxy for education and domestic investment are also included.

Thus, RGDPG=f(LP, CP, AP, BR, DR, NM, TO, SE, DI, INF).....(i)

Where,

RGDPG = Real GDP growth

LP = Labour population (Population ages 15-64, total)

CP = Children population (Population ages 0-14, total)

AP = Aged population (Population ages 65 and above, total)

BR = Birth rate

DR = Death rate

NM = Net migration (the net total of migrants during the period, that is, the number of immigrants less the number of emigrants)

TO = Trade openness (% of GDP)

SE=Secondary school enrolment (% of Gross) as proxy for education/technology

DI = Domestic investment (% of GDP)

INF = Inflation

The econometric specification of the function in (i) thus becomes: $RGDPG_t=\alpha_0+\alpha_1LP_t+\alpha_2CP_t+\alpha_3AP_t+\alpha_4BR_t+\alpha_5DR_t+\alpha_6NM_t+\alpha_7TO_t+\alpha_8SE_t+\alpha_9DI_t+\alpha_{10}INF_t+\varepsilon$...(ii)

a priori expectation: $\alpha_1,\alpha_5,\alpha_6,\alpha_7,\alpha_8,\alpha_9$ and $\alpha_{10}>0$; α_2,α_3 and $\alpha_4<0$

Recasting equation (ii) in a log-linear form, we have;

$RGDPG_t=\alpha_0+\alpha_1InLP_t+\alpha_2InCP_t+\alpha_3InAP_t+\alpha_4BR_t+\alpha_5DR_t+\alpha_6NM_t+\alpha_7TO_t+\alpha_8SE_t+\alpha_9DI_t+\alpha_{10}INF_t+\varepsilon_t$..... (iii)

To estimate the econometric model in (iii), this research adopted the ARDL technique in order to avoid spurious results that may be easily occasioned by using OLS if the variables under study have different orders of integration, we therefore recast equation (iii) as an autoregressive distributed lag (ARDL) model of the form:

$\Delta RGDPG_t=\delta_0+\delta_1\sum\Delta RGDPG_{t-1}+\delta_2\sum\Delta InLP_{t-1}+\delta_3\sum\Delta InCP_{t-1}+\delta_4\sum\Delta InAP_{t-1}+\delta_5\sum\Delta BR_{t-1}+\delta_6\sum\Delta DR_{t-1}+\delta_7\sum\Delta NM_{t-1}+\delta_8\sum\Delta TO_{t-1}+\delta_9\sum\Delta SE_{t-1}+\delta_{10}\sum\Delta DI_{t-1}+\delta_{11}\sum\Delta INF_{t-1}+ECM_{t-1}+U_t$..... (iv)

Estimation Techniques, Data Requirements and Sources

To avoid spurious regression, the time series properties of all variables were examined. To do this, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests were applied. Econometric literature provides many techniques to investigate cointegration among macroeconomic variables, for example, autoregressive distributed lag (ARDL) method, Johnson co-integration test and Engle-Granger model.

However, in this study, the autoregressive distributed lag (ARDL) method was used. This is due to a number of reasons. First, the ARDL approach is applicable irrespective of whether the regressors are stationary at level or stationary at first difference. Second, it performs better for small sample sizes than other cointegration techniques. Third, the ARDL approach allows variables to have different optimal lags. From the results, the presence of long-run

relationship among the variables is tested using the F-test statistic (Gujarati, 2017; Ghouse, Khan and Rehman, 2018).).

The data required for this study are values of dependent and independent variables. Real gross domestic growth is the dependent variable. The independent variables are secondary school enrolment (% of gross) for education/technology, government expenditure (% of GDP), log of labour population, log of children population, log of aged population, net migration, birth rate, death rate, and domestic investment (% of GDP). The data were secondary data sourced from World Bank's World Development Indicators (2019 - 2025), United Nations World Population Prospect (2021), CBN Statistical Bulletin and National Bureau of Statistics of varying editions.

