

THE INTERNATIONAL JOURNAL OF HUMANITIES & SOCIAL STUDIES

The Determinants of Population Growth in Nigeria: A Co-Integration Approach

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Abstract

Introduction: The impact of population growth on the standard of living is a major concern in most developing countries, including Nigeria. Nigeria's unprecedented growth rate and current hidden population momentum are no longer issues of common concern. Any conscious efforts to militate against rapid population growth will improve the standard of living of the people and this can only happen if the factors influencing population growth are known, leading to effective regulation of population growth. In addition, to evaluate the impact of the population policy, promoting access to reproductive health services and to bring the problems of population to the Nigerian populace require thorough knowledge of forces influencing population growth. Objectives: It is against this backdrop that this study examined the factors influencing population growth in Nigeria. Materials and Method: The study made use of secondary data and variables such as population growth rate, GDP per capita, infant mortality rate, maternal mortality rate, human development index, proportion-of-labor-force-employed sourced from the World Development Indicators (WDI) and Human Development Report (HDR). The study employed the Johansen Co-integration econometric technique to analyze the model specified. Results: Based on the analysis of the data, the study found out that infant mortality and maternal mortality rates have long run relationship the factors which influence Nigeria's population growth. Conclusion and Recommendations: The study recommends extensive population education and improvement on the quality and living standards of the citizens among others.

Keywords: Population Growth, standard of living, population momentum, Economic growth, human Development

1. Introduction

Globally, population growth is still a serious problem which has assumed the status of a public health issue particularly among countries in the African continent. Africa contributes a huge proportion of world's population every year. The impact of population growth on economic growth and standard of living is a major concern in most of the developing countries, including Nigeria (Headey and Hodge, 2009). Population growth is a critical challenge that put pressure on growth and development, thereby retards the maintaining of a sustainable society. According to UNDESA Population Division (2015), Africa has the highest fertility level with about 4.7 children per woman. In Nigeria, Africa's most populous nation, there are now signs that fertility rates are once more on the increase, which could have a significant impact on future estimates of the global population (Iwejingi, 2011).

Population of Nigeria is increasing rapidly, from 20.06 million in 1931 to 140 million in 2006 census exercise (NPC, 2009) and projected estimate of 181.6 (182) million in 2015 (WPDS, 2015). The Nigerian population census situation has been very controversial and intense debate since independence due to severe politicization and manipulation of population census as depicted in past census exercises. Population figures are the basis for revenue allocation, demarcation of constituencies, and allocation of representation in national and state assemblies, creation of states/local government areas among others. The population politics in Nigeria influence the demographic variables erroneously leading to ineffective population policies in Nigeria. Hence, the solution to the problem of rapid population growth, which has several adverse consequences in Nigeria has to start from proper understanding of the factors influencing rapid population growth, in order to evolve better policy measures towards reducing population growth and accelerate sustainable development. Thus, the paper has been conceived with objective to examine the factors influencing population growth.

The consequences of rapid growing population manifests heavily on species extinction, deforestation, desertification, climate change and the destruction of natural ecosystems on one hand; and unemployment, pressure on housing, transport traffic congestion pollution and infrastructure security and strain on amenities. Human population may be defined as the number of individuals usually within a specified habitat or area and population growth is change in population over time, that is- change in the number of individuals in a

population per unit time. Most times, it is believed that a reduction in the rate of population growth would bring important benefits towards better quality of life but that is only possible if we have proper understanding of the way it works. An estimate of the population size of Nigeria indicate that currently Nigeria is the 7th most populous country in the world with a population of 181.6 million in 2015 and projected to 4th position in 2050 with a population of 397 million (World Population Data Sheet, 2015). The population of Nigeria is growing at a rate of 2.9 per cent per year with a doubling of the population every 24 years. Nigeria adds about 3.5 million people to its population annually and has one of fastest growing population in the world (Akwenabuaye et al, 2013; NPC, 2003; FGN 2004). The unprecedented rapid population growth exposes Nigeria to population explosion in the near future.

