

## **DETERMINANTS OF POPULATION GROWTH RATE: EMPIRICAL EVIDENCE FROM NIGERIA**

**Clement Korgbeelo, Ph.D**  
**Department of Economics, Faculty of Social Sciences**  
**Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt, Nigeria**

*E-mail: [clementkorgbeelo@gmail.com](mailto:clementkorgbeelo@gmail.com)*

### **ABSTRACT**

*Several variables that determine the growth of a country's population have been identified. However, birth rate, death rate, and net migration flow are the variables that directly influence the growth rate of population. This study therefore investigated the impact of birth rate, death rate, and net migration rate on population growth rate in Nigeria. Annual time-series data from 1981 to 2023 were used for the study. The data were sourced from the Central Bank of Nigeria (CBN) annual reports and statements of accounts (various years), the National Bureau of Statistics (NBS) demographic statistics bulletins (various years), and the World Bank development indicators (various years). The autoregressive distributed lag (ARDL) approach to cointegration, the error correction mechanism (ECM), and Granger causality test were used to estimate the data. The estimated long-run and short-run regression results revealed that birth rate and net migration rate have significant positive impact on population growth rate while death rate has significant negative impact on population growth rate. The study concludes that birth rate, death rate and net migration rate are important determinants of Nigeria's population growth rate. Based on the findings, the study recommends, among other things, that there is the need to educate Nigerians on the necessity to have fewer number of children through the use of contraceptives and other birth control measures.*

**Keywords: Population-Growth, Birth-Rate, Death-Rate, Net-Migration.**

### **INTRODUCTION**

The world today is experiencing an unpredicted population growth. Beginning from the middle of the 20<sup>th</sup> century, the world's population has more than tripled in size, attaining about 8 billion persons in 2022. The United Nations projected that the size of the global population will be about 11 billion persons by 2100. The rapid growth rate of the world's population, which started since 1950, can be attributed to the gradual increase in average human longevity due to widespread improvements in public health, nutrition, personal hygiene and medicine, and the persistence of high levels of fertility in many countries (Wilmoth et al, 2022).

The size of a country's population has important implications on the economy of the country. However, these implications differ considerably among countries, based on their socio-economic and political conditions (United Nations, 2005; World Bank, 2010). For instance, countries with high levels of education, adequate investments in necessary infrastructural facilities, and relatively stable political and economic systems are better equipped to cope with rapid population growth. Contrariwise, countries with low levels of education, huge infrastructural deficits, and unstable political and economic systems are more likely to experience difficulties in effectively managing rapid population growth. Hence, developing

countries (including Nigeria) experiencing rapid increase in population size can be problematic, since they do not have the necessary infrastructure and human capital to keep up with a rapidly rising population (Lange & Vollmer, 2017; Ochinyabo, 2021; Ogunjobi et al, 2024).

Nigeria has a rapidly growing population. With an estimated population size of over 220 million persons and an average annual growth rate of about 2.6 percent, it is the most populous country in Africa and the 7<sup>th</sup> most populous country in the world. The age composition of the Nigerian population shows that it is mainly youthful with about 42 percent between the ages of 0-14 years and a dependency ratio estimated at about 76 percent. This makes Nigeria the third-largest youthful population in the world after India and China. The country also has a high fertility rate of about 5.4 children per woman (Alimi et al, 2021; National Bureau of Statistics, 2022; Wilmoth et al, 2022).

A country's national population policy serves as an important guide for managing demographic issues in order to improve the quality of life for the citizens. A sound population policy will enable the government to provide adequate social services and economic opportunities that will enable the people to contribute meaningfully to national development. The efficacy of a country's national population policy therefore lies in its ability to contribute to improvements in the quality of life and standard of living of the citizens (Abubakar, 2019; Mujrai & Rao, 2022). The current Nigeria's national policy on population which was launched in 2008, was formulated in 2004 while implementation started in 2005 with an end date of 2015 for most of the targets (National Population Commission and Health Policy Project, 2015; Ingiabuna & Uzobo, 2016). In this context, this national population policy is outdated and needed to be reviewed so as to reflect current demographic and socio-economic realities in the country. Such a policy review requires empirical evidence on the variables that determine the growth rate of the population. This study will provide such empirical evidence.