EMPIRICAL RESULTS

Descriptive Statistics

Time series data for Nigeria was used to carry out the study. The descriptive analysis includes mean value, median and standard deviation as presented in Table 1

Table 1: Descriptive Statistics

Variable	Observation	Mean	Median	Standard Deviation
Real GDP growth	39	3.150	4.196	5.467
Inflation	39	19.147	12.555	17.063
Log of Labour population	39	7.813	7.816	0.131
Log of Children population	39	7.735	7.727	0.124
Log of Aged population	39	6.538	6.537	0.120
Net migration	39	-0.391	-0.310	0.347
Birth rate	39	42.757	43.156	2.355
Death rate	39	16.546	17.895	2.459
Trade openness	39	32.078	33.720	12.450
Secondary enrolment(%Gross)	39	32.389	28.831	9.910
Domestic investment(%GDP)	39	36.385	34.110	19.053

***Source*: Author's calculations, using estimation data**

Table 1 shows that the labour population has the highest mean of 7.81 while the mean for children population and aged population are 7.73 and 6.54 respectively. This means that Nigeria has more labour population than children and aged population. Birth rate also has a mean of 42.76 which is higher than that of death rate that is 16.55. This is an obvious reason for the population growth in the Nigerian economy.

Presentation and Analysis of Results

As a result of the nature of the variables and data available, it was imperative to begin the empirical analysis by examining the time-series properties of the variables. The results displayed in Table 2 show that real GDP growth, net migration, birth rate and death rate are stationary at level and the other variables at first difference using the Augmented Dickey-Fuller test.

Table 2: Unit Root Test Results

	Augmented Dickey-Fuller (ADF)Test			***Phillips-Perron(PP) test***		
Variable	**Level**	**First Difference**	**Order of Integration**	**Level**	**First Difference**	**Order of Integration**
Real GDP growth	**--3.982***	**-10.314****	I(0)	**-3.982***	**-12.114****	I(0)
Inflation	**-4.020****	**-5.607****	I(0)	**-2.868**	**-10.605****	I(1)
Log of Labour population	**-0.775**	**-4.203***	I(1)	**-0.775**	**-4.203***	I(1)
Log of Children population	**-2.473**	**-5.859****	I(1)	**-2.473**	**-5.859****	I(1)
Log of Aged population	**-2.399**	**3.897***	I(1)	**-2.399**	**-3.897***	I(1)
Net migration	**-4.192***	**-4.946****	I(0)	**-3.041**	**-5.178****	I(1)
Birth rate	**-5.19****	**-2.673**	I(0)	**-0.334**	**-4.023***	I(1)
Death rate	**-4.15****	**1.690**	I(0)	**-5.598****	**-3.494**	I(0)
Trade openness	**-2.176**	**-4.704*****	I(1)	**-2.053**	**-11.246****	I(1)
Secondary enrolment(%Gross)	**-3.223**	**-4.458****	I(1)	**-1.962**	**-6.659****	I(1)
Domestic investment(%GDP)	**-2.714**	**-5.190*****	I(1)	**-2.636**	**-5.212****	I(1)

**** denotes the rejection of the null hypothesis at the 1% significant level; * denotes the rejection of the null hypothesis at the 5% significant level. *Source*: Author's calculations, using estimation data**

However, the Phillips-Perron test reveals that real GDP growth and death rate are stationary at level and the other variables at first difference. This shows that the order of integration of the variables under study differs. Therefore, it is appropriate to use ARDL bounds testing approach to assess the long run relationship among the variables.

The model was specified to assess the disaggregate effect of population dynamics on economic growth. Therefore; the study proceeded to implement the ARDL, using all the explanatory variables. The error correction model to obtain short run dynamic relationship and the results are reported in table 3.

The coefficient of the lagged error correction term is negative and statistically significant, supporting the existence of a long run relationship between population dynamics and economic growth.

Interestingly, the results of the ARDL bounds test indicate that the computed F-statistic (5.37) exceeds the upper critical value (3.86) at 1% level of significance, suggesting that a long run relationship exists between population dynamics and economic growth in Nigeria. Table 3 presents the ARDL regression results of equation (iv).

