

Population Growth and Economic Development in Nigeria

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Abstract: Nigeria currently ranks as the seventh most populous country in the world. However, there is no consensus in the empirical literature on the effect of this growing population on economic development. This study contributes to the ongoing investigations into the effect of population growth on economic development in Nigeria. The study used annual time series data for the period 1980 to 2016 and adopted the OLS regression technique. The results indicate that population growth retards economic development in Nigeria. However, the results further show that credit to the private sector is an important driver of economic development in Nigeria both in the short-run and long-run. Among others, the study concludes that policies that can control the escalating population; ensure that the existing population becomes more productive; and deepen the availability of credits for the private sector will enhance economic development in Nigeria.

Keywords: Population growth; Economic development; OLS regression; Nigeria.

JEL Codes: R23; O10; C22; N17.

INTRODUCTION

The study of population growth has remained an important aspect of empirical economics since the seminal work of Thomas Malthus titled "An essay on the Principle of Population" in 1798. Other renowned scholars like Pigou, Marshal, and Keynes have also played important roles in the study of population growth. They all saw the need for understanding the dynamics of population change and how this impacts on sustainable economic development [1].

Todaro and Smith [2] reveal that for most of human existence on earth, humanity's numbers have been few. When people first started to cultivate food through agriculture some 12,000 years ago, the estimated world population was no more than 5 million. Two thousand years ago, world population had grown to nearly 250 million, less than a fifth of the population of China today. From the olden times to the beginning of the Industrial Revolution around 1750, it tripled to 728 million people, less than three-quarters of the total number living in India today. During the next 200 years (1750-1950), an additional 1.7 billion people were added to the planets numbers. But in just four decades thereafter (1950-1990), the earth's human population more than doubled again, bringing the total figure to around 5.3 billion. The world entered the twenty-first century with over 6 billion people and there has been a tremendous increase in the world population from the twenty-first century to date. According to Max and Esteban [3], the increase in the world population between 1900 and 2000 was three times greater than during the entire previous years of humanity.

Today, the total world population is estimated at 7.5 billion people. Research has shown that more than 85 million people are added to the world population every year, and over 83% of this net increase in population comes from the developing countries. The population growth of developing countries is growing at a geometric rate, compared to that of the developed countries. Among the developing countries, Nigeria is one of the most populated countries. In fact, Nigeria is often referred to as the "Giant of Africa" due to its large population. With approximately 184 million inhabitants, Nigeria is the most populous country in Africa and the seventh most populous country in the world. Nigeria has one of the largest populations of youth in the world. Nigeria's current population according to the 2018 UN estimation is 194,623,929. This population is equivalent to 2.57% of the total world population.

Tartiyus *et al.*, [4] reveals that at a population growth rate of 2.8 percent per annum between 1952 and 1991, Nigeria is one of the fastest growing countries in the world. It accounts for one in five of Sub-Saharan African people. Nigeria's population has been increasing rapidly for at least the last 5 decades due to very high birth rates, quadrupling its population during this time. That type of growth rate is known as exponential. That is, it is not growing at a linear rate.

Growth was fastest in the 1980s, after child mortality had dropped rapidly, and has slowed slightly since then as the birth rate has declined slightly. According to the 2017 revision of the World Population Prospects, the total population was 190,886,000 in 2017, compared to only 37,860,000 in 1950. The proportion of children under the age of 15 in 2010 was 44.0%, 51% was between 15 and 59 years of age, while 4% was 60 years or older. The population forecast for Nigeria have shown that by 2035, its population must have doubled to 297 million [5]. This large population implies a high supply of human resources in the country. Human resource development is a key driver and component of economic development. However, the impact of population growth depends not only on the size or number of the people, but on the quality and development indicators like standard of living and literacy.

Economic development has to do with improving on the economic and social wellbeing of a nation. Nigeria has a relatively high unemployment rate which consequently leads to a lower standard of living. In the fifty eight years of independence, successive Nigerian governments have grappled with the recurring issues of unemployment, low per capita income, declining standard of living, and rising poverty levels across the nation, among other indicators of underdevelopment. Thus, this study is aimed at revisiting the development effect of population growth in Nigeria.

AN OVERVIEW OF THE EMPIRICAL LITERATURE

In Nigeria, several studies have examined the relationship between population growth and economic development. The results generally indicate that population growth has either positive, negative, or neutral effect on economic development. In order words, there is no empirical consensus yet on the effect of population growth on economic development in Nigeria. Examples of studies that have documented a positive effect of population growth on economic development in Nigeria are Adewole [6], Nwosu *et al.*, [7], and Tartiyus *et al.*, [4]. Adewole [6] investigated the effect of population on economic growth in Nigeria using annual time series data for the period 1981 - 2007. The study adopted the OLS regression approach. Variables included in the model are real gross domestic product (RGDP), population and per capita income (PCI). The results indicate that a strong positive relationship existed between population and economic growth during the period considered.