The problem of population is not a problem of numbers but that of human welfare as it affects the provision of welfare and development. Invariably, rapid population growth can have serious consequences for the well being of the society. Increase in unemployment and increase in the dependency ratio are other serious dimensions of the growth problems. When an ever-growing number of workers cannot be absorbed in the modern economic sectors, some of the workers are forced either into unproductive service occupations or back into the traditional sectors with its low productivity and low subsistence wage levels. This situation aggravates poverty and human misery which increase fertility and tends to hold back developmental activities by slowing down technological change and industrialization. Population growth will make it difficult for the masses to improve the quality of their health, education and living standards.

Numerous births accelerate the demand for allocation of resources to socio-economic and welfare sectors especially food, clothing, housing, education, health, amongst others, shifting from productive goods and services. Nigeria ranks among the low human development index (HDI) countries, on 152nd position as against 188 countries and high proportion of population (62.0%) living below income poverty line of US\$ 1.25 per day (HDR, 2015). The rapid growth of population raises the question of living standards, labor force and problem of unemployment, problem of poverty and human misery alleviation, improvement in health, education and other welfare amenities. This situation increases the dependency ratio and productive employment which exceed existing jobs thereby affecting adversely the level of development. If development according to Todaro and Smith (2009) entails the improvement in people's standard of living or quality of lives - their incomes, health, education and general well being among others, it is important to understand the nexus between population growth and development. This is similar to a call at the Seventh African population conference on African governments to make right human investments and appropriate policies to expand opportunities for young people's schooling, health to improve their well being, skills development to boost productivity and economic earning (Social Development Co Hosts Seventh African Population Conference (2015). Population is a factor of development and as such growth rate needs to be managed well in order to attain developmental goals. To comprehend how population factor affects living standards and development, an understanding of the determinants of population growth becomes imperative. This understanding is vital in designing policies and strategies towards better concern about rapid population growth and its socio-economic consequences.

Thus, the objective of this paper is to examine the factors influencing population growth in Nigeria and to proffer solutions to stem rapid population growth. With the above objectives, the study formulates the null hypothesis that; Gross Domestic Product (GDP) per capita, labour force, infant mortality rate, maternal mortality rate, human development index and infrastructure have no significant long run relationship with population growth. The remaining part of the paper is structured as follows: next is the literature review and theoretical framework, followed by the methodology in section III, results and findings are in section IV. discussion, recommendations and conclusion are in section V.

1.1. Rationale for the Study

Nigeria's unprecedented growth rate and current hidden momentum are no longer issues of common concern. Any conscious efforts to militate against rapid population growth thereby improving the quality of live and standard of living of the people of Nigeria can only be effective if the factors influencing population growth are known. In addition, to evaluate the impact of the population policy, promoting access to reproductive health services and to bring the problems of population to the Nigerian populace require thorough knowledge of forces influencing population growth.

2. Review of Literature

The world is getting populated despite various efforts put in place by organizations and nations leading to fear of survival with respect to carrying capacity. Demographers defined Population growth as the change in the size of population, depending on the interplay of population processes (fertility, mortality and migration), and which may be measured both in absolute and relative terms. In other words, human population has bearing to the numerical change in the size of any given place or region between two periods and family planning restraint people from becoming reproductive machine. Akinleye and Alade (2008) observed that a positive perception to family planning leads to informed decision on contraception, fertility, sexual health and marital satisfaction. According to Wood (2011) the earth population would grow so great to overcome the earth ability to provide enough food and other infrastructures necessary for human survival. Even though there has been decline in fertility experience among countries over the past several decades, sub Saharan Africa remains a high fertility region with majority of countries having total fertility of 4.7 children per woman (UNDESA POP DIV, 2015) thereby accelerating the growth of population in this region.

According to Kirill et al (2013) population momentum will have a positive impact on population growth in developing regions. This is because countries with populations that are young have relatively large cohorts of young people which will in the near future contribute towards further increases in projected population size, even if the total fertility was set at replacement level. The world population which stood at 6.313 billion as at 2003, reached 7.2 billion at the beginning of 2014 with approximately 82 million being added every year is expected to increase to 9.6 billion in 2050 if left unchecked to the world population (Abdulrahman, 2013; UN,

2014; Todaro and Smith, 2009). The current estimate of world population is 7.3 billion, with China having a total population of 1372 million, followed by India (1314 million), United State of America (321 million), Indonesia (256 million), Brazil (205 million), Pakistan (199 million) and Nigeria occupied the seventh position with a total population of 182 million as at 2015; and projected population by 2050 put India (1660 million) as first, followed by China (1366) million, United States (398 million) and Nigeria (397 million) being fourth [WPDS, 2015; UNDESA POP DIV 2015).

