



Effect of population growth on economic growth in Nigeria

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ABSTRACT

This research explored the effect of population growth on the economic growth of Nigeria over the period of 1994 to 2019. Time Series data on gross domestic product (GDP), mortality rate, fertility rate, and immigration rate, were obtained from the Central Bank of Nigeria (CBN) and world development indicators. This study utilized the co-integration and vector error correction model to analyse the data. The findings of the study revealed that mortality rate has a negative significant effect on GDP in Nigeria's perspective, while it can be concluded that fertility rate has a significant positive effect on GDP. International migration (IM) has a positive effect on economic growth in Nigeria. The study recommends that the Nigeria government should ensure that Nigeria's rising population should be channeled into areas of the economy where they may be fully, effectively and efficiently utilized in bringing about high rates of economic growth for the country. In addition, the Nigeria government should increase access to affordable health care services so as to reduce death rates in order for Nigeria to achieve increased economic growth.

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INTRODUCTION

In the past decades, agriculture appeared to be the major pre occupation of the people, consequently, production levels increased as a result of population growth. There was the notion that more people translated to greater productivity and economic well-being, because more workers or labourers working efficiently would most likely improve productivity and the overall output of the nation (Tartiyus et al., 2015).

The importance of the relationship between population growth and economic development has been recognized by the development economists. As Dawson and Tiffin (2008) put it: "The relationship between population growth and economic development has long been thought to be fundamental to our understanding of less developed countries (LDCs). However, there is no consensus whether population growth is beneficial or detrimental to the economic growth in the developing countries.

According to Thirlwall (1994), "The relationship between population growth and economic development is a complex one, and the historical evidence is ambiguous, particularly concerning, which is the cause, and the effect". In those developing countries where the relationship between population growth and economic performance could be described as *positive*, the demographic trends stimulate economic development and promote a rise in living standards. This is because the population growth encourages competition in business activities and, as the country's population grows, the size of its potential market expands as well (Todaro and Smith, 2011). The expansion of the market, in turn, encourages entrepreneurs to set up new businesses. Quite a number of population economist, have stressed the positive side of population growth and distinguished human beings as the vital and most essential element for economic development (Kuznets, 2007).

As Easterlin (2009) puts it, "The ultimate resource is people – skilled, spirited, and hopeful people who will exert their wills and imaginations for their own benefit, and

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inevitably they will benefit not only themselves but the rest of us as well”.

Some studies, however posit that the relationship between population growth and economic performance of a country can be described as *negative*, while Aidi et al. (2016) conclude that no causality exists between population growth and economic growth.

Population increase has become an impediment to a lot of countries' economic development. This is because the rapid expansion of population increases dependency burden (that is, the number of people who are considered to be economically unproductive, such as children and elder people). The negative views on the population growth have been prevailing over the positive opinions since Thomas Malthus warned about the danger of “over-population” (Malthus, 1798). Kelley and Schmidt (1996) argued that “Pessimism about the economic impacts of population has dominated the thinking of population analysts since the original alarmist treatise by the Reverend Thomas Malthus was published over two centuries ago”.

Economic reforms of the past decade, previously hindered by years of mismanagement have put Nigeria back on track towards achieving its full economic potential. Nigerian GDP at purchasing power parity (PPP) has almost tripled from \$170 billion in 2000 to \$451 billion in 2012. Correspondingly, the GDP per capita doubled from \$1400 per person in 2000 to an estimated \$2,800 per person in 2012 (Easterlin, 2009).

Nigeria is one of the fastest growing countries in the world with a population growth rate (POP) of about 2.44% as at 2016 according to the Central Bank of Nigeria. The most populous country in Africa which is endowed with wide range of natural resources, also accounts for one in five of Sub-Saharan Africa's people. Nigeria's population according to the National Population commission as at 2016 was 182.2million. Even though, Nigeria's high POP which is not peculiar to Nigeria but is a significant feature of a developing country, is set to increase even more as the years go by. This population increase is likely to have implications for Nigeria's economic growth as it affects a whole range of socio-economic variables. This study will therefore examine the effect of population growth on Nigeria's economic growth.

Objective of the study

The broad objective of this research work is to establish the effect of population increase on GDP in Nigeria. The specific objectives are;

- i. To ascertain the magnitude of effect of population growth on GDP in Nigeria;
- ii. To determine whether long run relationship exist between population growth and GDP in Nigeria.