***Table 3: Long-Run and Short-Run ARDL Relationship between Population Dynamics and Economic Growth* in Nigeria.**

Variable	Coefficient	t-statistics
Short-Run Relationship		
∆Inflation	**-33.727**	**-1.730**
∆Log of Labour population	**21.150**	**2.701****
∆Log of Children population	**-133.464**	**-3.039*****
∆Log of Aged population	**-11.577**	**-3.782*****
∆Net migration	**-0.083**	**-1.254**
∆Birth rate	**-2.531**	**-2.845*****
∆Death rate	**-0.134**	**-2.990*****
∆Trade openness	**0.003**	**2.623****
∆Secondary enrolment (%Gross)	**0.784**	**3.450*****
∆Domestic investment (%GDP)(-1)	**0.002**	**1.426**
∆Log of Labour population (-1)	**25.495**	**3.488*****
∆Log of Aged population (-1)	**-31.557**	**-2.336****
∆Net migration (-1)	**-0.187**	**-2.369****
Error correction (ECM_{t-1}) (Speed of Adjustment)	**-0.897**	**-5.385*****
Long-Run Relationship		
Death rate	**-0.205**	**-2.836*****
Birth rate	**-22.787**	**-3.231*****
Log of Aged population	**-17.727**	**-3.218*****
Log of Labour population	**16.703**	**2.072****
Domestic Investment	**113.963**	**0.6199**
Log of children population	**20.546**	**3.551*****
Secondary enrolment (%Gross)	**-0.002**	**-0.798**
Trade openness	**0.705**	**3.977*****
Net migration	**-13.648**	**-2.281****
Inflation	**-11.128**	**-0.441**
R-squared	**0.900**	
Adjusted R-squared	**0.690**	
Durbin-Watson statistics	**2.046**	

*****, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively**

The results show that in the short run, children population, aged population, birth rate and death rate have negative and significant effect on economic growth at 1% level of significance; lag of aged population at 5% level of significance while, secondary enrolment and lag of labour population have positive and significant effect at 1% level of significance; labour population and trade openness at 5% level of significance.

This means that in consonant with the study of Bloom, Canning and Finlay (2010), Dao (2012), Akintunde etal(2013),Mierau and Turnovsky (2014) ,Olabiyi (2014),Aidi, Emecheta and Ngwudiobu (20 16), Ogunleye, Owola and Mubarak (2018), increase in children population, aged population, birth rate and death rate will reduce economic growth while increase in secondary enrolment and trade openness will increase economic growth. These all conform to the a priori expectations of this study, except death rate which is not surprising because of Nigeria's high

adult mortality rate and low life expectancy (WDI, 2019; 2020) which implies that most of the deaths are of those still in the productive age. Therefore, these deaths reduce labour input, output and economic growth. The positive and significant effect of labour population also conform to a priori expectation and other studies (Rutger and Jeroen , 2011; An and Jeon , 2006; Ahmad and Khan, 2018)

Also, in the short run, lag of domestic investment on economic growth is positive, but not significant. This could be accounted for by the low-level domestic investment and investment in service industries rather than in the productive sector such as agriculture and manufacturing.

In the long run, aged population and death rate have a significantly negative effect on economic growth at 1% level of significance; net migration at 5% level while trade openness, children population and labour population have a positive and significant effect at 1%,1% and 5% level of significance respectively. Birth rate also has a negative effect on economic growth contrary to the study of Tartiyus, Dauda and Peter (2015), who found a positive effect. The effect of net migration on economic growth in Nigeria is negative contrary to expectation, but in conformity with the study of Kotani and Kotani (2012) and Aidi, Emecheta and Ngwudiobu (2016) . This could be as a result of the fact that we are losing more than we are gaining. Even the data on net migration confirms that there are more emigrants than immigrants (United Nations World Population Prospect, 2021). Also, there is brain drain in almost all the major sectors of this economy because of poor condition of service. This reduces productivity and hence economic growth. The positive effect of children population in the long run could be due to the fact that they become an asset to the economy in future as they grow into productive age and are productively engaged.

Diagnostic tests: The diagnostic analysis was done by testing for normality and heteroskedasticity. Normality test was done using histogram and Heteroskedasticity test was done using Breush-Pagan-Godfrey test. The result shows that the residuals are normally distributed as the P value of 0.8095 is greater than the significance level 0.05. The null hypothesis (H_0) for heteroskedasticity states that there is no heteroskedasticity. The result reveal that there is no heteroskedasticity in the model as all the Prob. Chi-Square (0.2205) and Prob. F-statistics (0.2068) are greater than 0.05.

