ISSN: 2958-2326

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African Journal of Commercial Studies

Publisher's Home Page: https://ijcsacademia.com/

AFRICAN JOURNAL OF COMMERCIAL STUDIES

Research Paper | Peer Reviewed | Open Access

Assessment of Economic Drivers of Population Growth in Nigeria

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African Journal of Commercial Studies, 2025, 6(3), 81–89
DOI Link: https://doi.org/10.59413/ajocs/v6.i3.8

Article Info

Volume 6, Issue 3

Publication history:
Accepted on 11 May 2025;
Published: 16 May 2025

Article DOI:
10.59413/ajocs/v6.i3.8

Abstract

This study examined the economic drivers of population growth in Nigeria. In effect, the objective of the study is to explore the economic drivers of population growth in Nigeria and the implication on the economy. Data for real gross domestic product proxy for growth rate was obtained from Central Bank of Nigeria statistical bulletin while data on population growth rate, net migration, crude death rate growth and birth rate growth were from World Bank world development indicators; data for secondary school enrolment were from UNESCO Institute for statistics. The Auto Regressive Distributed Lag model was employed to analyze the data. The findings revealed that birth rate, death rate and secondary school enrolment were the major drivers of population growth in Nigeria. The short run result revealed that Birth rate with a coefficient of 0.096061 has a positive and significant relationship with population growth at 5% level of significance. The long run result of Birth rate is consistent with that of the short run as it has a positive impact. While Crude death rate, secondary school enrolment and growth rate of real gross domestic product have negative effect on population growth rate. Also, the result of NM rate with its coefficient of 0.095506 has a positive and significant relationship with POPGR. This study recommends among others that the country should continually make policies towards human capital development-training, educating and ensuring healthy lives of citizens in order to increase the welfare of citizens.

Keywords: Population, Population growth, Population growth rate, Drivers, Economic growth

1. Introduction

The problem of population gained eminence from the work of Thomas Malthus (1798) which generated a lot of controversy and spurred further investigations into demographic problems. Population in many of the developing countries Nigeria inclusive has increased at rates never experienced before in world's history, triggering quicker growth in the world's population (Onwioduokit, 2019). The rate of population growth is important because of its implication on the economy.

UNWPP, (2024) argues that there are 8.2 billion people in the world and that Nigeria is the most populated country in Africa and the 6th heavily populated country in the world. It is estimated that Nigeria's population will be about 237,527,782 people by the middle of 2025, which is a rise from 235,072,214 of the population of 2024, an addition of 6,192,729 people, thus growing at a growth rate of 2.42 % (UNWPP, 2024). Nigeria accounts for 5 % of births globally and one fifth of all births on the African continent. UN (2021) projection has it that by the year 2050, one in every ten children born worldwide will be born in Nigeria. Therefore, Nigeria is a high fertility country, evidence from UN, (2019) shows that the country's fertility rate in 1981 was approximately 6.76 births per woman, in 1991 the rate was 6.46 births while in 2001 it was 6.10 births subsequently in 2018 the fertility rate was 5.42 births. In the same manner, viewing the Nigeria total fertility rates in 2019 and 2023, the UNWPP (2023) asserts that total fertility rate in 2019 stood at 5.349 while in 2020 the rate was 5.281 births which was a 1.27 % decline from that of the previous year. In 2021, it was 5.212 births per woman; in 2022 the rate was 5.144 which showed a decrease of 1.3 % from that of 2021. The study also reported that the total fertility of 5.076 births in 2023 was a decline of 1.32 % from that of the 2022.

Though, there is a little reduction in the fertility rate of Nigeria, available statistics shows that Nigeria's fertility level is still high and it is above the world replacement rate which is 2.0 births per woman. Inter-Agency Regional Analysts Network Report (2016) asserts that despite decreasing fertility, Nigeria's population is projected to continue to rise to 262 million by 2030 and 398 million by 2050 if the current trend is followed. However, the high growth rate could be as a result of some practices inherent in the country. For instance, traditionally in the eastern part of the country, there is the traditional belief about the value of children, also some religious practices in the northern part which permits marrying up to four wives. In addition to the above, some Christian faith teach that children are gift from God therefore the use of contraceptives are condemned. On the other hand, favorable factors like improvement in health and medical facilities aid in the reduction of death rate. All these factors limit the prospects for lowering the Nigerian population growth. Ojunta (2013), argue that improved medical facilities, attitude towards marriage, age distribution of population, low level of education and enlightenment, early marriage, high birth rate, reduced death rate, religion, custom/superstition and increase in material wellbeing are responsible for rapid population growth in Nigeria.