LITERATURE REVIEW

Conceptual review

Population growth

Population growth is the increase in the number of individuals in a population. Global human population growth amounts to around 83 million annually, or 1.1% per year. The global population has grown from 1 billion in 1800 to 7.616 billion in 2018. It is expected to keep growing, and estimates have put the total population at 8.6 billion by mid-2030, 9.8 billion by mid-2050 and 11.2 billion by 2100. Many nations with rapid population growth have low standards of living, whereas many nations with low rates of population growth have high standards of living. Population growth is the summary parameter of trends in population abundance (Macunovich, 2000). It tells us the increasing, and how fast they are changing. Population growth describes the per capita rate of growth of a population, as the factor by which population size increases per year (Furuoka, 2005).

Rapid population growth in Nigeria is equally associated with unemployment with figures ranging from 17 percent per annum for the entire population to 60 percent for the youths because job opportunities are fewer than the number seeking for them, and stagnating economic performance because a large proportion of available resources is consumed instead of being invested to generate growth (Federal Republic of Nigeria, 2004b).

In addition, it poses continuous pressure on resource, particularly on agricultural land. For instance, due to high density of people in the Eastern states as much as 53 percent of the farming populations cultivate less than 0.4 hectares in a given year and in the more congested areas of those states most farmers cultivates only 0.2 hectares per year. The result is fragmentation of farmlands and their subdivision into smaller plots to accommodate the growing farming populace. With time, the small plots would become untenable for even subsistence farming, forcing those concerned to move into marginal soils, where greater degradation takes place with attendant reduction in agricultural output (Akinbode and Madu, 2005).

The application of modern farming techniques and fertilizers could assuage this problem, but unfortunately as a capital deficient country, the traditional methods of farming dominate agricultural practices in Nigeria.

International migration (IM)

IM involves people crossing state boundaries and staying in the host state for a minimum length of time. Migration occurs for many reasons. The overwhelming majority of people migrate internationally for reasons related to work, family and study – involving migration processes that

largely occur without fundamentally challenging either migrants or the countries they enter.

In contrast, other people leave their homes and countries for a range of compelling and sometimes tragic reasons, such as conflict, persecution and disaster. While those who have been displaced, such as refugees and internally displaced persons (IDPs), comprise a relatively small percentage of all migrants, they are often the most in need of assistance and support. According to Klasen et al. (2007), the terms "international migration" and "international migrant" are different but often conflated and used interchangeably. IM is the process of moving from one country to another. It involves action. In contrast, a "migrant" is a person described as such for one or more reasons, depending on the context. While in many cases, migrants do undertake some form of migration, this is not always the case. In some situations, people who have never undertaken migration may be referred to as migrants – children of people born overseas, for example, are commonly called second or third-generation migrants.

While there are several different potential systems for categorizing international migrants, one system organizes them into nine groups: temporary labour migrants; irregular, illegal, or undocumented migrants; highly skilled and business migrants; refugees; asylum seekers; forced migration; family members; return migrants; and long-term, low-skilled migrants. These migrants can also be divided into two large groups, permanent and temporary. Permanent migrants intend to establish their permanent residence in a new country and possibly obtain that country's citizenship. Temporary migrants intend only to stay for a limited periods of time; perhaps until the end of a particular program of study or for the duration of their work contract or a certain work season. Both types of migrants have a significant effect on the economies and societies of the chosen destination country and the country of origin (Klasen et al., 2007).

Theoretical review

Models of economic growth proposed by different scholars have identified various theories that explain the relationship between population growth and economic growth. These include the liberal theory, the Marxist theory, the Malthusian theory, the Harrod and Domar (2003) model, Rostow's stages of Growth model, Endogenous Growth theory and the Romer model.

However, some of these theories were used for the purpose of this study.

Endogenous growth theory

The endogenous growth theory argues that economic growth is generated by forces within a system rather than

external forces. It specifically argues that economic growth is a result of policies, internal processes and investment in human capital. Economic growth of a country therefore on the basis of endogenous growth is on account of government policies promoting innovation, investment in human capital and acquisition of knowledge which constitutes internal technology driving economic growth. In the context of the present study therefore, Nigeria government policies on population growth controlling population growth through birth rates and death rates, will affect achievement of significant levels of economic growth of Nigeria. Hence, the endogenous growth theory is appropriate as the framework of the present study (Romer, 1994).

Empirical review

According to Aguirre (1999), there are many groups taking part in the current population debate. All approach the question of population from very different points of view and with different motivations.

Empirical studies which have used cross-country data to try and evaluate these claims, have however, found little evidence to support either argument. Once the effects of initial income, education and other determinants of growth are taken into account, population growth is found to have a negligible effect on growth of GDP (Bloom and Freeman, 2006). This gave rise to the population neutralist revisionist perspective, which held that demography was not a significant factor in the economic growth process. This view was irresponsible for the tenuous position population variables have recently occupied in studies of economic growth.