Human population growth has been identified as underlying environmental problems (Iwejingi 2011). He also observed that rapid population growth in Nigeria and many other developing countries result from an inter play of many factors over the years. According to Asthana and Asthana (2006) the impact of human beings on the environment is through reduction in ecosystem complexity, diversity and changes in biogeochemical cycles. In a similar study, Theodore (2006) stated that the effects of population growth on living standards, resources use and environment will continue to be a problem unless it is put on check.

High population growth rate is also closely associated with ignorance, illiteracy and traditional socio-cultural practices which are still prevalence among many Nigerian peoples (Agbodike, 2011).

The effect of population growth on economic growth is more adverse in developing countries because of greater resource-dilution and resource-diversion effects, as well as poorer policy on environments (Headey and Hodge, 2009). Eastwood and Lipton (2011) observed that in contrast to Asia, there is an alarming implication of continuing high levels of natural increase in sub-Saharan African population in the face of low savings rates and low capital productivity.

In Nigeria, there had been a phenomenal rise in population in the last few decades with high growth rate of population between 2.8 percent and 3 percent and spatially uneven. It is now recognized that the population of Nigeria is very large, young and is increasing very rapidly. Whereas in 1931 the population of Nigeria was 20.06, in 1953 the population of Nigeria was estimated at 30.4 million and in 1963, it increased to 55.7 million (Ekanem, 1972). In 1991 and 2006, it increased to 88.5 million and 140 million respectively (NPC, 2009). The trend is still moving upwards and as at today, 2015, the population of Nigeria stood at 181.6 million (WPDS, 2015), putting Nigeria among the league of fast growing population in the world on one hand and on the other hand leaving the nation without commensuration increase in food production as Nigeria spent several billion on the importation of rice alone and developmental trail. Nigeria ranks among the low human development index (HDI) countries and high proportion of people (62%) living below income poverty line of US\$ 1.25 per day (HDR, 2015). Rapid population growth is detrimental to economic and social development as there will be little or no time to adjust the economy to developmental efforts. Population will continue to eat up any gain in economic development and these may lead to adverse effects on the people as put forward by Malthus several years ago.

Nigeria is growing at a rate of 2.9 per cent per year with a doubling of the population every 24 years. Nigeria adds about 3.5 million people to its population annually and has one of fastest growing population in the world (NPC, 2004; FGN 2004). The unprecedented rapid growth exposes Nigeria to population explosion in the near future and raises the question of its impact on living standards, labor force, unemployment, poverty and human misery alleviation, improvement in health, education and other welfare amenities. Nwosu et al (2014) on time series study on the role of population growth on economic growth in Nigeria and how economic growth is effected through population growth, found that population growth has a significant impact on economic growth and that there is a sustainable long run equilibrium relationship between economic growth and population growth. Similarly, in a study on the impact of FDI inflows on real GDP in Estonia-using a co-integration approach and causality test, Khalid and his-Colleagues observed from Johansen co-integration Test, that both the real GDP and FDI series are co-integrated and all variables have long term relationship in that they will not deviate arbitrarily from each other and that their deviations from long run equilibrium path are corrected (Khalid et al, 2015).

According to Udabah (2002), it is a central problem of economic development and if the population of a nation expands as fast as national income, per capita income will decrease. Unfortunately, in developing countries, the quality of life relative to population growth is still poor because of the high level of poverty in these countries. Quite a large proportion of the population cannot eat balanced meal, access quality health facilities, send their children to good schools as well as provide basic amenities of life for themselves. This account for why there is a negative relationship between population growth and the quality of life in developing countries, including Nigeria.