Though some scholars argue that Nigeria rapid population growth has some benefits associated with it, like higher output level, higher demand, increased labor supply, increased political power and so on (Tartiyus, Dauda and Peter, 2015). Others see population growth as one of the developmental problems the nation has. Hence, rapid population is believed to retard the socioeconomic development of a nation. It has consequences like depletion of limited resources, environmental degradation, and unemployment, increased importation to satisfy the rising population, social unrest, health issues and reduced level of living. Therefore, Nigeria's speedy population growth is a distress to the nation and this has prompted the country to look for ways to control it. The first population policy in Nigeria was in 1988 during the regime of General Ibrahim Babangida, who made a policy statement that specified that each woman in Nigeria should have a maximum of four children. However, this mandate was not adhered to due to some cultural and religious belief inherent in the nation. In 2004, Nigeria made a policy to control her size, 'the Nigeria's national policy on population for sustainable development' which has nine strategies for family planning and fertility. This policy states that in order to achieve sustainable development and a higher quality of life for all people, Nigerians should promote appropriate policies which cannot compromise the ability of the future generation to meet their needs while meeting the needs of the current generation (Musa and Habibu, 2020). Apart from the above, various stakeholders, both non-governmental and government have tried to sensitize women of child bearing age on modern family planning methods, all are ways to control the growing Nigeria population. Despite all these efforts, Nigeria is yet to have a desirable population.

In effect, a lot of policies introduced to curb the rapid increase in Nigeria population try to remind all stakeholders the implications of population growth on the economy and on the citizens' well-being. Therefore, it is vital to strike a balance between population growth and policy issues which deals with development like health, housing, food supply, security, employment, education.

1.2 Research Objectives

1. To assess the major drivers of population growth in Nigeria.
2. To analyze the long run and short run implications of population growth in the Nigeria economy.

1.3 Conceptual issues

Population

Population is the number of persons living in a specific geographical area at a particular point in time. The population of a place is not static, it changes overtime. NPC, (2023) views population as individuals residing within a country, with data gathering procedures designed to enumerate all persons living in Nigeria at a specific time. NPC definition is in the perspective of census. The three major determinants of population size and growth are birth rate, death rate and net migration. the population of a country can be determined through census.

Population growth

This study defines population growth as the increase or decrease in the size of a given population overtime, Efunade and Efuntade, (2020) argue that population growth is the increase or decrease in the number of individuals in a population. Population growth rate is the rate by which the size of a given population changes over a time period.

Economic growth

Economic growth can be seen as the process by which a nation's economy enlarges overtime, leading to a rise in the value of goods and services produced. This is ordinarily measured by increase in the country's gross domestic product, which is revealed through higher income and enhanced standard of living (Peterson and Wesley, 2017). For the purpose of this study, economic growth is defined as the increase in real output or real per capita output of an economy. Economic growth is normally calculated in terms of annual percentage rates of growth.

Driver

In this study, a driver is simply a factor that causes a particular phenomenon to occur or develop. Therefore, economic

driver of population growth are those variables which affect the size, growth rate, distribution, dependency rate, sex composition of the sector of the population that is growing.

2. Literature Review

2.1. Theoretical literature

This study is based on the following theories;

Malthusian population theory: The theory was propounded by an English Clergyman, Reverend Thomas Robert Malthus, 'An Essay on the Principle of Population as It Affects the Future Improvement of Society' (1798). Malthus was worried about the fast-increasing population of England during his time. He felt that most of the problems which the society suffered then like poverty, malnutrition, and diseases were the resultant effect of overpopulation (Ojunta, 2013). Thus, his idea that there is a natural instinct in man to procreate at a faster rate which leads to population increase in geometric progression (2, 4, 8, 16…). On the other hand, based on the assumption that the supply of land is constant and there is the operation of the law of diminishing returns, food supply increases at a slow rate of arithmetic progression (1, 2, 3, 4…). By this, Malthus argues that with time it would be difficult for people to be sustained as the population would outgrow the available food supply.

