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The Chemistry Between Population and Economic Growth in Nigeria

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ABSTRACT

This study investigates the relationship between population and economic growth in the Nigerian economy. It particularly looked at the causes of population growth and the causal relationship between population and economic growth in the African most populous economy between 1990 and 2017. The VAR granger causality analytical techniques used showed that economic growth significantly drives population growth in Nigeria. However, fertility rate and gross secondary enrolment drive population growth on a low significant level in the study. The overall granger causality indicates that all the variables (POPG, FRATE and EDU) significantly granger cause GDPG to change in the Nigerian economy. One can deduce from the analysis that fertility rate which according to other studies is a major driver of population growth accounts for population growth, hence number of persons given birth to in Nigeria affects development. The direct granger causality of population on economic growth was only significant at a high rate degree of freedom and p-value. The study concludes that fertility and secondary education are intermediate variables in the discus of population and economic growth in Nigeria, and that the policy direction of education and fertility rate in the country can significantly reveal how population and economic growth relates. Hence, the study recommends that educational and fertility rate policies by all stakeholders should tilt toward ensuring the Nigerian population achieve demographic dividend instead of demographic disaster.

Keywords: Population; Economic Growth; Fertility; Education; GDP; Nigeria

1. INTRODUCTION

In recent times the issue of Nigeria population has become critical to economic development (Eli, Mohammed and Amade, 2015). According to the United Nations report of 2017, the world population is 7.6 billion and expected to reach 9.8 billion in 2050. Top of the list are China with 1.4 billion, India with 1.3 billion. Out of the top ten largest countries worldwide, the Nigeria population is the most rapidly growing at a rate about 2.6% making it the 7th most populated country in the world. Hence, the Nigeria population is projected to be the third largest populated country is 2050 surpassing the United States population.

Proceedings of the 22nd SMART iSTEAMS SPRING Multidisciplinary Conference *in Collaboration with*
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Institute of Elerical & Electronics Engineers Nigeria Section Compter Chapter
www.isteams.net/spring2019

The dynamic causes of population growth in the Nigeria demographic structure has generated many debates among which this thesis is expected to contribute how population growth and economic growth relates from the Nigerian experience (United Nations, 2017). Population is a natural endowment of human resources. Nigerian population has been tied to several economic indicators like other countries but the case of Nigeria is different as the huge population (of about 200 million in 2019) denominator has significant effect on Nigeria macroeconomic variables such as GDP per capita and education among others. However, different schools of thoughts have emerged from time about the effect of population on economic growth. Proponents posits that human resources amounts to human capital germane for economic development (Ekperiware, 2016). Opponents of population growth are of the view that population growth impedes economic growth (Theodore, 2006; Iwejingi, 2011).

Precisely, Jhingan (2005) posits that population growth is unfavourable to GDP per capita especially for high populated countries with unequal income distribution. Another possible set of scholars holds the opinion that population does not matter when it comes to economic growth (Bloom and Freeman, 1986; Aidi, Emecheta and Ngwudiobu, 2017). These scholars called population neutralist or revisionist perspective, holds that population growth is not a significant factor in the economic growth process. They suggest that it is the knowledge human possess (human capital) that causes economic growth especially with technological advanced globe. Hence, the paper systematically examine the relationship between population growth and economic growth in the Nigerian economy, and also identified the drivers of population in the Nigerian economy.

2. LITERATURE REVIEW ON POPULATION GROWTH AND ECONOMIC DEVELOPMENT

As pointed out by Ekperiware and Tenny (2017) and United Nations Report (2019), population is an important concept of economic development. Several studies have looked at the effect of population growth in Nigeria, some of these studies are theoretically and empirically reviewed in this study. Three theories have pointed out how population relates with economic development; the Malthus theory of population called the pessimist's theory accounts that population grows geometrically while food supply grows arithmetically which is anti-growth. This posits that population has a constant tendency to outrun the food supply (economic output) (Malthus, 1826). This population theory is further illustrated with a graph below which shows how population overtime will be more than economic output and causes vices and misery to society. This theory based on agrarian society is faced with technology reality where more economic output can be realized (Hirschman, 2004).
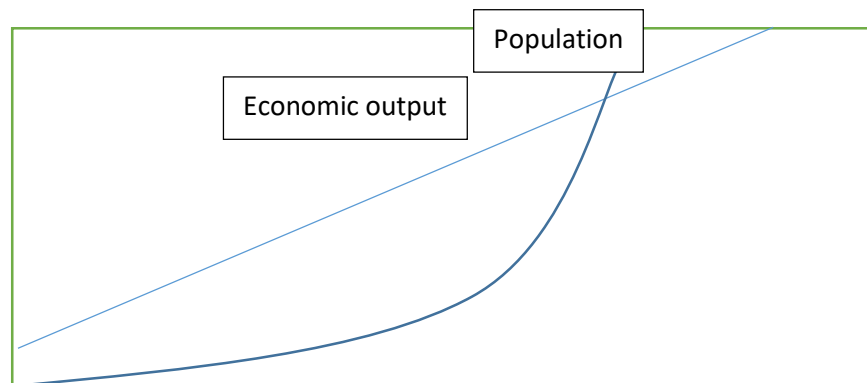