3. Materials and Methods

This study made use of time series data. The model in this study was estimated using the Johansen Co-integration econometric technique. This study made use of Nigeria and a time period between 1980 and 2013. The choice of years is precipitated by the fact that the population of Nigeria witnessed a high growth rate within this period. The rationale for using the Johansen co-integration technique is because it describes stationary long-run relationships that exist among a set of integrated variables. Thus, this study sets out to study the long-run relationship between population growth and the quality of life in Nigeria. The Co-integration technique is an improvement on the Ordinary Least Square (OLS) technique since the Co-integration technique takes care of the non-stationarity that is associated with the time series data. Non-stationarity means that the variables do not have a constant mean over time (Gujarati and Porter, 2009). The rationale for using Nigeria and the time frame stem from the fact that Nigeria had witnessed rapid population growth rate from 1980 till date resulting in the fall in the standard of living in the country over the period under review. The data was analyzed with the use of Eviews 7 software package. This is based on the ability of the software to handle the Johansen Co-integration technique and the various test statistics that the study is interested in.

The model in this study is specified as:

$$POGR = f(GDP_t, LAB, IMR, MMR, INF, HDI) \quad (1)$$

where; POGR is the population growth rate, GDP_k is GDP per capita; LAB is the proportion of the labour force employed (a measure of human capital); IMR is the infant mortality rate; INF is infrastructure (proxy by mobile and fixed-line telephone subscribers per 100 people); MMR is the maternal mortality rate and HDI is Human Development Index (a measure of growth in human capital).

Expressing equation (1) in econometric form gives:

$$POGR = \alpha_0 + \alpha_1 GDP_k + \alpha_2 LAB + \alpha_3 IMR + \alpha_4 MMR + \alpha_5 INF + \alpha_6 HDI + \varepsilon \quad (2)$$

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Where; ε is the error term, α_0 is the intercept term, $\alpha_1 \dots \alpha_6$ are the coefficients of the explanatory variables. The signs below the variables in brackets indicate the *a priori* expectations.

4. Results

The first test carried out is a test for multicollinearity; this is carried out to verify how related the explanatory variables are. Correlation gives an indication of the degree of relationship between variables. There is positive correlation between two variables when an increase in one brings about an increase in the other, otherwise, the correlation is negative. Correlation takes values between -1 and +1. For perfect negative correlation, the correlation coefficient is -1 while for perfect positive correlation it is +1. From the results in Table 2, all the variables have either low or negative correlation with one another. This implies that there is no multicollinearity among the variables so we can proceed with the estimations of the equations.

The second test carried out is the unit root test; this was conducted using the Augmented Dickey-Fuller test. The Co-integration test is carried out using the Johansen co-integration technique in order to test for the existence of a long run relationship between the dependent variable and the explanatory variables. The Vector Error Correction model (VECM) test which measures the speed of adjustment and the convergence or otherwise of each of the variables the dependent variable was also conducted. The unit root test result is presented in Table 3. The unit root test is used to ascertain if the time series variable is stationary or not. This is because most times, time series data are non-stationary in nature. This test was carried out using the Augmented Dickey Fuller (ADF) test for unit root. From the results in Table 3, POGR, GDP_k , LAB, IMR, MMR, INF and HDI are all integrated series of order 1(1). ADF statistics at levels shows that not all variables are stationary. This is shown by the comparison of the absolute values of ADF test statistics and the absolute values of critical values at levels. There was a need to proceed to test at 1st difference at which all variables were found to be stationary. A variable is stationary when ADF value is greater than the critical value, by considering only absolute values.

Since the variables are stationary, we proceed to carry out the Johansen co-integration test. This is done in order to determine the long run relationship among variables. The results in Table 4 show the estimated number of co-integrating equations using the Trace statistics test. The Trace statistic values are compared with the critical values. The result is satisfactory when the Trace statistic value is greater than the corresponding critical value at 5 percent level of significance. From the result in Table 4, it is evident that there is one co-integrating equation in the model with a Trace statistic is 66.47658 and a critical value of 55.12704 at 5 percent level of significance. The Trace statistics test is based on the maximum likelihood test. The Trace statistics indicate one co-integrating equation at 5 percent level of significance; this means that population growth and the quality of life are co-integrated in Nigeria. There exist both short-run and long-run relationships between them in Nigeria.

