

ANALYSIS OF THE IMPACT OF POPULATION GROWTH ON NIGERIA'S ECONOMIC GROWTH

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Abstract

The aim of this study was to analyze the impact of population growth on economic growth in Nigeria, using annual time series data from 1970-2018 sourced from World Bank Development Indicator (WDI) database. Four macroeconomic variables were selected based on theoretical and empirical evidence. The study conducted unit root tests such as Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test, Phillips and Perron (PP) test, and augmented Dickey-Fuller (ADF) unit root test to determine the variables' stationarity properties. The test results revealed that the variables under study are properly screened for more advanced statistical regressions. The study employed Autoregressive Distributed Lagged (ARDL) model to examine the short-run and long-run impact of crude birth rate, life expectancy rate, and fertility rate on economic growth in Nigeria. Results opined that despite significant, there exists a negative effect of population growth proxied by crude birth rate, life expectancy rate, fertility rate, and population growth on economic growth in Nigeria. Therefore, the study recommends that policies on education and child building capacity should be formulated and be implemented to enable these policies to translate into the economic progress of the country.

Keywords: *Population growth, Economic Growth, Life expectancy, ARDL, Nigeria, Time series*

Introduction

In the early twenty-first century, the world population had fluctuated around 6 billion, in which developing countries contributed to 80% of the total figure and mostly occur in Asian countries (Pham & Tran, 2011). The fact is that population growth and economic growth always have a close relationship. Over a period of time, the arguments about positive and negative effects of population on economic growth and development are still complicated problems for most of the economists; one of such economists was Thomas R. Malthus (1776-1834) who stated in his model in 1826, that the population level can reduce the output per capita because population grows at a geometrical rate while food production rises at an arithmetic rate so that output growth rate cannot keep the same pace (Pham & Tran, 2011). Another famous economist was Robert M. Solow (1956) who, unlike Malthus, focused on the term, 'population growth rate' instead of the 'population-level'. He stated that an increase in the population growth rate can decline the capital per worker as well as the steady-state output per worker. As a result, higher population growth can be detrimental to productivity and thus, economic growth (Kale 2014). The Nigerian economy over the years has been marred by periodic booms and bursts as reflected in her unsteady and unsustainable economic growth rates. Notwithstanding, Nigeria has remained an oil-rich country,

selling at \$65 per barrel and it is estimated that Nigeria exports 2.2 million barrels a day, making Nigeria become the 13th largest oil-producing nation in the world (World Bank, 2018). However, economic and demographic mismanagement, instability, and political tensions have kept the country from achieving its potentials. The World Bank country director for Nigeria, using World Bank statistics stated that poverty per capita in Nigeria is estimated at 86.9%; 60% of Nigeria's 180 million population is unemployed and that at least 71% of Nigerian youths are unemployed bringing the unemployment rate to 23.1% as at September 23, 2018 (World Bank, 2018). Although, there has been a recent review using a new calculation methodology placing Nigeria's unemployment rate at 6.4% of the nation's 72 million labour force population (Kale 2014). The World Bank also in 2018, ranked the country second poorest leaving only China to take the lead (World Bank, 2018). The Agency showed that Nigeria has a Human Poverty Index of 33.1%, with 7% of the world's 1.2 billion poor persons as Nigerians (World Bank, 2018). From the foregoing, this paper seeks to investigate the impact of population growth on economic growth in Nigeria.

Literature Review

Conceptual Issues

Concept of Population

"A population is the total number of persons at a specified time, living in a particular geographic area or country or in a well-delimited part of a country" (United Nations, 2008 p.23). According to Okafor (2004), the population is a critical factor in the development plans of any civilized society.

Economic Growth

In an attempt to explain the concept, Kuznets, (1973) defined a country's economic growth as the long term rise in her capacity to supply increasingly diverse economic goods to its population (p.55). This growing capacity is based on advancing technology, institutional and ideological advancements that it demands (David, 1994).