Endogenous growth theory: The endogenous growth theories emerged in the 1980s as a substitute to neoclassical growth theory. The advocates of the theory are Paul Romer, Arrow, Solow and Lucas among other economists (Acemoglu, 2009). This theory argues that it is the forces within a structure that generates economic growth and not the external forces. The theory asserts that economic growth results from policies within the internal process of government and investment in human capital. Thus, the growth of a nation is seen in the type of policies taken and implemented in a nation. From this, the endogenous growth has redefined the concept of economic growth as being determined by population growth and innovation. Therefore, this theory believes that government policy should encourage entrepreneurship as a means of creating new business and an important source of new jobs, investment and further innovations.

2.2. Operational Definitions

Empirical literature review

A review of studies on population growth suggests that there are a lot of empirical researches on the subject from across the globe.

Okwori, Ajegi, Ochinyabo and Abu (2015) examined the Malthusian population theory in Nigeria from 1982-2012. The result shows that population growth has no significant impact on economic development in Nigeria. The study recommends amongst others that the government should embark on enlightening campaigns to intimate the populace on the dangers of over population and its attendant consequences.

Mahmud (2015) examined econometric model on population growth and economic development in India from 1980 to 2013. The result of the study showed that the variables are co-integrated. The short run influence on the dependent variable (GDP) by the independent variables (population, rate of urbanization and employment) were tested using Wald test which indicated that each independent variable influences the dependent variable in the short run.

Orumie (2016) examined the effect of unemployment rate and population growth rate on gross domestic product in Nigeria from 1970 - 2005. The result revealed that unemployment rate and population growth rate has been on the increase since 1970 amidst the declining gross domestic product. It also showed that the independent variables improve to gross domestic product.

In a like manner, Aidi, Emecheta and Ngwudiobu (2016) investigated the relationship between population dynamics and economic growth in Nigeria using time series data which spans from 1970 to 2014. The data were analyzed using ordinary least square estimation technique. The result revealed that all the core variables (fertility, mortality and net migration) of the study were inversely related to economic growth. It recommends among others that the labor force should be improved through education and skill acquisition programs.

Peterson and Wesley (2017) examined the role of population on economic growth. The study found that increasing population in low- income countries is unfavorable to economic growth as it leads to full dependent children.

Olusogo, Oluwarotimi and Muazu (2018) explored the effect of population growth on economic growth in Nigeria over the period of 1981 to 2015. The findings revealed that population growth has a positive and significant effect on economic growth in Nigeria. The study recommends that government should ensure that Nigeria's rising population is channeled into area of the economy where they may be fully utilized.

Onyeoma, (2020) investigated the influence of rising population on poverty and unemployment in Nigeria. The study found out that rising population has a negative impact on the economy.

Akinola, (2021) assessed the impact of population growth on Nigeria economy. The result proved that population growth has positive impact on economic growth in Nigeria.

Efuntade and Efuntade, (2020) investigated the effect of population growth on economic growth in Nigeria within the range of 1994 to 2019. The study concluded that fertility rate has significant and positive effect on gross domestic product

while mortality has negative effect on Gross domestic product.

Ochinyabo (2021) examined the rapid population growth and economic development issues in Nigeria. The result showed that population, remittances, Gross Domestic Product (GDP) and unemployment have a negative and significant effect on human development index in Nigeria.

Sajini (2022) examined the link between demographic change and economic growth in Nigeria from geographical and health perspectives. The research adopted the qualitative method of analysis. The result revealed that improvement in public health and medical technology, better nutrition, and general sanitation are factors which bring about decreased death rate and encourage fertility rate increase, resulting to rise in population growth. It concludes that population growth has serious impact on economic growth. The study commends the enactment and execution of realistic population and economic policies.

Amadi, Nwankwo and Nwikina (2024) assessed the relationship between population and economic development in Nigeria. The study used ordinary least square to analyze data and the result proved that population growth has significant and positive impact on economic growth.

From the empirical literature review, some scholars argue a positive relationship between population growth and economic growth Olusogo et al (2018), Akinola (2021), Amadi, Nwankwo and Nwikina (2024), while scholars like Onyeoma (2020), Ochinyabo (2021) found a negative and statistically significant relationship between population growth and economic growth. The review showed that most of the studies focused on the impact of population growth on the economy while none tried to investigate the major drivers of population growth in Nigeria. In effect, this study is an extension of the previous studies to this direction as it will explore the major drivers of population growth in Nigeria. This will help policy makers in their decisions towards demographic issues.

3. Research Methodology

This section deals with the main method of analysis employed for the study.