Table 5 shows the normalized co-integration coefficients of the situation where there is at least one co-integration equation. The t-statistic is used to show the significance of the independent variable in the long run. If the t-statistic is 2 or greater than two, the variable is significant but the reverse is the case when the t-statistic is less than two. The result shows that all the explanatory variables have a negative relationship with the dependent variable POGR (that is population growth). As regards the t-statistic results, all the variables except GDP_k and HDI are not significant because their t-stat values are less than 2.

The next test carried out is the Vector Error Correction Model (VECM). The criteria used are the coefficients of the variables and the t-statistic values. The rule of thumb in making use of the coefficients stipulates that the sign of the dependent variable be negative showing that there is convergence of the variables to the same long run equilibrium path following every period of disequilibrium and the VECM must be between zero (0) and one (1). The t-statistic is used to check for the significance of the variable. The results in Table 6 reveal that the Error Correction Model shows that the magnitude of POGR that was corrected in the co-integrating equation $D(GDP_k)$ is about 24 percent and its value was correctly signed, the magnitude of POGR that was corrected in the co-integrating equation $D(LAB)$ is about 18 percent and this value was correctly signed also, the error correction model shows that the magnitude of POGR that was corrected in the co-integrating equation $D(IMR)$ is about 17.5 percent and this value was correctly signed also. The results for the other variables are similar to this and they are correctly signed. A further analysis of the result shows that the t-statistic values for all the variables show that they are all significant because the values are all greater than 2.

Generally, this study has been able to establish based on the results obtained from the analyses that the gross domestic product per capita, labour, infant mortality rate, maternal mortality rate, human development index and infrastructure which are the variables used in this study have long run relationship with the population growth rate.

5. Discussions

The results of this study show that there are negative relationships between gross domestic product per capita (proxy for economic development), labour, human development index (proxy for the quality of life) as well as infrastructure and population growth. This implies that as population is growing in Nigeria, there is a fall in the level of economic development, a fall in labour participation rate, a fall in the quality of life (proxy by the human development index) and a fall in the quantity of infrastructure provided vis a vis the population of people using the infrastructures. These are evidenced from the high population growth rate being experienced in Nigeria,

the low quality of life experienced by a greater proportion of the population as well as the inadequacy of infrastructures available for the populace to use. The implication of all these combined is the poor quality of life visible in Nigeria.

Furthermore, the results of this study also reveal that there are also negative relationships between infant mortality rate and maternal mortality rate and population growth. This implies that based on population theory, as infant mortality and maternal mortality rates increase, population is expected to fall and vice versa. But this is not evidenced in the Nigerian economy. In spite of the increase in both the infant and maternal mortality rates, the population of Nigeria is still relatively high. The study deduced that one reason why this is so may be due to the fact that the fertility rate of Nigeria is high which has contributed to the increase in the population of the country. The results of this study supports the finding of Heady and Hodge (2009) who posited that population growth has a negative effect on economic growth if the government is not putting measures in place to grow the economy whilst the rate at which the population grows is not controlled. This results in the country not experiencing growth; this explains why Nigeria as a less developed country is not having a high level of growth.

6. Recommendations

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

The government should put in place extensive population education programs for the masses, effect family planning policies based on cultural setting, improve on the standards of living/quality of life in the Nigeria, and provide more infrastructural facilities for the populace in order to curtail population growth and accelerate economic growth and development in Nigeria.

7. Conclusion

This study examined the factors influencing population growth in Nigeria. The study found out that there is a long run relationship between the living standards and population growth in Nigeria. Since infrastructural facilities help in improving living standards as well as the quality of life, the Nigerian government has to take the financing of infrastructural facilities as important in order to improve on the well being of the citizens of the country which will make population regulatory interventions very receptive among Nigerians.

8. Acknowledgements

The authors wish to acknowledge the assistance of Mrs. A.E. Akunna, Department of Estate Management, Covenant University Ota, Nigeria, for typing the first draft of the manuscript. We are also grateful to Dr S. Opkosin, Department of Economics and Development Studies, Covenant University Ota Nigeria, for his useful comments that improved the paper.