Empirical Literature Review

Several types of research have been conducted on the impact of population growth on economic growth as reviewed below. Ogujiloba (2005) attempted to quantify and examine how changes in population dynamics affect household portfolio choices (expenditure on food, monetary transactions, goods and services, and non-cash expenditure) in Nigeria given the fact that Nigeria is going through a demographic transition. Previous efforts to assess impacts of population growth have ignored the household expenditure response which has been far from being definitive on the transmission net effects on household portfolio choices. This study focuses on Nigeria with the aim of overcoming these defects and obtaining reliable information. The study established a link between demographic variables and household expenditure components using the Vector Error Correlation Methodology. Next, the estimated equations are used to project the pattern of the different components of expenditure income based on three population scenarios generated from different assumptions on changes in fertility. The results suggest that population growth in Nigeria can produce significant effects on the economy via the expenditure profiles of households. The results also suggest that other factors such as real per capita income, the ratio of other expenditure categories to total expenditure influence growth of household expenditure components. Oladosu (2001) suggests that the prospects for fertility decline in Nigeria are bright. Trends in the use of contraception between 1990 and 1999 increased. The proportion of women who had birthed in the five years before the survey declined. More women think that they have

the same reproductive goals as their husbands. These are favourable indicators for a future decline. In addition, young women who work away from home are more likely to use contraception; they are more likely to not have had a birth in the five years before data collection and are more likely to have the same desire for children as their husbands. Young women who married at later ages are likely not to have birthed in recent years (at the time of the survey). Shavazi and Jones (2001) explore population dynamics and characteristics of Muslim population to aid deeper understanding of the Muslim world having defined Muslim-majority countries and countries with large Muslim populations, the study explains demographic, social and economic characteristics of Muslim populations, and second, analyze demographic transition in the Muslim world. Population policy in Muslim majority countries was examined. Makinwa and Adebuseye (1991) analyzed adolescent reproductive behaviour in Nigeria using five cities, which are Enugu, Kaduna, Jos, Onitsha, and Zaria as a case study. The findings indicated that the lives of a large segment of Nigeria's youth may be in jeopardy in many ways from early unguarded sexual resulting in unwanted pregnancies, disruption of education, and illegally induced abortions.

Kremer (1993) has empirically confirmed that a larger population was associated with higher population growth rates and faster technological improvement. This technological development is a consequence of population growth, which leads to an increase in labor productivity, per capita income, and improvement in living standards. Nicholas Eberstadt (2011) expresses this conclusion, "population growth is clearly a form of social change; nations and governments that cope poorly with change are unlikely to deal adeptly with the disequilibria that more rapid rates of population growth necessarily bring". Finally, it is noteworthy to state that in more recent times, what has been labeled revisionism Revised' has emerged (Birdsall 2001; Sinding 2009). That Revisionism Revised is well-founded; indeed if anything, it is believed that they seem to be understating the power of their case.

Nwosu, Dike, and Okwara (2014) conducted a study on the effects of population growth on economic growth in Nigeria between the period of 1960 and 2008. The study empirically examined the time series role of population growth on economic growth and how economic growth is affected through population growth. Augmented Dickey-Fuller (ADF) stationarity test combined with Granger Causality and Co-integration tests were adopted for data analysis. Findings revealed that population growth had a significant impact on economic growth, there was a sustainable long-run equilibrium relationship between economic growth and population growth and also there was evidence of unidirectional causality between population growth and economic growth. The researchers concluded that that economic growth formed a significant relationship with population growth and recommended among others that the level of per capita technology should be made to increase as this would lead to better resource utilization in the economy.