Summary

The literature on population dynamics and its effect on economic growth in Nigeria have mostly considered the effect of change in population size and not change in the structure of the population. Resulting from this, most of the policy recommendations and decisions of government regarding population and growth lack focus.

This work, however, assesses the disaggregate effect of each element of population dynamics, including the characteristics of the population (using the age structure) on economic growth in Nigeria. Secondary data on the Nigerian economy sourced from the World Bank, UNESCO Institute for Statistics, United Nations World Population Prospect, Central Bank of Nigeria Statistical Bulletin and National Bureau of Statistics was used to carry out the study.

Descriptive Statistics and Unit Root Test (Augmented Dickey-Fuller (ADF) and Phillip- Perron) results were presented. Implementing the ARDL dynamic specification, we found out that aged population, migration, children population, birth rate and death rate have a significantly negative effect on economic growth while labour population, education and trade openness have positive and significant effect.

The R^2 shows that 90% of the variation in economic growth is explained by the combined effect of all the explanatory variables and the Durbin-Watson statistics indicate that there is no autocorrelation.

Conclusion

This research has made a significant attempt at assessing the disaggregate effect of the major components of population dynamics on economic growth in Nigeria. This study captured the change in size via birth rate, death rate and net migration while

the age structure was used to examine the change in structure.

It has made it clear that every component of population dynamics has a significant effect on economic growth. Therefore, a holistic approach to solving the problem of population in Nigeria will mean addressing each of the components appropriately as regard to how they affect economic growth.

Do the Nigerian population and economic growth experience conform to the view of the 'population pessimists' or the 'population optimists', or the 'population neutralists'? This study has shown that the answer to this question depends on what part of the population is growing. If it is the labour population that is growing, then there will be positive effect on economic growth, but if it is children and aged population, then the reverse will be the case.

However, since the Nigerian demographic structure reflects that of a growing youthful population, the study can conclude that this will have a positive effect on economic growth. When this youthful population are productively engaged in labour intensive production as exemplified in the Chinese economy, there will be growth in the Nigerian economy.

Policy Implications of Results/ Recommendations

Education has shown a significantly positive effect on economic growth while birth rate has shown a significantly negative effect on economic growth. Education can help to bring down birth rate.

The Nigerian government have made a number of policy efforts over time to address the growing population problem. The government promulgated her first population policy in 1988 which was revised in 2004. Even recently, Nigeria announced new birth control to address high fertility rate, but all these are yet to yield the desired results. The high level of illiteracy is one of the factors accountable for this failure. The positive and significant effect of education on economic growth as revealed in our study could also be through the channel of influencing the people to be more receptive to these policies that will bring about change in their lifestyle. Illiteracy tends to make people more religiously and culturally inclined and as such, become nonreceptive to all forms of family planning. There has also been over emphasis/focus on the role of women in population increase in these policies to the neglect of the role of men. A woman can only get pregnant once in nine months while a man can impregnate several women in one month. Lack of proper education has been one of the failings of the policy makers themselves, who though may have academic certificates, but are not truly educated in their minds. They still hold tightly to the African mentality of the freedom and supremacy of the men. Therefore, the role of proper education for the government, policy makers and the populace in population control cannot be overemphasized.

It has become obvious from the experiences of advance countries that when the women are well educated and gainfully employed, the opportunity cost of giving birth and raising children is increased and fertility drops. The microeconomic theory of fertility also confirms the drop in demand for children as a result of increase in income of women (when the increase income of the family is from the woman's employment, the demand for children will fall, even when income is rising).

Also, when girls stay in school, they are more likely to delay early marriage and childbirth which leads to lower fertility among the women. Therefore, government should ensure access to quality education at all levels. They should also prioritize policies that create jobs and decent work opportunities for young people.

Government at all levels should enlighten traditional and religious leaders on the benefit of formal education to a girl child. Policy measures for the reabsorption of dropout girls due to premarital pregnancy should be put in place by government to provide another opportunity for them to go back to school.

Policies should be put in place to levy heavy fines on parents who put out their children for child marriage that deprive them of good education. In addition to education, free contraceptives should be made available to both men and women. Legislation on the

maximum number of children should be effectively put in place for all Nigerians, regardless of their religion.