Research design

For the purpose of this study, descriptive and time series analytical research design were adopted. Descriptive design helps to interpret past trend of event and fact. The use of the method is that the collected data has time attribute which enables one to study the variables overtime.

Model Specification

This study adopted a modified model of Olusogo, Oluwarotimi, and Muazu (2018). Thus, Net migration, growth rate of real gross domestic product and secondary education enrolment were added while fertility rate was changed with birth rate growth in order to have a better view of the analysis, thus the model is specified as in equation (1) below.

$$POPGR_t = b0 + \alpha_1 BR_t + \alpha_2 CDR_t + \alpha_3 RGDPgt_t + \alpha_4 NM_t + \alpha_5 SE_t + \varepsilon_t \quad \text{.....(1)}$$

$$\Delta POPGR_{t-1} = b0 + \sum\alpha_1 \Delta BR_{t-1} + \sum\alpha_2 \Delta CDR_{t-1} + \sum\alpha_3 \Delta RGDPgt_{t-1} + \sum\alpha_4 \Delta NM_{t-1} + \sum\alpha_5 \Delta SE_{t-1} + \varepsilon_t \quad \text{....2}$$

$A0 > 0$, $\alpha_1 > 0$, $\alpha 2 < 0$, $\alpha 3 > 0$, $\alpha 4 > 0$, $\alpha 5 < 0$

Where,

RGDPgt = Growth rate of Real Gross Domestic Product which is proxy for economic growth.

POPGRt = Population growth rate; BR = Birth rate growth; DR = Death rate growth

SE = Secondary education enrolment; NM = Net migration rate

bo = Constant term of the model and the intercept of the estimated regression line.

$\alpha 1$- $\alpha 5$ = The coefficient of the respective independent variables.

t = The time period of observation;

εt = The error term

Data and source

This study will use annual time series data obtained from Central Bank of Nigeria statistical bulletin and World development indicators from World Bank (2020, 2023), UNESCO Institute for statistics (2023). The period of 1981 to 2022 will be covered in the analysis. The choice of the sample period is because of data limitations in the sources.

Diagnostic test / Estimation technique

This study will employ the Augmented Dickey –Fuller and Phillips Peron for unit root test to examine whether the variables are stationary. This is necessary so as to curb spurious regression since literature has proved that most time series variables are non-stationary (Gujarati, 2017). If any of the variables are of 1(0) and some are of 1(1) provided none is of the order 1(2). The study will use the Auto Regressive Distributed Lag (ARDL) technique, to investigate the short run impact of population growth. This study will conduct bound test approach to co-integration proposed by Paseran and Shin (2001) to determine the existence of long run among the variables. To analyze the time series data collected from various sources, this study will employ the use of econometric analysis package (E- Views 18).

4. Data analysis and discussion of findings

4.1. Unit root test

This study conducted a preliminary test which is the unit root test using Augmented Dickey Fuller (ADF) and Phillips Peron to test whether the variables were stationary.

Table 1: Summary Of Augmented Dickey Fuller (ADF) and Phillips Peron (Ph.P) test

Variables	ADF Value	Critical value 5%	Order.	Ph.P	Critical value 5 %	Order.
POPGR	-4.782052	-3.536601	1(I)	-4.348040	-3.536601	1(1)
BR	-4.451422	-3.526601	1(0)	-4.744533	3.540328	1(1)
CDR	-4.914142	-3.574244	1(0)	-5.375201	-3.536601	1(1)
NM	-4.192063	-3.536601	1(0)	-5.178255	-3.536601	1(1)
RGDPG	-3.981698	-3.533083	1(0)	-3.981698	-3.533083	1(0)
SE	-4.458553	-3.557759	1(1)	-6.661308	-3.536601	1(1)

Source: Author's computation from E views 18.

4.2. Auto regressive distributed lag (ARDL) result

This study employed ARDL model for further analysis considering the result of the unit root test. The reason for this is given by Paseran, Shin and Smith (2001). From the result, the coefficient of determination (R2) is 0.995698 which implies that 99 % of the variations in the dependent variable is explained by the independent variables while only 1 % is accounted for by the variables not included in the model. The F-statistics which measures the joint statistical significance of the coefficient of our model was used to test for the overall significance of the model. The result of the F- statistics is 94.9648 with its p- value of 0.0000 is significant at 5 % level of significance this confirms the goodness of fit of the model. Akaike information criterion was selected and it is the best for the model as it has the lowest value as presented in table 2.