Michael, Usang, Nelson, Etim, Onah, and Chukwudi (2014) examined the effect of population explosion on the family standard of living in Calabar, Nigeria. The study applied descriptive statistics and discovered that poor family planning, illiteracy, poverty, ignorance, culture, religion, migration, and urbanization cause population explosion and are influenced by factors like war, disaster, search for jobs and education, polygamy and early marriage, climate change, and inflation. Okwori, Ajegi, Ochinyabo, and Abu (2015) empirically examined the Malthusian population theory in Nigeria from 1982 -2012. The study applied a vector error correction model and the result showed that population growth had no significant impact on economic development in Nigeria. The finding was in line with the works of Dao (2012) and Thirwal (1973). In other words, the Malthusian population theory was relevant when applied to the Nigerian economy.

Klaudia, Lorena, and Fjona (2015) studied population, economic growth, and development in the emerging economies for a period of twenty-four (24) years (1990-2014) with the aim of identifying the demographic factors that influence economic growth. Analysis of variance and regression analysis of the log-log model with Ordinary Least Square (OLS) technique was adopted for data analysis. Findings revealed that: i). there was a positive correlation between total population and economic growth has given that when population growth, it translated into an increase of participation in the workforce; ii). There was a positive correlation between increased birth rates and economic growth because growth rates of fertility led to population growth; and iii). There was also a negative relationship between urban population growth and economic growth because population growth in urban areas was done without proper planning and led to a reduction of quality of life. The study concluded amongst others that developing countries are unable to afford an increase of such a rapid population (as is currently happening and is expected to happen in the coming years) which would negatively affect the quality of life and slow economic growth.

Mohsen and Chua (2015) examined the effects of trade openness, investment, and population on the economic growth in Syria from 1980-2010. The study applied the cointegration test and Granger causality test and the result indicated a). bidirectional short-run causality relationships between trade openness, investment, population, and GDP. b). bidirectional long-run causality relationships between investment, population and GDP, and c). unidirectional long-run causality relationship running from trade openness to GDP. The study results indicated that the population had the biggest effect on the GDP, thus it was suggested improving the quality of the human capital in the country. The paper also noted that it was essential for the Syrian Government to upgrade the quality of human capital in the country by improving the quality of the education system, health services, the standard of living, and the quality of life.

Theoretical Literature

The population optimistic view put forward by the renowned Danish economist- Ester

Boserup in 1981. This economist noted that contrary to the negative relationship between population and economic growth acclaimed by the Malthusian theorists, a rapidly growing population will impact positively on an economy because a rapidly growing population will make room for economies of scale as well as the promotion of technological and institutional innovations. The followers of this theory strongly counter the Malthusian's position of inevitable future food shortage (resulting from population expansion) by explaining that advancement in technology will positively influence productivity thus neutralising any potential threat of a growing population on food supply. These theorist's belief in technology as a way out was also backed by Simon who noted that humans are only weights to earth without skill, science, and technology therefore output/productive capacity can be expanded using own knowledge, fore-thought and skills (Aidi, Emecheta& Ngwudiobu, 2016).

Methodology

Measurement and Sources of Variables

The measurements of the variables used in this study are presented in Table 1.

Table 1: Measurement of Variables and Sources

Variable	Definition/measure	Sources of Data
GDPGR _t	Gross Domestic Product growth rate. It is measured in percentage	World Development Indicator (WDI) database
CBR _t	CBR is measured by the crude birth rate per 1,000 in Nigeria, it is measured in percentage.	World Development Indicator (WDI) database
LER _t	Life expectancy rate. It is measured in ratios	World Development Indicator (WDI) database
FER _T	Fertility rate, it is measured in ratios	World Development Indicator (WDI) database
POPG	Population Growth. It is measured in percentage	World Development Indicator (WDI) database

Source: Prepared by the author (2019)

Model Specification

The model used in this study followed the work of Ogunleye, Owola, and Mubarak (2018), which explored the effect of population growth on the economic growth of Nigeria over the period of 1981 to 2015. This study adapted the empirical specification to capture the specific objectives of the study; the model presented by Ogunleye, Owola, and Mubarak (2018), was as follows;

$$GDPGR_t = \beta_0 + \beta_1 CBR_t + \beta_2 FER_t + \beta_3 LER_t + POPG_t + U_t \quad (3.1)$$