The long run significantly negative effect of net migration on economic growth in Nigeria confirms the fact that this massive exodus of Nigerians, if not checked will not only destroy our economy for today, but also for the future. The government must improve the condition of service in the various sectors and ensure that the remuneration of professionals in this country is raised to internationally competitive level, so as to halt the massive brain drain that has been going on in this country for some years now.

The positively significant effect of labour population reveals that engaging them optimally will do a lot of good to the economy of this nation. Policies and programs that improve labour participation rates and labour income are critical. Government at federal, state and local government level should create greater economic opportunities for young people across socio-economic strata, rural-urban divides, and gender and age group.

Government should make the economic environment conducive in terms of infrastructure (reliable energy supply, communication and transportation network etc) to attract local and foreign investors. Institutionalizing sound regulatory structure to make informal and private sectors function effectively to increase job opportunities is also imperative in increasing labour participation rate.

REFERENCES

Adewole, O. (2012). Effect of Population on Economic Development in Nigeria: A Qualitative assessment. *International Journal of Physical and Social Science,* 2(5), 1-14.

Aghion, P.& Howitt, P.(2009). *The Economics of Growth*. The MIT Press

Ahmad, M. & Khan, R. (2018). Age-structure, Human Capital and Economic Growth in Developing Economies:A Disaggregated Analysis", Pakistan Journal of Commerce and Social Sciences, 12(1), 229-252.

Ahmad, M. & Khan, R. (2018). Does Demographic Transition with Human Capital Dynamics Matter for Economic Growth? A Dynamic Panel Data Approach to GMM", *Social Indicators Research*, 142(3), 753-772

Aidi, H. O., Emecheta, C. & Ngwudiobu, I. M.(2016). Population Dynamics and Economic Growth in Nigeria. *Journal of Economics and Sustainable Development,* 7(15).

Akintunde, T. S., Olomola, P. A .& Oladeji, S. I.(2013). Population Dynamics and Economic Growth in Sub-Saharan Africa. *Journal of Economics and Sustainable Development,* 4(13).

Akintunde, T. S., Olomola, P. A. & Oladeji, S. I. (2013). Population Dynamics and Economic Growth. *Journal of Economics and Sustainable Development*, 4(13), 148-157.

Alexia, P. & Lindh, T. (2007). The Relationship between Demographic Change and Economic Growth in the EU. *Vienna Institute of Demography, Austrian Academy of Sciences,* Research Report 32

An, C. & Jeon, S. (2006), *Demographic Changes and Economic Growth in Korea*. Paper presented at the APEA Conference.

Anyanwu, J.C. (2014).Factors Affecting Economic Growth in Africa: Are There any Lessons from China? *African Development Review*, 26(3), 468–493.

Arrow, K., Partha, D., Lawrence, G., Gretchen, D., Paul, E., Geoffrey, H., Simon, L., Karl-Göran, M., Stephen, S., David, S. & Brian, W. (2004). Are We Consuming Too Much? *Journal of Economic Perspectives,* 18(3), 147–172.

Asian Development Bank (1997). *Emerging Asia*, Manila.

Banerjee, R. (2012). Population Growth & Endogenous Technological Change: Australian Economic Growth in the Long run. Economic Record, 88, 214-228.

Bawazir, A., Aslam, M. & Osman, A. (2020), "Demographic Change and Economic Growth: Empirical Evidence from the Middle East",

Economic Change and Restructuring, 53, 429-450.

Bloom, D., Canning, D. & Sevilla, J. (2001). The Effect of Health on Economic Growth: Theory and Evidence. *National Bureau of Economic Research (NBER) Working Paper.*

Bloom, D. E., Canning, D. & Sevilla, J. P. (2003). *The Demographic Dividend. Population Matters.* A RAND Program of Policy-Relevant Research Communication, Santa Monica, California.

Bloom, D. & Canning, D. (2006), Demographic Challenges, Fiscal Sustainability and Economic Growth. *PGDA. Working Paper* No. 8.

Bloom, D. E., Cannning, D. & Finlay, J. E. (2010). Population Aging and Economic Growth in Asia. *National Bureau of Economic Research*, 19, 61-89.