Table 2: Summary Of Auto Regressive Distributed Lag

Variable	Coefficient	t-Statistic	Prob.*
POPGR(-1)	0.897115	34.01763	0.0000
BRG	0.025317	2.961597	0.0068
BRG(-1)	0.026913	2.754775	0.0110
DRG	-0.014773	-4.221200	0.0003
DRG(-1)	-0.007418	-2.037791	0.0527
NM	0.047674	4.569035	0.0001
NM(-1)	-0.070509	-7.754764	0.0000
RGDPGT	-0.000646	-1.953084	0.0626
RGDPGT(-1)	0.000462	1.613560	0.1197
SE	-0.000876	-3.741495	0.0056
C	0.260561	4.024472	0.0005

R-squared	0.995698	Mean dependent var	2.611667
Adjusted R-squared	0.983726	S.D. dependent var	0.068515
S.E. of regression	0.005427	Akaike info criterion	-7.333678
Sum squared resid	0.000707	Schwarz criterion	-6.805838
Log likelihood	104.0062	Hannan-Quinn criter.	-7.149448
F-statistic	94.9648	Durbin-Watson stat	2.047420
Prob(F-statistic)	0.000000		

Source: Author's computation from E views 18.

4.3. Co integration result

The co integration revealed short run coefficients of the variables as; BRG 0.025317, DRG -0.014773, NM 0.047674, RGDPGT -0.000646, SE -0. 000876. From table 3 below, all the variables are significant except RGDPGT which has a negative and insignificant impact on POPOGR. DRG also has negative and significant impact on POPGR just like SE. NM and BRG have positive and significant impact on POPGR. The long run result also has coefficients as BRG 0.507650, DRG -2.215689, NM -0.342623, RGDPGT -0.001782, SE -0.008859. BRG has positive and significant impact on population growth while RGDPGT has negative and insignificant impact on population growth. DRG, NM, and SE have negative and significant impact on population growth.

From Table 3 below, the result of the co-integration revealed that the lagged error correction term ECT (-1) is negative and statistically significant at 5 % level of significance. This shows the speed at which the entire system adjusts towards long run. The ECT (-1) result of -0.58 means that annually 58 % inconsistency in short run are corrected and incorporated into the long run.

Table 3: Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BRG)	0.025317	0.008549	2.961597	0.0068
D(DRG)	-0.014773	0.003500	-4.221200	0.0003
D(NM)	0.047674	0.010434	4.569035	0.0001
D(NM(-1))	0.070509	0.009092	7.754764	0.0000
D(RGDPGT)	-0.000646	0.000331	-1.953084	0.0626
D(SE)	-0.000876	0.000234	-3.741495	0.0056
CointEq(-1)	-0.582885	0.026372	-3.901303	0.0007

Cointeq = POPGR - (0.5077*BRG -0.2157*DRG -0.3426*NM -0.0018 *RGDPGT -0.0088*SE + 2.5325)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BRG	0.507650	0.170321	2.980551	0.0065
DRG	-0.215689	0.057377	-3.759135	0.0010
NM	-0.342623	0.083312	-4.112515	0.0004
RGDPGT	-0.001782	0.004450	-0.400425	0.6924
SE	-0.008859	0.002392	-3.703671	0.0084
C	2.532541	0.052486	48.251442	0.0000

Source: Author's computation from E views 18.

4.4. ARDL bounds test result

The ARDL bounds test result proved the existence of long run relationship among the variables at 5 % level of significance. The F-statistics is 9.45538, since this value is above the upper bound at 5 % level of significance; this confirms the existence of long run relationship among the variables.

4.5. Findings

The result of the short run as presented in Table 3 revealed that BR with a coefficient of 0.025317 has a positive and statistically significant relationship with POPGR at 5 % level of significance. This is in line with the a priori expectation. However, DR with coefficient of -0.014773 has a negative and significant relationship with POPGR which is in line with the a priori expectation. The NM rate with its coefficient of 0.047674 has a positive and statistically significant relationship with POPGR. That is in line with the a priori expectation while the RGDPGT with coefficient -0.000646 has a negative and insignificant relationship with POPGR this is however against our expectation. The SE enrolment with coefficient of -0.000876 has a negative and significant relationship with POPGR.