Where;

GDPGR = Gross Domestic Product Growth Rate

FERT = Fertility Rate

CBR = Crude Birth Rate

LER= Life Expectancy Rate

POPG= population growth

Model Estimation Techniques and procedure

Autoregressive Distributed Lagged (ARDL) Model

To capture the long run and short-run dynamic relationship population growth and economic growth in Nigeria, the study employed an autoregressive distributed lag approach developed by Pesaran, M. H., Y. Shin, and Smith R. P. (1997). This approach is also known as bounds testing, and has certain econometric advantages compared to other traditional cointegration approaches: It solves the endogeneity problems and the inability to test hypotheses on the estimated coefficients in the long term associated with the Engle-Granger method (Engle and Granger, 1987). It also estimates long-as well as short-term parameters separately in a single model. The ARDL bounds testing approach is applicable whether the variables are purely I(0), purely I(1), or

fractionally integrated. It is found that the small sample properties of the bounds testing approach are far superior to that of multivariate cointegration (Narayan, 2005). The following unrestricted error correction regressions of Eq. (3.3) were estimated with the GDP growth rate as the dependent variable for Nigeria:

$$\Delta GDPGR_t = \theta_0 + \sum_{i=1}^p \beta_1 \Delta GDPGR_{t-i} + \sum_{j=0}^q \beta_2 \Delta CBR_{t-j} + \sum_{m=0}^r \beta_3 \Delta LER_{t-m} + \sum_{n=0}^s \beta_4 \Delta LER_{t-n} + \sum_{v=0}^u \beta_5 \Delta FER_{t-v} + \beta_6 GDPGR_{t-1} + \beta_7 CBR_{t-1} + \beta_8 LER_{t-1} + \beta_9 FER_{t-1} + \beta_{10} POPG_t \quad (3.2)$$

Result and Discussions

Unit Root Test

A time series unit root test was conducted to determine the series of properties of data collected. The test is essential as it revealed the stationarity status of the series data. This is because when series data are non-stationary and regression is conducted, it will lead to a problem of spurious regression. This is indicated by high values of R^2 with low values of Durbin-Watson statistics; so after conducting the test, some variables are not stationary at level, i.e. $I(0)$ and as such, made stationary by carrying out the necessary levels of differencing to achieve stationarity (Dimitriou & Stephen, 2007). The study applied the commonly used Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test, Phillips and Perron (PP) test and augmented Dickey-Fuller (ADF) unit root tests to determine the variables' stationarity properties.

The results of the three unit-root tests in Table 2. suggest that there was strong evidence that the null hypothesis of the presence of unit roots could not be rejected in level form for all the variables with the exception of GDPGR and POPG which was stationary at level. In other words, the results suggested that all the series in the level were non-stationary with the exception of GDPGR.

Table 2 Unit Root Tests Results

LEVEL					
Test/Variables	GDPGR	CBR	POPG	LER	FER
ADF	-5.569828 (0.0000)	2.393298 (1.0000)	-3.2564 (0.0000)	2.385431 (1.0000)	2.906597 (1.0000)
PP	-5.581005 (0.0000)	2.168138 (0.9999)	5.6598 (0.0000)	0.144104 (0.9659)	1.557514 (0.9992)
KPSS	0.123449	0.883052	2.3641	0.826423	0.831609
FIRST DIFFERENCE					
Test/Variables	CBR	LER	FER		
ADF	-5.415930 (0.0325)	-3.877718 (0.0219)	-4.772494 (0.0020)		
PP	-5.415930 (0.0325)	-3.877718 (0.0219)	-5.416557 (0.0433)		
KPSS	0.116473	0.192057	0.618640		

Source: Author's computation using E-views. Version 10 (2019).