There are several variables that determine the growth rate of a country's population. These include birth rate, death rate, net migration flow, natural disasters, personal hygiene and public sanitation, nutrition standards, life expectancy at birth, standard of living, fertility rate, the general socio-economic conditions in a country, among others. However, these variables indirectly affect the size of a country's population through their influence on birth rate, death rate, and net migration flows. Hence, in practice, the actual growth in a country's population size is mainly determined by demographic variables such as the natural rate of population growth (i.e., the number of births minus the number of deaths) plus net migration flows (Alvarez-Diaz et al, 2018).

This study therefore examined the impact of birth rate, death rate and net migration rate on the growth rate of Nigeria's population.

## **Literature Review and Conceptual Clarifications**

### **Population Growth Rate**

In economic parlance, population simply refers to the number of persons living in a particular geographical area during a given time period. The population growth rate is the average change in a population over time. The rate of natural population growth is the rate at which a population is increasing (or decreasing) in a given year due to excess (or deficit) of births over deaths expressed as a percentage of the base year population. The total population growth rate refers the natural population growth rate plus net migration rate.

That is Total Population Growth Rate = Natural Increase plus Net Migration expressed as a percentage of the total population in the base year.

### **2.1.2 Determinants of Population Size**

The determinants of population size are the variables that influence the size of a country's population. For this study, three main determinants of population size are considered. They include birth rate, death rate, and net migration rate.

#### **i) Birth Rate**

This refers to the number of live births (children born alive) per 1000 of the population. It is calculated by dividing the total number of live births by the mid-year population and then multiplied by 1000.

#### **ii) Death Rate**

This is the number of deaths in a year per 1000 of the population. It is calculated by dividing the number of deaths by the mid-year population and then multiplied by 1000.

Note that birth-rate – death-rate = natural population growth rate.

#### **iii) Net Migration Rate**

Net migration is the difference between the number of persons entering a country (immigrants) and the number of persons leaving a country (emigrants). If the number of immigrants is more than the number of emigrants, the net migration will be positive. On the other hand, if the number of emigrants exceeds the number of immigrants, net migration will be negative. Net migration rate is the difference between number of immigrants and number of emigrants in a year expressed a percentage of the total population.

## **Literature Review**

### **Demographic Transition Theory**

The demographic transition theory, also called the theory of population stages or the theory of population cycle, is a theoretical proposition that explains population change over time. The theory which is based on the actual demographic trends of the developed countries of the world states that, every country passes through different phases of demographic development. It is a generalized description of the changing pattern of mortality, fertility and population growth rates as societies transit from one demographic era to another (Kirk, 1996; Frejka, 2016).

The demographic transition theory was first developed by an American demographer named Frank W. Notestein in the mid-20<sup>th</sup> century. However, it was later refined and expanded upon by other scholars. The theory therefore has three versions. For instance, W. S. Thomson and Frank W. Notestein presented the theory in three stages; Karl Sax's version has four stages while C. P. Blacker's version has five stages. Based on the Blacker's version, the five stages of demographic transition starts with the high stationary stage which is characterized by high birth and death rates, resulting in low population growth rate. This is followed by the early expanding stage marked by high birth rate and high but falling death rate, the resultant of which is rapid population growth rate. The third stage is the late expanding stage. During this stage, there is declining birth rate with more rapidly declining death rate which results in diminishing population growth rate. Following the third stage is the low stationary stage with low birth rate accompanied by an equally low death rate. This leads to a further decline in the growth rate of population. The fifth stage is the declining phase. During this stage, both birth and death rates are low but death rate exceeds birth

rate. Consequently, the population growth rate declines (Kirk, 1996; Wilson, 2002; Jhingan, 2016).