The long run result in Table 3 revealed that BRG with a coefficient of 0.507650 has a positive and significant impact with POPGR which is consistent with the short run result. Also DRG result of the long run with a coefficient of -0.215689 is negative and significant which is consistent with that of the short run. The long run result of NM with a coefficient of -0.342623 is significant and negatively related with POPGR. Also, the long run result of RGDPGT with coefficient of -0.001782 is insignificant and also shows a negative relationship with POPGR. SE long run result with coefficient of -0.008859 is consistent with the short run result because it still has a negative and significant relationship with POPGR.

4.6. Discussion / Implications of the findings

The economic implication of the above result which revealed that BR has a positive and statistically significant relationship with POPGR in the short run is in line with the findings of Efuntade and Efuntade (2020) who also found a positive and significant relationship between fertility and gross domestic product. The findings of this result is also in agreement with Olusogo et al (2018) who argue that rise in birth rate brings about the increase in children and young people. Thus, with more children in Nigeria, there will be increase in demand for goods and services, which is a positive effect on the economy as it also leads to increase in production. On the contrary, it may have negative effect on labor force participation especially for women and child labor because when there is rise in birth rate there will be increase in labor supply which might result in low wage and low saving. Also there will be rise in the dependency ratio. The implication of DR result which is negative

is that the nations' reduced death rate could be a major driver of population growth, in other words, increase in death rate could be used to check population growth according to Malthusian positive check but this could result to an ageing population. From the result, NM result was also positive and significant in the short run this means that non stringent immigration policy could have a positive impact on population growth in the short run this will result to youth bulge which if not engaged they become delinquent to the society as unsatisfied youth can springs up crises in a nation.

The implication of negative relationship between secondary school enrolment and population growth is that with more education, the citizens will have knowledge of fertility control measures and also they might be engaged in employed jobs. Therefore the time and desire for large family may be reduced. In consonance with this, fertility decreases with increasing education and wealth (NDHS, 2018, 24). Negative effect of RGDPG (which represents citizens' welfare) on the POPG could have implications as increased wealth is in line with reduced family size. High income inequality will have high fertility differential between the educated rich and the uneducated poor, as the poor will have many children while the rich will prefer to have few and educated children. This could be supported with stage 3 of the demographic transition theory. In other words, if government embarks on policies that will increase the citizens' income, it could be used as a measure for population control especially when such policies are geared towards increase in the income of women.

Therefore, the implication of negative effect of economic growth on population growth is that at the long run, the increase in economic growth in the form of higher per capita income, improved wellbeing of the citizens will reduce population growth as wealthier couples will prefer smaller families which will overtime reduce population growth. In line with the endogenous theory, Nigerian government should embark on economic policies that can help to train and educate its population as the theory argued that development of a nation comes from factors within the system. The high human capital should be developed through skillful training, proper education and improvement in health facilities and delivery.

5. Conclusion and Recommendations

5.1. Conclusion

In view of the rapid population growth rate in Nigeria, this study tried to assess the economic drivers of population growth and the implication for Nigeria economy. It employed the ARDL bounds test technique to test for short run and long run relationship among the variables. The evidence from this study proved that birth rate, death rate, net migration and secondary school enrolment are the major drivers of population growth as they have significant impact on population growth both in the short run and in the long run. However, most population control in Nigeria emphasis mainly on birth rate and death rate but Olusogo et al (2018) argue that controlling population growth through birth rate and death rate will affect the achievement of significant level of economic growth in Nigeria. Thus, this study advocates for policies which promote innovation and investment in human capital simply in adherence with the endogenous theory.

5.2. Recommendations

Based on the findings of this study, the following recommendations were made.

i. Though birth rate, death rate and secondary school enrolment have been identified as the major drivers of population growth in Nigeria, the country should stop laying much emphasis on birth control as the only population control measure, rather they should continually make policies towards human capital development- training, educating and ensuring healthy lives of citizens. Thus, with enhanced education the population will be controlled.
ii. Government should increase the budgetary allocation for education and encourage private sector with fair education policies to participate fully in education at all levels.

This study suggests a further study to investigate the impact of female labor participation on population growth in Nigeria. The recent pandemic which increased the worlds' death rate calls for further study that will incorporate the impact of Covid -19 on Nigerian population.

Conflict of Interest

The authors declare that they have no conflicting interests

Funding

This research did not receive any specific grant from finding agencies in the public, commercial, or not-for-profit sectors.

Ethical considerations

The article followed all ethical standards appropriate for this kind of research.

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