As observed from the results obtained in Table 2, it seemed necessary to test the stationarity of the variables at their first difference since the variables were not stationary at levels with the exception of GDPGR and POPG which was stationary at levels. The results suggest after differencing the series, the null hypothesis of non-stationarity in each of the series could be rejected at 1% level of significance. Thus, the series were integrated of different orders, that is, there was a mixture of I(1) and I(0) variables.

ARDL Long Run Regression Analysis

Having established that there is a long-run relationship between the variables using the ARDL bounds testing approach to cointegration, the next step was to estimate the long-run relationship between the cointegrating variables. Table 3 presents the long-run estimates of the variables.

Table 3 ARDL Long-Run Estimates

Dependent Variable: GDPGR				
Variables	Coefficient	S.E	t-values	P-Value
POPG	25.36879***	35.2478	5.54111	0.0000
CBR	-23.70034***	8.075786	-2.934740	0.0066
FER	-14.7075**	64.71070	-2.251676	0.0324
LER	17.22522**	7.601416	-2.266054	0.0314
C	903.1297*	561.4379	1.608601	0.1189

*Note****, **, and * represents statistical significance at 1%, 5% and 10% levels, respectively.

Source: Author's computation using E-views. Version 10 (2019).

The result shows the impact of crude birth rate (CBR), life expectancy rate (LER), and fertility rate (FER) on gross domestic product growth rate (GDPGR). From the results, the sign of the coefficient of crude birth rate (CBR) is negative and statistically significant at 1%. The coefficient of -23.70034 implies that over the study period, an increase in CBR by 1% Would lead to an approximately 23% decrease in growth rate. Theoretically, this conforms with the Malthusian theory where an increase in population would lead to a decline in fixed resources. This finding implies that an increase in birth rate means a corresponding decrease in the economic growth rate of Nigeria. However, the finding is not in line with the Optimistic theories which predict that increase in population will lead to growth, which implies that increasing birth rate will eventually decrease the population of the economy and lead to slow economic growth. The finding of this study is consistent with the work of Okwori, Ajegi, Ochinyabo, and Abu (2015) who empirically examined the Malthusian population theory in Nigeria from 1982 -2012. The study applied a vector error correction model and the result showed that population growth had no significant impact on economic development in Nigeria.

Also, the sign of the coefficient of fertility rate (FER) is negative and statistically significant at 5%. The coefficient of 14.7075 implies that over the study period and an increase in FER by 1% would lead to an approximately 14% decrease in GDPGR. Also, the sign of the coefficient of life expectancy rate (LER) is positive and statistically significant at 5%. The coefficient of 17.22522

implies that over the study period and an increase in LER by 1% will lead to an approximately 17.2% increase in GDPGR. This finding implies that an increase in the life span of individuals means a corresponding increase growth rate of Nigeria and is consistent with the studies of Hami (2016) which found that life expectancy had a significant positive effect on economic growth in Iran. The sign of the coefficient of population growth (POPG) is also positive and statistically significant at 1%. The coefficient of 25.36879 implies that over the study period and an increase in POPG by 1% will lead to an approximately 25.3% increase in GDPGR.

ARDL Short-Run Regression Analysis

After analyzing the long-run relationship between the variables, the study further estimated the short-run relationship between the variables. The short-run results are illustrated in Table 4 with delta sign (Δ) showing the changes that affect the dependent variable.

Table 4 ARDL Short-Run Estimates

Dependent Variable: Δ(GDPGR)					
Variables	Coefficient		S. E	t-values	P-Value
Δ(POPG)	5.3658***	0.254811	0.254687	0.0000	
Δ(CBR)	-0.222222***	0.097288	-2.284164	0.0301	
Δ(FERT)	-0.842804**		0.205805	-4.095168	0.0010
Δ(LER)	22.42419**		6.380813	3.514316	0.0031
ECT _{t-1}	-0.842804*	0.154269	-5.463221	0.0001	
R-squared		0.849600			
Adjusted R-squared		0.793200			
Durbin-Watson stat		2.429815			
F-statistic		9.347105			

Note***, **, and * represents statistical significance at 1%, 5% and 10% levels, respectively.