Nwosu *et al.*, [7] studied the relationship between population growth and economic growth in Nigeria from 1960 to 2008 using annual time series data. The study used OLS regression analysis and granger causality test. The results indicate that population growth has a positive relationship with economic growth in Nigeria. Tartiyus *et al.*, [4] examined the impact of population growth on economic growth in Nigeria from 1980 to 2010. The data were analyzed using descriptive statistics and regression analysis, and the variable of interest were real gross domestic product (RGDP), population growth rate, fertility rate, life expectancy at birth, crude death rate, and export growth rate. The results revealed that there is a positive relationship between economic growth (proxied by GDP growth) and population growth in Nigeria.

Contrary to the above studies, other empirical studies have also established a negative relationship between population growth and economic development in Nigeria. These include: Onwuka [8], Nwakeze and Omoju [9], Olabiyi [10], and Oramah [11]. Onwuka [8] evaluated the impact of Nigeria's growing population on the country's development from 1980 to 2003 using time series data. The OLS regression technique was used, and the variables of interest were GDP growth rate, population growth rate, population, lagged per capita output, oil production, agricultural output, among others. The empirical results showed that rapid population growth is inimical to the economic development of Nigeria. Nwakeze and Omoju [9] investigated the relationship between economic growth and savings using time series data from 1980 to 2007. The variables used in the model were saving rate, population, real per capita GDP, interest rate, inflation rate, and financial depth. The study relied on vector error correction regression model for its analysis and it was discovered that population growth and economic development have a negative relationship.

Olabiyi [10] examined the effect of population dynamics on economic growth in Nigeria between 1980 and 2010 using the vector autoregressive (VAR) model. The variables of interest are infant mortality rate, fertility rate, trade openness, government expenditure, real gross domestic product and primary school enrolment. The study found that there is a negative relationship between fertility rate and economic growth. Azuh *et al.*, [12] studied the impact of population growth on the standard of living in Nigeria. The study made use of time series data and the Johansen Co-integration econometric technique. The variables used were population growth rate, GDP per capita, labour, infant mortality rate, infrastructure, maternal mortality rate, and human development index. The results show that there is a negative relationship between gross domestic product per capita (proxy for economic development) and population growth.

Oramah [11] studied the effect of population growth on the Nigerian economy. The study highlighted the need for population control in Nigeria by explaining the potential danger that can ensue from disregarding the trend at which the population is growing. The researcher focused more on the impact of population growth on non-renewable resource consumption and depletion, land degradation and waste disposal, whether modification, rapid urbanization and even

desertification. Among the factors identified as influencing population size in Nigeria are religion, education, male-child preference, high infant mortality, among others. However, Aidi *et al.*, [1] documents that population growth does not influence economic developments in Nigeria. The study employed Granger-Causality technique, and found that there is no Granger-Causality running from population growth to economic growth and vice versa.

Empirical economic studies in other countries have also established that population growth has either positive, negative, or neutral effect on economic development. Examples of studies showing positive relationship between population growth and economic development include: Kothare [13], Schneider *et al.*, [14], Ali *et al.*, [15], Rutger and Jeroen [16], Klasen and Lawson [17], Kiguru *et al.*, [18], Bhanu and Archana [19], Zheng and Liping [20], and Furuoka [21]. Kothare [13] examined the relationship between population growth and economic growth in India. The study covered all provinces in India from 1988 to 1998. The results indicate that population growth impacts significantly and positively on economic growth, which is consistent both in the short-run and long-run.

Klasen and Lawson [17] investigated the link between population, per capita growth and poverty in Uganda. The study employed both cross-sectional data and panel data. The results of the estimates show that population growth has a positive impact on overall economic growth. But the coefficient is always smaller than 1, suggesting that additional people have a less than proportionate influence on economic growth. In the cross-section specification, the impact is generally larger than in the panel specifications. Furuoka [21] investigated the relationship between population growth and economic growth in Philippine, for the period of 1950-2007. The study used OLS technique and found that population growth has a positive impact on economic development. Rutger and Jeroen [16] investigated the impact of population dynamics (age-structure) on economic growth in developing countries from 1997 to 2008. The variables included in the model are asset (wealth) index (used as proxy for district GDP), GDP per capital growth, growth rate of working-age share, urbanization rate, landlocked, life expectancy, trade openness. The results revealed a robust positive effect of working age population on growth rate of GDP.