Bonuedi, I., Kamasa, K. & Boateng, E. (2019), The Growth Effects of Bulging Economically Active Population in Sub-Saharan Africa: do Institutions Matter., *African Development Review*, 31(1), 71-86

Borjas, G. (2013). *Immigration and the American worker*. Center for Immigration Studies. Washington, DC.

Boubtane, E., Coulibaly, D., & Rault, C. (2013). Immigration, growth, and unemployment: Panel VAR evidence from OECD countries. *Labour*, 27, 399-420.

Brenner, M. H. (2005) **.**Commentary: Economic growth is the basis of mortality rate decline in the 20th century—experience of the United States 1901–2000**.** *International Journal of Epidemiology*, 34, 1214–1221

Bucci, A. (2015). Product Proliferation, Population, and Economic Growth. *Journal of Human Capital*, 9, 170-197.

Center for Global Development (2005). *Population Dynamics and Economic Development: Elements of a Research Agenda* Final Working Group Report. 9-14

Chojnicki, X. & Ragot, L. (2016). Impacts of Immigration on an Aging Welfare state: An Applied General Equilibrium Model of France. *Fiscal Studies*, 37, 258-284.

Dao, M. Q. (2012). Population and Economic Growth in Developing Countries. *International Journal of Academic Research in Business and Social Sciences*, 2(1), 6-17

David, E. B. & Finlay, J. E. (2008): Program on the Global Demography of Aging. 2019b. International Monetary Fund(IMF).

Ehrlich, I. & Kim, J. (2005), Endogenous Fertility, Mortality and Economic Growth: Can a Malthusian Framework Account for the Conflicting Historical Trends in Population? *NBER Working Paper* No. 11590.

Ewugi, M. S., & Yakubu, I. (2012). Malthusian Population Theory and the Nigerian Economy: A Political Economy Approach. *International Journal of Human Resource Studies*, 2(4), 197.

Frum,D. (2015,2016). Does Immigration Harm Working
Americans? *The Atlantic.*Retrieved https://www.the atlantic.com/business/archive/2015/01/does-immigrationharm-working-americans/384060/
Gordon, R. J. (2016).

Galor, O. (2012). Unified growth Theory: From Stagnation to Growth. Retrieved May 10, 2017 from www.https://press.princeton.edu/titles/9477.html.

Garza-Rodriguez, J., Andrade-Velasco, C. I., Martinez-Silva, K. D., Renteria-Rodriguez, F. D., & Vallejo-Castillo, P. A. (2016). *The Relationship Between Population Growth and Economic Growth in Mexico*.Mexico

Gatsi, J.G. & Appiah, M.O (2020). Population Growth, Income Growth and Savings in Ghana. *Journal of Economics and Development*, 22 (2), 281-296.

Ghouse, G., Khan, S. & Rehman, A. (2018). ARDL Model as a Remedy for Spurious Regression:Problem, Performance and Prospectus. *MPRA Paper No. 8397*. 4-32

Gujarati, D.N.(2017).*Basic Econometrics*. McGraw-Hill. United States. pp 627-680

Gupta, M. D., Bongaarts, J. & Cleland, J. (2011). Population, Poverty, and Sustainable Development A Review of the Evidence. *Policy*

Research Working Paper, 5719.

Hamza, L. (2015). *Panel Data Analysis of Population Growth and It Implication on Economic Growth of Developing Countries*. Proceedings of the International Symposium on Emerging Trends in Social Science Research. Chennai-India, paper Id C509.

Heady, D. D., & Hodge, A. (2009). The Effect of Population Growth on Economic Growth: A Meta-Regression Analysis of the Macroeconomic Literature. *Population and Development Review*, 35, 221-248.

Higgins, M. & Williamson, J. G. (1997). Age Dynamics in Asia and Dependence of Foreign Capital. *Population and Development Review,* 23, 261–293.

Higgins, M. (1998). Demography, National Savings, and International Capital Flows. *International Economic Review*, 343–369.