Source: Author's computation using E-views. Version 10 (2019).

The F-statistics which measures the overall significance of the regression model provides a test of the null hypothesis that the true slope coefficients are simultaneously zero. The computed F-statistics (9.347105) which is greater than the critical F (2.76) at 5% level of significance indicates the model has a robust fit and is statistically significant. This means there is a relationship between the dependent variable and the independent variables. The R^2 measures the goodness of fit of the estimated model. From the ARDL regression result, the R^2 is 0.849600 while the adjusted R^2 is 0.793200. This means that the model explains about 85% of the total variation in GDPGR explained by the explanatory variables.

From the results, just like the long-run estimates, the sign of the coefficient of Crude Birth Rate (CBR) is negative and statistically significant at 1%. The coefficient of -0.222222 implies that over the study period and an increase in CBR by 1% will lead to an approximately 0.2% decrease in growth rate in the short-run. Theoretically, this conforms with the Malthusian theory where an increase in population will lead to a decline in fixed resources. This finding implies that an increase

in birth rate means a corresponding decrease growth rate of Nigeria. The finding of this study is consistent with the studies of Okwori, Ajegi, Ochinyabo, and Abu (2015).

Also, the sign of the coefficient of fertility rate (FER) is also negative and statistically significant at 5%. The coefficient of -0.842804 implies that over the study period and an increase in FER by 1% will lead to approximately 0.8% decreases in GDPGR. This conforms with the Malthusian theory where an increase in population will lead to a decline in fixed resources. This finding implies that an increase in fertility rate (FER) decreases the growth rate of Nigeria. The findings are not in line with the Optimistic theories which predict that increase in population will lead to growth. The finding of this study is consistent with the studies of Lachisa and Yirdaw (2012); Ogunleye, Owola, and Mubarak(2018). Also, the sign of the coefficient of life expectancy rate (LER) is positive and statistically significant at 5%. The coefficient of 22.42419 implies that over the study period and an increase in LER by 1% will lead to approximately 22.4% increases in GDPGR in the short-run. This finding implies that an increase in the life span of individuals means a corresponding increase growth rate of Nigeria. The finding of this study is consistent with the studies of Hami, 2016; Manfred and Ngangue, 2015. The coefficient of population growth (POPG) is positive and statistically significant at 1%. The coefficient of 5.3658 implies that over the study period and an increase in POPG by 1% will lead to an approximately 5.3% increase in GDPGR. The estimate of ECT_{-1} term is negative and significant at 1% level corroborating the proven long-run association between gross domestic product growth rate (GDPGR), crude birth rate (CBR), life expectancy rate (LER), the fertility rate (FER) and population growth (POPG) as expected. The estimate of the ECM_{t-1} term is -0.842804, which implies that the deviations from the short-run towards the long-run are corrected by 84.3% each year and it would take almost one year and two months to reach the stable long-run equilibrium path in the level of growth rate model in case of Nigeria. This implies that for any disequilibrium in the system, the system will automatically adjust itself back to the equilibrium after a year and two months.

Conclusion and Recommendations

The study employed Autoregressive Distributed Lagged (ARDL) model to examine the short-run and long-run impact of population growth on economic growth in Nigeria. The population growth indicators (crude birth rate, life expectancy rate, and fertility rate) were selected based on theoretical and empirical evidence. The study made use of annual data series dating from 1970 – 2018, sourced from the World Bank Development Indicator (WDI) database. Results show that despite significant, there exists a negative effect of population growth proxied by crude birth rate, life expectancy rate, fertility rate, and population growth on economic growth in Nigeria. Therefore, the study recommends that policies on education and child building capacity should be formulated and be implemented to enable these policies to translate into the economic progress of the country.

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