Schneider *et al.*, [14] reassessed the impacts of population growth, economic development and technical change on global food production and consumption using partial equilibrium model. The variables incorporated for analysis in the model include population, average GDP per capita, average crop productivity factor, arable land loss (from urbanization) and change in non-agricultural water usage. The results of the partial equilibrium and simulation model showed that population growth leads to highest increase in total food production, and that changes in income exerted a positive influence on per capita food consumption. Zheng and Liping [20] studied population growth and economic growth in Indonesia, using the Cobb-Douglas model and found that there is a positive relationship between population growth and economic growth. Ali *et al.*, [15] examined the impact of population growth on economic development in Pakistan between 1975 and 2008 using the autoregressive distributed lag model (ARDL). The study established a significant positive relationship between population growth and economic growth. Kiguru *et al.*, [18] studied the impact of population change on economic growth in Kenya, using vector autoregression estimation technique and annual time series data for the period 1963 to 2009. The results reveal that there is a positive relationship between population growth and economic growth. Bhanu and Archana [19] examined the effect of population growth rate on the economic development of India, and found that population growth has a positive effect on economic development.

Several studies in other countries such as Kotani and Kotani [22], Dao [23], Bloom *et al.*, [24], Akintunde *et al.*, [25], Afzal [26], Abdullah *et al.*, [27], and Thi and Hoang [28] also established negative relationship between population growth and economic development. Afzal [26] studied population growth and economic development in Pakistan from 1981 to 2005 using time series data and the OLS method. The results show that high population growth adversely affects economic development in Pakistan. Bloom *et al.*, [24] examined the relationship between aging population and economic growth in Asia between 1960 and 2005, using both descriptive statistics and fixed (dynamic) panel regression model. The findings include a negative relationship between aging population and economic growth, among others. Thi and Hoang [28] studied the effect of population growth on economic development in Asian developing countries over the period of 40 years (1965 - 2005). Eight countries were studied, namely: China, India, Thailand, Philippines, Vietnam, Iran, Indonesia and Pakistan. The results show that population growth impact on economic development negatively.

Kotani and Kotani [22] investigated the effect of net-migration on population-economic growth relationship in Indonesia between 1993 and 2005 using OLS regression technique and annual time series data. The study revealed that lagged fertility does not affect the economic growth in the two-variable regression; however, a significant negative relationship between population growth and economic growth upon the inclusion of net migration as a control variable was observed. Dao [23] examined the relationship between population and economic growth in Africa using data that covered selected forty-five (45) African economies. The study used panel data regression analysis and found that the relationship between population growth and per capita GDP growth is linear and negative. Akintunde *et al.*, [25] examined the relationship between population dynamics and economic growth in sub-Saharan African from 1975 to 2005 using five year average. The study used both pooled OLS and dynamic panel techniques on data obtained from thirty-five

(35) countries in sub-Saharan countries. The results revealed that total fertility rate has a negative impact on economic growth while life expectancy at birth was found to have a positive relationship with economic growth during the considered period. Abdullah *et al.*, [27] investigated the effect of increase in population on the economic growth of Bangladesh. The study used data for the period 1980 to 2005 and employed the multiple linear regression method. The results indicate that economic growth and population are both negatively correlated and that an increase in population will have a negative impact on the economic growth.

Empirical studies in other countries apart from Nigeria have also documented a neutral effect of population growth on economic development. Examples of such studies are: Ukpolo [29], Dawson and Tiffin [30], and Thornton [31]. Dawson and Tiffin [30] used an annual time series data over the period 1950-1993 to analyze the long run relationship between population and economic growth in India. The study employed Granger causality and co integration methods and found that there is no long-run relationship between the two variables. Thornton [31] examined the long-run relationship between population and economic growth in seven Latin American countries, namely, Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela. The study used an annual time series data over the period 1900-1994 and employed co integration and Granger causality methods of estimation. Its results showed that there is no long-run relationship between population growth and economic growth in any of the countries. This is to say that there is no direction of causality between population and economic growth. Ukpolo [29] studied the economic association between population growth and economic growth in Africa using Johansen Co-integration and Granger-Causality techniques. The study used annual time series data and found that the variables are co-integrated, that is, long-run relationship existed between the variables in Nigeria but not in Coted'ivoire. The results further revealed a negative long-run causal relationship between the two variables of concern in Nigeria (that is, population growth negatively affects economic growth) in the long-run. In Coted'ivoire, the results showed that population growth causes economic growth only in the short-run.