### **Empirical Literature Review**

Adebayo (2023) investigated the impact of migration patterns on demographic trends in Nigeria. The study established that both domestic and international migration has significant impact on Nigeria's population structure and population growth rate. Effiong et al (2022) examined the effect of fertility and income growth on population growth and birth rates in Nigeria for the period 1961-2020. The findings revealed that fertility rate and life expectancy at birth have significant positive impact on population growth rate while per capita income has insignificant positive impact on population growth rate. On the other hand, fertility rate and life expectancy at birth have significant negative impact on birth rate while per capita income has insignificant negative impact on birth rate.

Applying the ordinary least squares (OLS) technique on annual data for the period 1970 to 2017, Okijie and Effiong (2021) found that per capita income, food production index and fertility rate have insignificant positive impact on population growth while crude birth rate has significant positive impact on population growth. Also, social globalization has insignificant negative impact on population growth. Ene et al (2021) examined the determinants of population growth in Nigeria for the period 1980 to 2018. The findings indicated that infant mortality rate and life expectancy at birth have insignificant negative impact on population growth rate while maternal mortality rate has significant negative impact on population growth rate. On the other hand, per capita income and total fertility rate have significant positive impact on population growth rate. Dao (2021) examined the determinants of total fertility in a sample of 107 developing countries. For the full sample, the result showed that use of contraceptives, per capita gross national income, and female labour force participation rate all have significant negative impact on total fertility while infant mortality and child labour have significant positive impact on total fertility. For a sub-sample of 40 Sub-Saharan African countries, the result showed that infant mortality and child labour have significant positive impact on total fertility while female labour force participation rate has insignificant positive impact on total fertility. On the other hand, use of contraceptives has significant negative impact on total fertility while per capita gross national income has insignificant negative impact on total fertility in Sub-Saharan Africa. In a related study, Adzugbele et al (2020) established that maternal education, income, used of contraceptives, access to health centre, place of residence, age, and age at first birth are the important determinants of fertility among Nigerian women.

Alvarez-Diaz et al (2018) examined the determinants of population growth in 28 sub-regions of the European Union countries for the period 1960-2010. The findings revealed that economic conditions significantly determine population growth while ageing and denser regions have less population growth. Nyoni (2018) found that life expectancy at birth, infant mortality rate, and contraceptive prevalence rate have significant negative impact on population growth rate in Pakistan. On the other hand, unemployment rate and per capita income growth have significant positive impact on population growth rate while total fertility rate has significant positive impact on population growth rate in Pakistan. Azuh et al (2016) in their study on the determinants of population growth in Nigeria, found that GDP per capita and human development index have insignificant negative impact on population growth rate while labour force, infant mortality rate, maternal mortality rate, and infrastructure all have significant negative impact on population growth rate. Olatayo and

Adeboye (2013) established that birth rate and death rate are important determinants of population growth in South-western Nigeria.

From the empirical literature reviewed, it is observed that studies that actually investigated the factors that determine population growth in Nigeria are very few. It is also observed that previous studies on the determinants of population size in Nigeria concentrated on variables such as fertility rate, life expectancy at birth, infant mortality, maternal mortality, per capita income, etc. Our argument is that these variables do not directly influence the growth rate of population. Rather, they indirectly affect the population growth rate through their impact on birth rate and death rate. Hence, joining these variables together with birth rate and death rate in a model may result to the problem of multicollinearity. It is based on this argument that this study identifies birth rate, death rate and net migration rate as the actual determinants of population growth rate in Nigeria.

## Method of Study

### Model Specification

The model used for this study is specified based on the theory of demographic transition and the analytical model used by Okijie and Effiong (2021) which is expressed as follows:

$$PGR = f(GPC, CBR, FPI, IMR, FER, SGL) \dots\dots\dots 1$$

where PGR = Population Growth Rate

GPC = Gross Domestic Product Per Capita

CBR = Crude Birth Rate

FPI = Food Production Index

IMR = Infant Mortality Rate

FER = Fertility Rate

SGL = Social Globalization

f = Symbol of Functionality

The adopted model above was modified so as to allow for the inclusion of the variables of the present study. Hence, the model used for this study is specified in its mathematical form as follows:

$$PGR = f(BTR, DTR, NMIGR) \dots\dots\dots 2$$

where PGR = Population Growth Rate

BTR = Birth Rate

DTR = Death Rate

NMIGR = Net Migration Rate

f = Symbol of Functionality

PGR is the dependent variable while BTR, DTR and NMIGR are the explanatory variables.