Adewole (2012) examined effect of population on economic development in Nigeria from 1981 to 2007 using ordinary least square (OLS) method of analysis. The result revealed that population growth exert positive and significant effect on economic growth measured as per capita income (PCI) and real gross domestic product (RGDP) in Nigeria between 1981 and 2007.

Ogunleye et al. (2018) explored the effect of population growth on the economic growth of Nigeria over the period of 1981 to 2015. Using the OLS regression, their findings of the study showed that population growth has a positive and significant effect on economic growth of Nigeria, while fertility was negative and significant for economic growth in Nigeria. Exchange rate and crude death rate are however insignificant for economic growth of Nigeria.

However, Onwuka (2006) has a contrary view, from his study which evaluated the impact of growing population on economic growth in Nigeria between 1980 and 2003 using OLS regression model. The empirical result showed that negative relationship existed between population growth and economic growth during the period considered.

The study by Nwosu et al. (2014) can be regarded as

one of the most comprehensive studies on the relationship between population growth and economic development. This model, which utilized time-series data in Nigeria. The results obtained from the simulation showed that in the short – run, a reduced rate of population growth would bring about a higher rate of per capital income. However, it must be noted have that these results did not consider the impact of migration especially, from the rural and the urban areas.

Ogujiliba (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. The study focused 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 (VECM) (Engle and Granger, 1987). 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 suggested that population growth in Nigeria can produce significant effects on the economy via the expenditure profiles of households. The results also suggested that other factors such as real per capital income, ratio of other expenditure categories to total expenditure influenced growth of household expenditure components.

RESEARCH METHODOLOGY

The descriptive and inferential statistics was used in addition in order to build strong conclusions about the impact of population growth on GDP in Nigeria (proxy of economic growth). The study used figures, tables and functions for data presentation.

Annual quantitative time series secondary data from 1994-2019 (25 years) was used for the analysis. The data on three economic variables was used namely the GDP, POP and IM. The data was obtained from relevant government agencies, National Bureau of Statistics (NBS) and World Bank Indicators.

Model specification

The following mathematical model was developed to analyze the relationship between population growth and GDP in Nigeria using POP, IM as the independent variables and regressed against the dependent variables

RGDP used as proxy for GDP of Nigeria.

This study employed the model specified below:

$$Y_{it} = \alpha_{it} + \beta_2 POP_{it} + \beta_3 IM_{it} + \epsilon_{it} \tag{1}$$

Where Y represents RGDP a; α , the constant term; POP, population growth rate; IM, international migration; β , the coefficient of the function; ϵ , error term.

Since RGDP is the proxy to be used in measuring GDP in Nigeria. In this study, the model will be modified as follows:

$$RGDP_{it} = f(POP_{it}, IM_{it}) \tag{2}$$

$$RGDP_{it} = \alpha + \beta_2 POP_{it} + \beta_3 IM_{it} + \epsilon_{it} \tag{3}$$

Where μ_i is the Error term or other variables that could have lent further explanation to the explained variables but are not included in the model and is assumed to be normally distributed in zero and constant variance.

In consonance with economic theory, it is expected that the level of fertility rate, mortality rate, and IM to a large extent, determine the level of GDP of a country. All things being equal, a *priori* intercept and the slope of the coefficients are expected to have positive signs. Thus, the *a priori* expectation may be denoted mathematically as: > 0 . The numerical values of the parameters were estimated by the use of OLS techniques based on econometric computation. To determine the relevant hypothesis, estimates were evaluated for statistical significance based on the relevant statistics of regression output. The explanatory power of the model as a measure of goodness of fit is then decided.

$$\alpha_{it} + \beta_2 POP_{it} + \beta_3 IM_{it} + \epsilon$$

DATA ANALYSIS AND PRESENTATION

A combination of co-integration and error correction modeling through regression was adopted in this research. The choice of these econometric techniques is based on their ability to ascertain stationary and test for causality among the variables. The analysis of data was conducted using E-Views statistical package Version 9.0.

Time series diagnostic tests were carried out to ensure that the model satisfies the classical linear regression model assumptions. The data was subjected to diagnostic tests notably normality of the disturbance term and functional form misspecification, stationary, serial correlation, multicollinearity and heteroscedasticity. These tests are meant to verify whether the data are normally distributed, stationary and have no mutual correlation among the independent variables and thereafter used it in

Table 1. Descriptive statistics of RGDP, POP and IM.