The foregoing indepth review of the empirical literature shows that empirical studies have been conducted on the impact of population growth on economic development in various countries across the globe, especially in Asia and Europe. However, the lack of consensus in the findings of these studies calls for further investigation. This is because while some studies found a positive relationship between population growth and economic growth, others found negative or neutral relationships. It is the goal of this study to contribute to this ongoing investigation.

METHODOLOGY

This study is anchored on the Malthusian theory, which explains that an inverse relationship that exists between population growth and economic development. The theorist explained that food supply which is an important property of economic development grows in an arithmetic progression while population growth was increasing at a geometric rate. This will make population to surpass food supply, which will in turn lead to a conflict that can only be resolved by some positive and preventive checks. This theory provides a theoretical framework for this study.

The econometric model that used in this study can be expressed as follows:

$$GDPPC_t = \beta_0 + \beta_1 TPOP_t + \beta_2 DR_t + \beta_3 INF_t + \beta_4 FDI_t + \beta_5 CPS_t + \varepsilon_t \quad (1)$$

Where: $GDPPC_t$ = GDP per capita growth; $TPOP_t$ = total population growth; DR_t = death rate; INF_t = inflation rate; FDI_t = foreign direct investment; CPS_t = bank credit to private sector; ε_t = error term; and the subscript t is time measured in years. All the variables were logged prior to estimation, except for inflation rate. The parameters of this model (i.e. $\beta_i, i = 1, 2, \dots, 6$) are estimated using the ordinary least squares (OLS) technique. This is because one of the main purposes of this study is to make predictions and also to determine which subsets among the explanatory variables may contain redundant information. Besides, the parameter estimates obtained by OLS under certain conditions are said to be the best linear unbiased estimates (BLUE). Furthermore, the computational procedure of OLS is fairly simple relative to other econometric techniques. In addition, the mechanics of OLS are simple and easy to understand even by non-economists; and the essential components of most other econometric techniques are subsumed in the OLS method. The entire data set used in this study is taken from the World Development Indicators, 2017 edition.

EMPIRICAL RESULTS AND DISCUSSION

This empirical study began with the examination of the time series properties of the data using the ADF unit root test. The results indicate that the variables are either I(0) or I(1) at the 5% level, suggesting the likelihood of an equilibrium relationship between the variables. Accordingly, we conducted the Johansen co-integration test and the results are reported in Table-1 as follows:

Table-1: Johansen co-integration test results

Hypothesized No of CE(s)	Eigenvalue	Trace Stat	5% Critical Values	P-value
None *	0.8685	165.4432	95.7537	0.0000
At most 1 *	0.6546	94.4329	69.8189	0.0002
At most 2 *	0.4614	57.2264	47.8561	0.0052
At most 3 *	0.4450	35.5711	29.7971	0.0097
At most 4	0.3402	14.9634	15.4947	0.0600
At most 5	0.0116	0.4077	3.8415	0.5231

Source: Authors' computation. Note: * denotes significance at 5% level.

The Johansen co-integration test results in Table-1 shows the existence of at least four co-integrating equations, which confirms that there is a long-run relationship among the variables at the 5% level. The long-run regression results are reported in Table-2. The results indicate that apart from total population and inflation rate, all the variables are statistically significant at the conventional 5% level. In addition, apart from foreign direct investment, all the variables have the expected signs. Specifically, we find that credit to the private sector is an important driver of economic development in the long-run; while total population, death rate and inflation rate are impeding economic development over the period studied. The results indicate that contrary to economic expectation, foreign direct investment is development retarding.

Table-2: Long-run regression results

Variables	Coefficient	HAC Std. Error	t-Statistic	Prob.
Constant	8.8447	2.5294	3.4967	0.0014
Total population	-0.3153	0.2490	-1.2661	0.2149
Credit to private sector*	0.0021	0.0006	3.4162	0.0018
Death rate*	-2.4156	0.4801	-5.0311	0.0000
Foreign direct investment*	-0.0074	0.0014	-5.4323	0.0000
Inflation rate	-0.0004	0.0003	-1.2228	0.2306
Diagnostics:				
Adj R-squared	0.8656			
Durbin-Watson stat	0.6360			
F-statistic	47.3540			
Prob(F-stat)	0.0000			

Source: Authors' computations. Note: * denotes significance at 5% level

The diagnostic checks in Table-2 indicate that the independent variables have substantially explained the variations in the dependent variable as seen from the adjusted R^2 of 87%. The F-statistic also indicate that the model as a whole is statistically significant. However, the Durbin-Watson statistic of 0.64 is quite low, suggesting the presence of residual serial correlation. Indeed, the Breusch-Godfrey serial correlation test in Table 3 indicates the presence of autocorrelation problem. To solve this problem, we used the HAC standard errors as shown in Table-2. The diagnostic checks in Table 3 further indicate that there is no problem of heteroskedasticity, while Figure 1 shows that the residual is normally distributed in line with the assumptions of OLS.