The ordinary least squares (OLS) multivariate regression equation based on the mathematical form of the model is expressed as follows:

$$PGR = \beta_0 + \beta_1 BTR + \beta_2 DTR + \beta_3 NMIGR + U \dots\dots\dots 3$$

where  $\beta_0$  is the intercept term,  $\beta_1$ ,  $\beta_2$ , and  $\beta_3$  are the parameter estimates of the explanatory variables while U is the random variable. All the variables are as earlier defined.

### Apriori Theoretical Expectations

Based on apriori theoretical reasoning, the following signs of the parameter estimates are expected.

$$PGR = \beta_0 + \beta_1 BTR + \beta_2 DTR + \beta_3 NMIGR + U \dots\dots\dots 4$$

$$\beta_1 > 0, \quad \beta_2 < 0, \quad \beta_3 > 0$$

The economic implication of the above signs of the parameter estimates is that an increase in birth rate will bring about an increase in the growth rate of the population while an increase in death rate will bring about a decrease in the population growth rate. For  $\beta_3$ , an increase in immigration over emigration (i.e., positive net migration rate) will bring about an increase in population growth rate while an increase in emigration over immigration (i.e., negative net migration rate) will bring about a reduction in the population growth rate.

## **Description of Variables**

### **Dependent Variable**

The dependent variable for this study is population growth rate. It is defined as the annual average change in the size of the population expressed as a percentage of the total population in the preceding year.

### **Explanatory Variables**

#### **i) Birth Rate**

This refers to the number live births per 1000 of the population in a year.

#### **ii) Death Rate**

This is the number of deaths in a year per 1000 of the population in a year.

#### **iii) Net Migration Rate**

This refers to the difference between number of immigrants and number of emigrants in a year expressed as a percentage of the total population.

## **Nature and Source of Data**

The data used for this study are annual time-series data covering the period 1981 to 2023. The data were obtained from secondary sources such as the Central Bank of Nigeria (CBN) annual reports and statements of accounts (various years), National Bureau of Statistics (NBS) demographic statistics bulletins (various years), and the World Bank development indicators (various years).

## **Data Estimation Techniques**

This study made use of time-series data. But the classical least squares technique is based on the implicit assumption that the underline time-series are stationary. However, in real life, many macroeconomic time-series are not stationary (Gujarati & Porter, 2009). There is also the need for the time-series data to be cointegrated. Two or more time-series variables are said to be cointegrated when there exist long-run (equilibrium) relationships among them. Therefore, to account for the time-series properties of the data, the actual estimation procedure was preceded by stationarity test which was conducted using the Augmented Dickey-Fuller (ADF) unit root test. Based on the result of the stationarity test, the autoregressive distributed lag (ARDL) bounds test approach was used to conduct the test for cointegration. Also, the error correction mechanism (ECM) was used to determine the dynamic or short-run behaviour of the variables while the Granger causality test was used to test for the nature and direction of causal relationships between each of the explanatory variables and the dependent variable.

## **Presentation of Results and Discussion of Findings**

### **Descriptive Statistics**

The summary of the descriptive statistics result is reported in table 1.

**Table 1: Descriptive Statistics Result**

	PGR	BTR	DTR	NMIGR
Mean	2.641628	42.27388	16.33353	-0.381372
Median	2.620000	43.02000	17.40700	-0.295000
Maximum	3.050000	46.71600	19.15100	-0.075000
Minimum	2.410000	36.02600	11.89400	-1.725000
Std. Dev.	0.132232	2.879439	2.404883	0.331553
Skewness	0.648451	-0.565497	-0.402080	-2.664083
Kurtosis	3.853473	2.483226	1.496293	9.797530
Jarque-Bera	4.318582	2.770280	5.209827	133.6508
Probability	0.115407	0.250289	0.073910	0.000000
Sum	113.5900	1817.777	702.3420	-16.39900
Sum Sq. Dev.	0.734386	348.2291	242.9053	4.616956
Observations	43	43	43	43