Name	Symbol	Definition/Description	Source
Population Growth Rate.	POGR	Population refers to the total number of persons living in a country at a particular time. The population growth rate is the percentage rate at which the population increases per annum.	World Development Indicators (WDI)
GDP per capita.	GDP _k	This refers to the total Gross Domestic Product (GDP) divided by total population. It is used as an economic indicator of level of living and development.	WDI
Human Development Index.	HDI	An index measuring national social development. Based on measures of life expectancy at birth, educational attainment, literacy and adjusted real per capita income.	Human Development Reports (HDR –various issues)
Proportion of Labour Force employed.	LAB	This is the proportion of the working-age population that is employed. That is, employment to population ratio.	WDI
Infant Mortality Rate	IMR	This is defined as the rate at which children between 0 and five years old survive at birth.	
Maternal Mortality Rate	MMR	Maternal health is defined as a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity, in all matters relating to women of reproductive age.	DHS
Infrastructure	INF	This refers to the amount of physical and financial capital expended on communication so as to aid interaction among people and boost trading activities. This is proxy by mobile and fixed-line telephone subscribers (per 100 people).	WDI

Table 1: Description of Variables and their Sources

Source: Authors' Compilation, 2015

	Pogr	Gdpk	Lab	Imr	mmr	inf	hdi
Pogr	1						
Gdpk	-0.0234	1					
Lab	0.0066	0.3846	1				
Imr	-0.1863	0.1585	-0.2185	1			
Mmr	-0.0069	-0.3954	-0.6072	-0.1569	1		
Inf	0.0281	0.4081	0.2864	0.1188	-0.2496	1	
Hdi	0.0207	-0.2422	0.3344	-0.2235	0.0517	-0.1635	1

Table 2: Correlation Matrix
Source: Authors' Computation, 2015

1 st Difference			
Variables	ADF	Critical Value at 5%	Remarks
POGR	-9.204691	-2.847130	S
GDP _k	-4.778259	-2.847130	S
LAB	-8.056704	-2.847130	S
IMR	-2.971208	-2.847130	S
MMR	-2.932971	-2.847130	S
INF	-4.157093	-2.847130	S
HDI	-8.372482	-2.847130	S

Table 3: The Unit Root Test Results
Source: Estimated by the Authors, 2015

Unrestricted Co-Integration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.672625	66.47658	55.12704	0.0024
At most 1	0.352876	30.64124	35.18365	0.1534
At most 2	0.256108	17.05139	20.27284	0.1334
At most 3	0.218432	7.452173	9.152446	0.1024

Table 4: Unrestricted Co-Integration Rank Test (Trace)
Source: Authors' Computation using E-views, 2015

Trace test indicates 1 co-integrating equations at 0.05 confidence level

*denotes rejection of the hypothesis at 0.05 confidence level

**MacKinnon-Haug—Michelis (1999) p-values

POGR	GDP _k	LAB	IMR	MMR	INF	HDI
1.000000	-1.970669 (3.01584)	-20.75161 (6.44828) [-3.21816]	-9.03732 (5.38677)	-16.95791 (4.65142) [-3.64575]	-7.30382 (4.18654)	-12.03561 (3.51204)
	[0.65345]	[-3.21816]	[-3.64575]	[2.49284]	[2.68453]	[1.34204]

Table 5: The Normalized Co-integrating Coefficient
Source: Estimated by the Authors using E-views, 2015

Note: () represents the standard error values and [] represents the t-stat values

Variable	D(POGR)	D(GDP _k)	D(LAB)	D(IMR)	D(MMR)	D(HDI)	D(INF)
ECN (-1)	-0.85232	0.24050	0.18048	0.17526	0.15836	0.20737	0.16332
Standard errors	(0.4166)	(0.0134)	(0.0089)	(0.0013)	(0.0043)	(0.0537)	(0.0246)
T-Statistic	[2.0506]	[2.1829]	[2.2789]	[2.0157]	[2.0072]	[2.1908]	[2.0352]

Table 6: The Vector Error Correction Estimates
Source: Computed by the Authors using E-views, 2015

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