Huang, T., & Xie, Z. (2013). Population and Economic Growth: A Simultaneous Equation Perspective. *Applied Economics*, 45, 3820-3826

International Planned Parenthood Federation (IPPF) (2013*). Family Planning and Demographic Dividend*. Briefing Paper 1. London SE1 3UZ United Kingdom

Jonathan, E. O., Udo, G. C., & Onuigbo, F. N.(2018). Population Growth and Economic Development in Nigeria. *Saudi Journal of Business and Management Studies (SJBMS),*3(12),8

Kelley, A. & Schmidt, R. (1995). Aggregate Population and Economic Growth Correlations: The Role of the Components of Demographic Change. *Demography*, 32, 543–55.

Kelley, A. & Schmidt, R. (1996). Savings, Dependency, and Development, *Journal of Population Economics*, 9, 365–386

Kerr, S. P., Kerr, W., Ozden, C., & Parsons, C. (2016). Global Talent Flows. *Journal of Economic Perspectives*, 30(4), 83-106.

Klasen, S. (2004). *Population Growth, (Per Capita) Economic Growth, and Poverty Reduction in Uganda: A Brief Summary of Theory and Evidence*. Mimeographed, University of Göttingen.

Klasen, S. & Lawson, D. (2007). *The Impact of Population on Economic Growth and Poverty Reduction in Uganda*. WorkingPaper.

Klasen, S. & Thorsten, N. (2006). Population, Population Density and Technological Change. *Journal of Population Economics*, 19(3): 611-626

Kotani S. & Kotani, K. (2012). The Effect of Net-migration on Population-growth Relationship in Indonesia. *Asian Journal of Empirical Research*, 2(2), 62-72

Krugman, P. (1994). The Myth of Asia's Miracle. *Foreign Affairs*, 73

Liddle, B. (2003). Developing Country Growth Collapse Revisited: Demographic Influences and Regional Differences. *MPIDR Working Paper WP* 2003-007

Maddison, A. (2001).*The World Economy: A Millennial Perspective*. Development Centre Studies. Paris: OECD.

Mann, D. (2015). The President's Column (NPG-155). *Negative Population Growth*. Retrieved from http://www.npg.org/presidents-column/the-presidents-column.html

Mason, P. L. (2014). Immigration and African American wages and employment: Critically appraising the empirical evidence. *The Review of Black Political Economy*, 41, 271-297.

Michael, T. O. and Odeyemi, M. A.(2017), Nigeria's Population Policies: Issues, Challenges and Prospects, *Ibadan Journal of the Social Sciences* .15(1)

Mierau, J. O., & Turnovsky, S. J. (2014). Demography, Growth and Inequality. *Economic Theory*, 55, 29-68.

Mishra, V. (1995). A Conceptual Framework for Population and Environment Research. *Working Paper WP-95-20*, 7-9.

Munir, K. & Shahid, F.S. (2021). Role of Demographic Factors in Economic Growth of South

Asian Countries. *Journal of Economic Studies*, 48 (3), 557-570

National Population Commission (2006).*Census 2006: National Summary*. Lagos: National Population Commission.

National Population Commission (NPC) [Nigeria] and ICF Macro. (2013). *Nigeria Demographic and Health Survey 2013: Preliminary findings*. Abuja, Nigeria: National Population Commission and ICF Macro.

National Population Commission (NPC) [Nigeria] and ICF Macro. 2009. *Nigeria Demographic and Health Survey 2008*. Abuja, Nigeria: National Population Commission and ICF Macro.

Nwosu, C., Dike, A., O. & Okwara, K., K. (2014). International Journal of Engineering and Sciences, 3(11), 7- 18.

OECD(2001). *Glossary of Statistical Terms.* The Organisation of Economic Co-operation and Development. Paris

OECD(2001).*Principles and Recommendations for Population and Housing*. Revision 1. New York

Ogbuabor, J.E., Udo, G.C. & Onuigbo, F.N. (2018). Population Growth and Economic Development in Nigeria. *Saudi Journal of Business and Management Studies (SJBMS),* 3 (12), 1348-1354.

Ogunleye, O.O., Owola, O.A. & Mubarak, M. (2018). Population Growth and Economic Growth in Nigeria: An Appraisal", *International Journal of Management, Accounting and Economics*. 5 (5), 282-299

Olabiyi, A. K. (2014). The Effects of Population Dynamics on Economic Growth in Nigeria. *Researchjournali's Journal of Economics*, 2(1),1-16.