**Source: E-view Output**

The descriptive statistics result in table 1 indicated that the mean values of the variables are 2.641628 percent, 42.27388 percent, 16.33353 percent, and -0.381372 percent for PGR, BTR, DTR, and NMIGR respectively. The standard deviation statistic showed that BTR with a standard deviation value of 2.87943 percent is the most fluctuating or most unstable variable while PGR with a standard deviation value of 0.132232 percent is the most stable or least fluctuating variable. For the skewness statistic, PGR (0.648451) is positively skewed while BTR (-0.565497), DTR (-0.402080), and NMIGR (-2.664083) are negatively skewed. The kurtosis statistic indicated that PGR (3.853473) and NMIGR (9.797530) are leptokurtic since their values are greater than 3. This implies that their distributions have heavier tails relative to normal distribution. On the other hand, BTR (2.483226) and DTR (1.496293) are platykurtic since their values are less than 3. The implication is that they have lighter tails relative to normal distribution.

**Stationarity Test**

The test for stationarity was conducted using the Augmented Dickey-Fuller (ADF) unit root test. The result is presented in table 2.

**Table 2: ADF Unit Root Result**

Variable	ADF Test Statistic (At Levels)	Critical Values		Prob.	ADF Test Statistic (At 1 <sup>st</sup> Diff.)	Critical Values		Prob.	Order of Integration
		1%	5%			1%	5%		
PGR	-0.105307	-3.61054	-2.938987	0.9418	-5.153216*	-3.610453	-2.938987	0.0001	I(1)

BTR	-	-	-	0.74	-	-	-	0.00	I(1)
	0.9908	3.60098	2.93500	77	6.21782	3.6009	2.9350	00	
	82		1		0*	87	01		
DTR	-	-	-	0.87	-	-	-	0.03	I(1)
	0.5297	3.64634	2.95402	27	3.13855	3.6463	2.9540	33	
	92		1		3**	42	21		
NMIG	-	-	-	0.00					I(0)
R	4.6881	3.60098	2.93500	05					
	41*		1						

**Source: E-view Output**

**Note:** \* and \*\* denote rejection of the null hypothesis of unit root at the 1% and 5% levels of significance respectively.

The ADF unit root test result in table 2 revealed that population growth rate (PGR), birth rate (BTR), and death rate (DTR) are stationary at first difference at the 1%, 1% and 5% levels of significance respectively. They are therefore integrated of order one (i.e., I(1)). On the other hand, net migration rate (NMIGR) is stationary at levels at the 1% level of significance. It is therefore integrated of order zero (i.e., I(0)).

**Cointegration Test**

The result of the autoregressive distributed lag (ARDL) bounds test for cointegration is presented in table 3.

**Table 3: ARDL Bounds Test Result**

ARDL Bounds Test  
Sample: 1983 2023  
Included observations: 41

Null Hypothesis: No Long-Run Relationships Exist					
Test Statistic	Value	K	Significance	I(0)	I(1)
F-statistic	24.20729	3	10%	2.72	3.77
			5%	3.23	4.35
			2.5%	3.69	4.89
			1%	4.29	5.61

**Source: E-view Output**

The ARDL bounds test result in table 3 shows that the estimated F-statistic of 24.20729 is greater than the upper bound (I(1)) critical value of 4.35 at the 5% level of significance. This implies that the null hypothesis that no long-run relationships exist is rejected. Hence, there exist long-run (equilibrium) relationships among the variables of the study.

**Estimated Regression Results**

The ARDL estimated short-run and long-run regression results are presented in the upper and lower panels of table 4 respectively.