Var	Max	Min	Median	Mean	Std. dev.	Jarque- Bera	Prob	Skewness	Kurtosis
RGDP	2551160	17566	244351	622783.6	719336.6	9.710	0.0078	1.216	3.471
POP	80567	463	7655	21004.61	24770.66	6.907	0.0316	1.040	2.812
IM	272264	1176	18499.5	50551.24	66173.38	30.99	0	1.783	5.619

Table 2. Unit root test at first difference.

Variable	ADF	1%	5%	Decision	
POP	-5.624120	-3.626784	-2.945842	Reject	H0
RGDP	-4.349471	-3.626784	-2.945842	Reject	H0
IM	-5.627301	-3.626784	-2.945842	Reject	H0

regressions without fear of getting spurious results.

Data analysis results

Tables 1 and 2 shows the unit root test for stationary using Augmented Dickey-Fuller. The result shows that all the variables (GDP, POP and IM) are stationary at first difference. Since the t-statistics are greater than the critical values at 1 and 5% level of significance in absolute term. We therefore conclude that all variables are not characterized by unit root problem and accept the hypothesis that says POP and IM, and RGDP have no unit root problem (Phillips and Perron, 1988).

Diagnostic test

Time series data is associated with several problems which require investigation to avoid spurious results upon application of the OLS method of estimation. Primarily, the OLS method assumes serial uncorrelation, correct model specification, homoscedastic error term and absence of correlation between the error terms and the regressors. If these assumptions are violated, the estimated parameters would not meet the statistical threshold. Tests carried out on the data included the normality test, unit root test, multicollinearity test, serial correlation test and heteroscedasticity test (Tables 2, 3, and 4).

Stationarity test

When time series data is non-stationary and used for analysis, it may give spurious results which cannot be used for any meaningful inferences, since estimates obtained

from such data will possess non constant mean and variance. Moreover, if the data is not stationary, the value of R-squared is high and this makes it difficult to determine the relationship between the variables. Because this study used time series data, it was important to establish the stationary of the data. The variables are therefore tested for unit root and in its presence differencing is done to alleviate the problem. However, this leads to loss of some fundamental long run information hence biased solutions and this is corrected through Augmented Dickey Fuller Test (Dickey and Fuller, 1979).

Testing for multicollinearity

Multicollinearity among the independent variables implies that they are perfectly correlated (Table 5). If the explanatory variables in the model are perfectly linearly correlated, the parameters of the model become indeterminate and the method of OLS breaks down. This violation is not a problem of the model or the disturbance term and therefore does not affect the BLUE properties of the OLS estimates. In any practical context, the correlation between explanatory variables will be non-zero, although this will generally be relatively be in line in the sense that a small degree of association between explanatory variables will almost always occur but will not cause too much loss of precision. However, a problem occurs when the explanatory variables are very highly correlated with each other.

Table 6 under diagnostic test shows multicollinearity test between independent variables. The VIF is less than 10, meaning that the variables are poorly correlated with each other. Therefore, there is no multicollinearity among the independent variables. So it appropriate to use the independent variables simultaneously in order to run the

Table 3. Serial correlation results (Breusch-Godfrey serial correlation LM test).

F-statistic	0.338161	Prob. F(2,30)	0.7158
Obs*R-squared	0.815741	Prob. Chi-Square(2)	0.6651

Table 4. Heteroscedasticity test (Harvey).

F-statistic	0.982374	Prob. F(4,32)	0.4310
Obs*R-squared	4.046574	Prob. Chi-Square(4)	0.3997
Scaled explained SS	5.379728	Prob. Chi-Square(4)	0.2505

Table 5. Cointegration test results.

Date: 03/03/2020; **Time:** 09:22; **Sample:** 1994-2019; **Included observations:** 34 after adjustments; **Trend assumption:** Linear deterministic trend; **Series:** RGDP POP IM; **Lags interval (in first differences):** 1 to 2.

Unrestricted cointegration rank test (trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical value	Prob.**
None *	0.803382	123.3298	69.81889	0.0000
At most 1 *	0.590193	68.02905	47.85613	0.0002
At most 2 *	0.525285	37.69870	29.79707	0.0050
At most 3	0.200771	12.36730	15.49471	0.1402
At most 4 *	0.130325	4.747624	3.841466	0.0293

Unrestricted cointegration rank test (maximum eigenvalue)				
Hypothesized		Max-eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical value	Prob.**
None *	0.803382	55.30072	33.87687	0.0000
At most 1 *	0.590193	30.33035	27.58434	0.0216
At most 2 *	0.525285	25.33140	21.13162	0.0121
At most 3	0.200771	7.619677	14.26460	0.4187
At most 4 *	0.130325	4.747624	3.841466	0.0293

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level; max-eigenvalue test indicates 3 cointegrating equation(s) at the 0.05 level; Unrestricted Cointegrating Coefficients (normalized by b'S11*b=I).

*Denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values.

regression model since there is no multicollinearity problem (Gujarati, 2003).

DISCUSSION OF FINDINGS

The results from the Error Correction Model and also the OLS regression model showed that, international immigration has positive significant relationship with economic growth (Tables 7 and 8). Similarly, POP has a positive significant relationship with GDP. Meaning that there exists both long run and short run positive

relationship between international immigration rate and GDP; and also between POP and GDP.

This implies that population growth has a positive relationship with economic growth in Nigeria. The R-squared of 0.786413 and indicates that the model is a good fit, and the independent variables explain 78 % of changes in GDP.

Conclusion

From the findings it can be concluded that international

Table 6. Diagnostic tests (variance inflation factors).

Date: 03/03/2020; Time: 09:22; Sample: 1994-2019; Included observations: 25; POP , population growth rate; IM , international migration.			
Variable	Coefficient	Uncentered	Centered
	Variance	VIF	VIF
C	3.92E-05	1.001297	NA
D(FR)	0.000729	1.259000	1.258958
D(IM)	0.001710	1.059275	1.058904
D(MR)	0.002341	1.188650	1.188482
U(-1)	0.027970	1.020291	1.019554

Table 7. Error correction model.

Dependent variable: RGDP; Method: Least Squares; Date: 03/03/2020; Time: 08:55; Sample (adjusted): 1994-2019; Included observations: 36 after adjustments.				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001232	0.006264	-0.196625	0.8454
D(POP)	0.346363	0.041358	8.374727	0.0210
D(IM)	0.080937	0.047437	1.706205	0.0983
U(-1)	-1.028119	0.167241	-6.147519	0.0000
R-squared	0.786713	Mean dependent var		-0.003142
AdjustedR-squared	0.751166	S.D. dependent var		0.075290
S.E. of regression	0.037557	Akaike info criterion		-3.574902
Sum squared resid	0.042316	Schwarz criterion		-3.310982
Log likelihood	70.34823	Hannan-Quinn criter.		-3.482786
F-statistic	22.13115	Durbin-Watson stat		1.931441
Prob(F-statistic)	0.000000			

Table 8. Egression model results.

Dependent Variable: RGDP; Method: Least squares; Date: 03/03/2020; Time: 11:06; Sample: 1994-2019; Included observations: 37.				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.067919	0.014007	4.848889	0.0000
POP	-0.370923	0.062153	5.967917	0.0143
IM	0.035601	0.068842	0.517138	0.6086
R-squared	0.627002	Mean dependent var		0.134550
Adjusted R-squared	0.580377	S.D. dependent var		0.062702
S.E. of regression	0.040617	Akaike info criterion		-3.444173
Sum squared resid	0.052792	Schwarz criterion		-3.226482
Log likelihood	68.71721	Hannan-Quinn criter.		-3.367427
F-statistic	13.44783	Durbin-Watson stat		1.954836
Prob(F-statistic)	0.000002			

immigration rate has significant effect on population growth in Nigeria. Also we conclude that population growth has a positive relationship with economic Growth in Nigeria in line with (Nwosu et al., 2014).

This study examined the impact of population growth on economic growth in Nigeria. The motivation for this study was primarily premised on the paucity of theoretical literature on population growth and GDP in Nigeria. In trying to achieve this objective, descriptive, co-integration and error correction modeling through regression was adopted for the data analysis (Johansen, 1988).

The results of Johansen's co-integration test indicate a long-run stable relationship between POP, IM and GDP. The research closes the knowledge gap induced by inconclusive evidence on the population growth and economic growth which most often have resulted in situations where results of researches done in developed economies are generalized to developing countries (Yao et al., 2013).

RECOMMENDATIONS

Nigeria government should ensure that Nigeria's rising population are channeled into areas of the economy where they may more fully, effectively and efficiently utilized in bringing about high rates of economic growth for the country. And also, the Nigeria government should increase access to more social amenities, more infrastructural development and good security of live and properties since it negatively affects international immigration, population and therefore will negatively affect Nigeria's efforts to achieve increased economic growth.

Thirdly, efforts at providing easy of doing business incentive and services should be doubled and intensified to meet the increasing needs of the increasing business and international migrants population as increased population contributes to economic growth. Finally, sufficient infrastructure including health and education should be provided by the Nigeria government for a growing population as the population increases and makes a valued contribution to high GDP in Nigeria.

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