Onwuka, E. C. (2006). Another look at the Impact of Nigeria's Growing Population on the Country's Development. *African Population Studies,* 21(1), 1-18.

Pérez-Brignoli, H (2001). *Human Capital, Fertility decline, and Economic Development: The Case of Costa Rica since 1950*. Paper Presented at the XXIVth IUSSP General Population Conference, Salvador,S39 Population and Development

Peri, G. (2012). The Effect of Immigration on Productivity: Evidence from U.S. States. *The Review of Economics and Statistics*, 94, 348-358.

Peter, A. & Bakari, I. (2018). Impact of Population Growth on Economic Growth in Africa: A Dynamic Panel Data Approach (1980 -2015). *Pakistan Journal of Humanities and Social Sciences,* 6 (4), 412 – 427.

Peterson, W.F. (2017).The Role of Population in Economic Growth. *SAGE Open.* October-December, 1–15

Preston, S. H. (2007). Response: On the Changing Relation between Mortality and Level of Economic Development. *International Journal of Epidemiology* 36:502–503.

Rahman, M.M., Saidi, K.,& Mbarek, M.B. (2017). The Effects of Population Growth, Environmental Quality and Trade Openness on Economic Growth: A Panel Data Application. *Journal of Economic Studies*, 44 (3), 456-474.

Rahman, M.M., Rana, R.H. & Barua, S. (2019). The Drivers of Economic Growth in South Asia: Evidence from a Dynamic System GMM Approach. *Journal of Economic Studies,* 46 (3), 564-577

Rutger, V. & Jeroen, S. (2011). The Demographic Window of Opportunity: Age Structure and Sub-National Economic Growth in Developing Countries. *NICE Working Paper* No: 11-112, Nijmegen University, Netherlands.

Sachs, J. (2008). *Common Wealth: Economics for a crowded planet*. New York: Penguin Books.

Sethy, S. K., & Sahoo, H. (2015). Investigating the Relationship between Population and Economic Growth: An Analytical Study of India. *Indian Journal of Economics and Business,* 14, 269-288.

Shah, T, Sargani, G, Ali, A & Siraj, W, (2015). The Effect of Increase in Population on the Economic Growth of Bangladesh (1980-2005). *Developing Country Studies*, 5(17).

Solow, R. M. (1956). A Contribution to the Theory of Economic Growth. *The Quarterly Journal of*

Economics, 70(1), 65.

Stone, C. (2017). *Economic Growth: Causes, Benefits, and Current Limits.* Center on Budget and Policy Priorities.Sub-Saharan Africa. *Population and Development Review* 38(2): 285–310.

Tartiyus, E.H., Dauda, M.I & Peter, A (2015). Impact of Population Growth on Economic Growth in Nigeria (1980-2010). IOSR *Journal of Humanities and Social Science* (IOSR-JHSS), 20(4), 115-123

Todaro, M.P. & Smith, S.C. (2011).*Economic Development*. eleventh edition. Pearson Education Limited, Pages 269-340

Tumwebaze, H. K., & Ijjo, A. T. (2015). Regional Economic Integration and Economic Growth in the COMESA region, 1980- 2010. *African Development Review*, 27, 67-77.

Ukpolo, V. (2002). Population Growth and Economic Growth in Africa. *Journal of Developing Societies*, 18(4), 315-329.

United Nations (2012). *Population dynamics*. UN Task Team ON Post-2015 Development Agenda

United Nations (2013). *Nigeria Demographic Profile*. Population Division of the Department of Economic and Social Affairs of the United Nations.

Uzobo, E.& Jack,J. T. (2016). Population Dynamics, Environmental Changes and Sustainable Development in Nigeria: Implication for Policy Makers. *Conference Paper*. www.https://research gate.net/publication

Yao, W., Kinugasa, T., & Hamori, S. (2013). An empirical analysis of the relationship between economic development and population growth in China. *Applied Economics*, 45, 4651-4661.

Young, A. (1994).Lessons from the East Asian NIC's: A Contrarian View.*European Economic Review*, 38, 964–973.

Young, A. (2005): The Gift of the Dying: The Tragedy of AIDS and the Welfare of Future African Generations. *Quarterly Journal of Economic s*CXX(2), 423–466.