**Table 4: Estimated Regression Results**

ARDL Cointegrating and Long-Run Form  
Dependent Variable: PGR  
Selected Model: ARDL (2, 1, 0, 0)  
Sample: 1981 2023

Included observations: 41

<b>Cointegrating Form</b>				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PGR(-1))	0.356422	0.090538	3.936719	0.0004
D(BTR)	0.490468	0.082715	5.929646	0.0000
D(DTR)	-0.145241	0.015188	-9.562696	0.0000
D(NMIGR)	0.133472	0.025947	5.144029	0.0000
CointEq(-1)	-0.360485	0.077838	-4.631211	0.0001
Cointeq = PGR – (0.1071*BTR-0.1197*DTR+0.1100*NMIGR+0.1824)				
<b>Long-Run Coefficients</b>				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
BTR	0.107121	0.006351	16.867074	0.0000
DTR	-0.119696	0.007227	-16.561511	0.0000
NMIGR	0.109997	0.023645	4.651994	0.0000
C	0.182369	0.171609	1.062700	0.2954

**Source: E-view Output**

From the short-run regression result in the upper panel of table 4, the error correction term (i.e., CointEq(-1)) turned up with a correct negative coefficient and it is also statistically significant at the 0.05 significance level. The coefficient of the error correction term is -0.360485. This implies that any disequilibrium in the short-run is reconciled to long-run (equilibrium) trend with a speed of adjustment of about 36 percent within one year in the current period. The long-run coefficients in the lower panel of table 4 indicated that birth rate and net migration rate have significant positive impact on population growth rate while death rate has significant negative impact on population growth rate.

**Post-Estimation Tests**

The classical linear regression model (CLRM) is based on certain assumptions. These assumptions need to be verified so as to establish the validity of the estimated short-run regression result. The results and decisions of the post-estimation tests are presented in table 5.

**Table 5: Post-Estimation Tests Results**

Test	Value	Prob.	Decision
Linearity (Ramsey RESET) Test t-Statistic F-Statistic	0.083080 0.006902	0.9343 0.9343	Accept Ho: (Model correctly specified)
Breusch-Godfrey Serial Correlation LM Test F-Statistic	0.354739	0.7041	Accept Ho: (No serial correlation)
Heteroskedasticity (Breusch-Pagan-Godfrey) Test F-Statistic	0.275307	0.6193	Accept Ho: (Residuals have constant variance, i.e., model is homoscedastic)
Normality (Jarque-Bera) Test F-statistic	0.730945	0.693869	Accept Ho: (Data normally distributed)

**Source: E-view Output**

**Note:** For each of the post-estimation tests in table 5, the null hypothesis (Ho) is accepted if the estimated probability value is greater than 0.05.

**Granger Causality Test**

The result of the Granger causality test is presented in table 6.

**Table 6: Granger Causality Test Result**

Pairwise Granger Causality Test

Sample: 1981 2023

Lags: 2

Hull Hypothesis	Obs	F-Statistic	Prob.
BTR does not Granger Cause PGR	41	1.58619	0.2187
PGR does not Granger Cause BTR		5.19136	0.0104
DTR does not Granger Cause PGR	41	2.92006	0.0668
PGR does not Granger Cause DTR		0.11271	0.8937
NMIGR does not Granger Cause PGR	41	5.73153	0.0069
PGR does not Granger Cause NMIGR		6.30894	0.0045
DTR does not Granger Cause BTR	41	6.64978	0.0035
BTR does not Granger Cause DTR		2.20538	0.1249
NMIGR does not Granger Cause BTR	41	4.21575	0.0226
BTR does not Granger Cause NMIGR		1.21655	0.3081
NMIGR does not Granger Cause DTR	41	0.41443	0.6638
DTR does not Granger Cause NMIGR		0.18114	0.8351

**Source: E-view Output****Discussion of Findings****Estimated Long-Run Regression Result**

The estimated long-run regression result in the lower panel of table 4 showed that birth rate turned up with a correct positive coefficient indicating a positive impact of birth rate on population growth rate. Birth rate is also statistically significant at the 0.05 level of significance. In terms of magnitude, one percent increase in birth rate is associated with an average increase of 0.107121 percent in population growth rate. Death rate also displayed a correct negative coefficient and it is statistically significant at the 0.05 significance level. This implies that death rate has significant negative impact on population growth rate. Thus, one percent increase in death rate will on the average, bring about 0.119696 percent reduction in population growth rate. Similarly, the coefficient of net migration rate showed the right positive sign. It is also significant at the 0.05 level of significance. The implication is that net migration rate has a significant positive impact on population growth rate. In other words, during the period under investigation, there was an excess of immigration over emigration, leading to a net positive increase in population growth rate. In terms of size, one percent increase in net migration rate is associated with an average increase of 0.109997 percent in the growth rate of population.