Table-3: Serial correlation and heteroskedasticity tests results

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	15.56767	Prob. F(2,29)	0.0000
Obs*R-squared	19.15691	Prob. Chi-Square(2)	0.0001
Heteroskedasticity Test: White			
F-statistic	0.946536	Prob. F(5,31)	0.4651
Obs*R-squared	4.900532	Prob. Chi-Square(5)	0.4281
Scaled explained SS	3.960573	Prob. Chi-Square(5)	0.5551

Source: Authors' computations

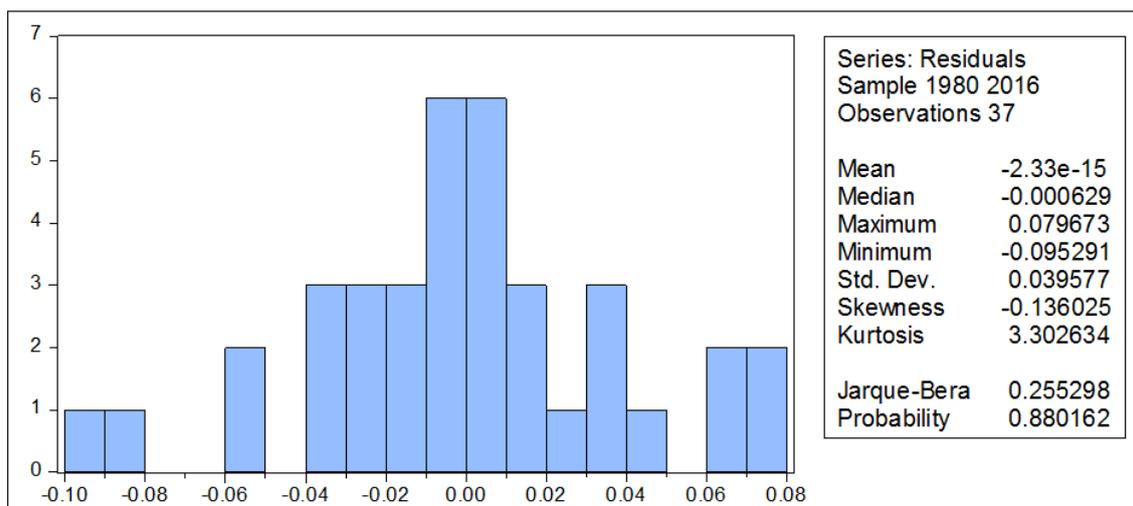


Fig-1: Normality test results
Source: Authors' computations

To account for the short-run dynamics, we estimated the error correction form of the model in equation (1). The patterns in the results are quite similar to the long-run results. In the main, we still find that total population impacts negatively on economic development, though its impact remains statistically insignificant. We also find that credit to the private sector contributes positively to economic development, while inflation rate, death rate and foreign direct investment impact negatively on economic development with the effects of inflation rate and foreign direct investment being statistically significant at the 5% level.

CONCLUSION AND POLICY RECOMMENDATIONS

Nigeria's ranking as the seventh most populous country in the world motivates this study which seeks to find out if this increasing population positively or negatively affects economic development. To do this, we used annual time series data for the period 1980 to 2016 and adopted the OLS regression technique. The results indicate that population growth retards economic development in Nigeria, which is consistent with the bulk of the empirical literature as well as the Malthusian Theory which claims that with a geometric increase in population growth, more mouth will have to be fed thus leaving little or nothing to be saved. This will in turn lead to a fall in productivity. This result suggests that there is need for government policies not only to control the escalating population but also to ensure that the existing population becomes more productive. Given the role of death rate which has a negative effect on economic development both in the short-run and long-run, this study makes a strong case government at all levels in Nigeria to evolve policies that will revitalise the health sector. Since inflation affects economic development negatively, this study recommends that government should make deliberate policies both fiscal and monetary in order to curb this negative effect of inflation. This study also established that credit to the private sector is an important driver of economic development in Nigeria. Accordingly, the Nigerian government is urged to evolve policies that will deepen the availability of credits for the private sector.

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