**Estimated Short-Run Regression Result**

From the estimated short-run regression result in the upper panel table 4, population growth rate lagged by one period has significant positive impact on the growth rate of population in the current period. This means that the values of population growth rates in the past

significantly contribute to a rise in the current rate of population growth. In terms of size, one percent increase in the period one lagged value of population growth rate produces an average increase of 0.35622 percent in population growth rate in the current period.

Similarly, birth rate in the current period has significant positive impact on population growth rate. Hence, one percent increase in birth rate is associated with an average increase of 0.490468 percent in population growth rate. Death rate in the current period in the short-run has significant negative impact on population growth rate. One percent increase in death rate is associated with an average decline of 0.145241 percent in population growth rate. Net migration rate in the current short-run period has significant positive impact on population growth rate. One percent increase in net migration rate leads to 0.133472 percent increase in population growth rate on the average.

The estimated short-run regression result also revealed that the error correction variable (i.e.,  $CointEq(-1)$ ) turned with a correct negative coefficient and it is significant at the 0.05 level of significance. The coefficient of the error correction variable is -0.360485. This implies a speed of adjustment of about 36 percent of any disequilibrium in the short-run to long-run (equilibrium) trend of population growth rate within one year in the current period.

### **Granger Causality Test Result**

The estimated Granger causality test result indicated unidirectional causalities from population growth rate to birth rate; from death rate to birth rate; and from net migration rate to birth rate. Also, a bidirectional causality was observed between net migration rate and population growth rate while no causality was found between death rate and population growth rate, and between net migration rate and death rate.

## **CONCLUSION AND RECOMMENDATIONS**

### **Conclusion**

Based on the findings, the study concludes that birth rate and net migration rate contribute significantly to increase in Nigeria's population growth rate while death rate strongly reduces the growth rate of population in Nigeria.

### **Recommendations**

Based on the outcome of the study, the following policy measures are recommended.

- i) There is the need to reduce the birth rate in Nigeria. To this end, there is the need to educate Nigerian couples to have fewer number of children. To achieve this, the National Population Commission (NPC), the National Orientation Agency (NOA), the Ministry of Information and faith-based organisations in the country should embark on a thorough public enlightenment campaigns to educate Nigerian families on the negative economic consequences of bearing many children. Such campaigns should concentrate on the rural areas.
- ii) The government should enlighten the people on the need for and use of contraceptives and other modern family planning techniques. In addition, family planning units should be established in health institutions (especially primary health centres) across the country.
- iii) The National Population Commission should revise the national population policy in line with current demographic and economic realities in the country. Such a national policy on population should stipulate an optimal population growth rate that will be consistent with an optimum per capita income and other welfare indicators in the country.

- iv) There is the need to closely check Nigeria's borders and also adopt other measures to control the number of immigrants into the country through an effective national migration policy.

## REFERENCES

- Abubakar, B. D. (2019). Comparative analysis of national population policy and population control in Nigeria. *Nigerian Journal of Health Promotion*, 12, 130-135.
- Adebayo, E. (2023). Migration patterns and changing demographics of Nigeria. *Journal of Physical Sciences*, 5(1), 13-25.
- Adzugbele, A. S., Chimere, I. O., Ogochukwu, A. C., & Augustine, I. P. (2020). What determines fertility among women in Nigeria? A disaggregated analysis using Poisson regression. *Economics Bulletin*, 40(4), 3046-3060.
- Alimi, O. Y., Fagbohun, A. C., & Abubakar, M. (2021). Is population an asset or a liability to Nigeria's economic growth? Evidence from fm-ols and ardl approach to cointegration. *Future Business Journal*. 7(20), 1-12. <https://doi.org/10.1186/343093-021-00069-6>.
- Alvarez-Diaz, M., D'Hombres, B., Ghisetti, C., Pontarollo, N., & Dijkstra, L. (2018). *The determinants of population growth*. Publication Office of the European Union, Luxemburg.
- Azuh, D., Oluwatoyin, M. A., & Fagbeminiyi, F. F. (2016). The determinants of population growth in Nigeria: A cointegration approach. *The International Journal of Humanities and Social Studies*, 4(11), 38-44.
- Dao, M. Q. (2021). An empirical analysis of the determinants of fertility in developing countries. *Studies in Economics and Econometrics*, 32(1), 42-56. <https://doi.org/10.1080/10800379.2008.12106>.
- Effiong, U. E., Udonwa, U. E., & Ekpe, J. P. (2022). Fertility and population explosion in Nigeria. Does income actually count? *International Journal of Business Management*, 5(7), 42-59.
- Ene, E. E., Nyipeten, I. R., & Ekpe, A. N. (2021). Determinants of population growth in Nigeria. *International Journal of Innovation Research and Advanced Studies*, 8(3), 31-35.
- Frejka, T. (2016). The demographic transition revisited: A cohort perspective. *Max Plank Institute for Development Research (MPIDR) Working Paper*, No. WP2016-012.
- Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics* (5th ed.). McGraw Hill Inc.

- Ingiabuna, T. E., & Uzobo, E. (2016). Population and development in Nigeria: An assessment of the national policy on population and sustainable development. *International Journal of Development and Management Review*, 11, 80-102.
- Jhingan, M. L. (2016). *The economics of development and planning* (41<sup>st</sup> ed.) Vrinda Publications Ltd.
- Kirk, D. (1996). Demographic transition theory. *Population Studies*, 50(3), 361-387. <https://doi.org/10.1080/003247203100149536>.
- Lange, S., & Vollmer, S. (2017). The effect of economic development on population health: A review of the empirical evidence. *British Medical Bulletin*, 121(1), 47-60.
- Mujrai, P., & Rao, L. T. (2022). A critical analysis and evaluation of national population policy. *The Review of Contemporary Scientific and Academic Studies*, 2(2), 1-8.
- National Bureau of Statistics (2020). *Demographic statistics bulletin*. NBS, Demographic Statistics Division.
- National Bureau of Statistics (2022). *Demographic statistics bulletin*. NBS, Demographic Statistics Division.
- National Population Commission and Health Policy Project (2015). *Nigeria's 2004 national policy on population for sustainable development: Implementation assessment report*. Futures Group, Health Policy Project.
- Nyoni, T. (2018). Determinants of population growth: Empirical evidence from Pakistan (1960-2017). *Munich Personal RePEc Archive (MPRA) Paper No. 87522*
- Ochinyabo, S. (2021). Rapid population growth and economic development issues in Nigeria. *Journal of Economics and Allied Research*, 6(3), 1-13.
- Ogunjobi, J. O., Oladipo, R. O., & Oladipo, A. O. (2024). Effect of population growth and human capital development on economic growth in Nigeria. *International Journal of Research and Innovation in Applied Sciences*, 9(7), 19-27.
- Okijie, S. R., & Effiong, U. E. (2021). Ascertaining the optimal population growth threshold for Nigeria's economic development. *International Journal of Research and Innovation in Social Sciences*, 5(6), 43-50.
- Olatayo, T. O., & Adeboye, N. O. (2013). Predicting population growth through births and deaths rate in Nigeria. *Mathematical Theory and Modeling*, 3(1), 96-101.
- Tombofa, S. S., & Anaelo, A. A. (2002). *Principles of economics*. Pearl Publishers.
- United Nations (2005). *Population challenges and development goals*. United Nations, Department of Economic and Social Affairs, Population Division.

Wilmoth, J., Menozzi, C., & Bassarsky, L. (2022). *Why population growth matters for sustainable development*. United Nations Policy Brief No. 130. United Nations, Department of Economic and Social Affairs.

Wilson, G. (2002). *Development economics: A concise text*. Pearl Publishers.

World Bank (2010). *Determinants and consequences of high fertility: A synopsis of the evidence*. Portfolio Review, the World Bank Group.