Figure 1: Trend of population and economic resources
Source: Malthus (1826)

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Conference *in Collaboration with*
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Institute of Elerical & Electronics Engineers Nigeria Section Compter Chapter
www.isteams.net/spring2019

The optimum theory of population is another population theory that measures population size and available production of wealth. Here, it's the income per head that is measured. Hence, a reduction of population size will lead to increase in per capita income while an increase in population will lead to a reduction in per capita income. However, this theory assert an optimum population that will give per head the maximum income in a society. Also, the theory of demographic transition is talking about the three stages population growth passes through in any society. In the first stage, there is high birth rate and the death rate but the growth rate of population is low. In the case of the second stage, the birth rate remains stable, while the death rate falls. This leads to high population. The third stage, the birth rate tend to fall and equals the death rate leading to low population growth in such society. All these demographics have effect on economic development (Ekperiware and Tenny, 2017).
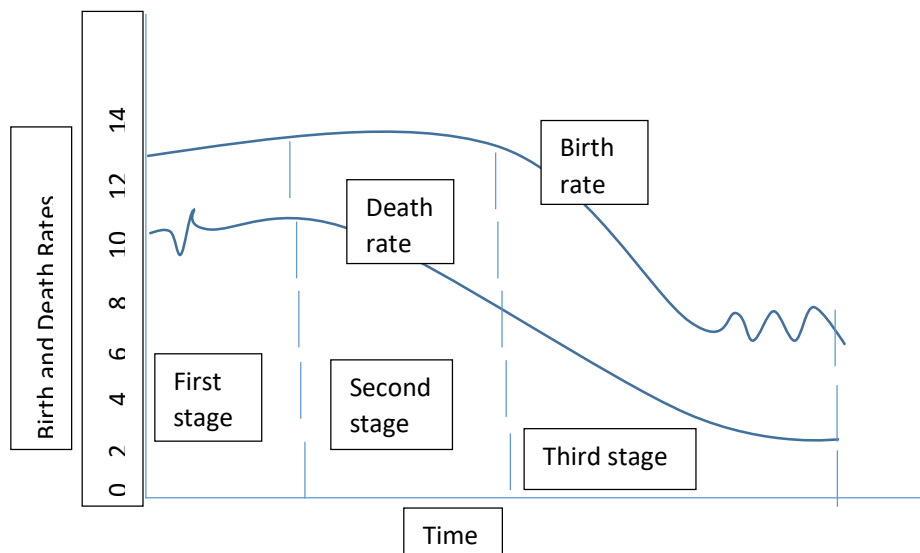

Figure 2: The theory of demographic transition
Source: Author's construct, 2019

A sum from the theoretical discuss, each of the sequential theory discuss is an improved thematic and all exhibits how population relates with economic development of society. From the Malthus theory of population and food supply in relation with the optimum theory of population, population essentially relates with economic growth. Hence, an empirical review of population and economic growth is further looked at. Ogunleye, Owolabi and Mubarak (2018) considered the effect of population growth rate, fertility rate, death rate on economic growth in Nigeria from 1981 to 2015 using the ordinary least square regression analysis. The study indicated that population growth rate in the country positively affected economic growth significantly. However, they found fertility rate to be affecting economic growth negatively. This shows that the number of children per woman is impeding economic growth. This maybe because of how number of children per woman can reduce the working hours of female gender in the country which the study did not considered.

Adewole (2012) examined the Malthusian theory of population on economic development in Nigeria with data from 1981 to 2007. The study found real GDP, population growth and per capita income stationary at first difference. The findings further showed that population growth positively impact the real GDP and per capita income in Nigeria.

Proceedings of the 22nd SMART iSTEAMS SPRING Multidisciplinary Conference *in Collaboration with*
The ICT University Foundations, USA &
Institute of Elerical & Electronics Engineers Nigeria Section Compter Chapter
www.isteams.net/spring2019

Gao and Shao (2016) examine population effect on local provinces using the economic convergence theory to establish a theoretical model in selecting a panel data in eight minority provinces in China from 1992 to 2012. The result revealed a significant positive correlation among investment, human capital, the growth rate of labor and per capita GDP growth. A significant negative correlation between children's dependency ratio and per capita GDP growth was observed. This indicates a geometric improvement as investment in human capital improves per capita income of the people and the reducing dependency ratio policy is increasing the per capita income level in these provinces.

Schramm (2011) studied the One-Child-Policy in China economy from 1979 to 2005 using critical model analysis with the Solow's model through different population development scenarios of low, middle and high growth rates. The results indicated that the One-Child-Policy influenced the China's economic development in the periods and will continue to affect its future. Precisely, the policy from the study is turning the impact from a positive one to a negative one in the China economy. Eli *et al.* (2015) further used descriptive and regression analysis to examine the impact of population growth in Nigeria from 1980 to 2010. The findings revealed a positive relationship between economic growth and population, but negative relationships were found between economic growth and life expectancy in the study. The study shows that Nigerian population positively affects economic growth, hence the need to investigate between population and economic growth.

Nwosu, Dike and Okwara (2014) investigated the interrelationship between population growth and economic growth in Nigeria using a linear model from 1960 to 2008. They made use of the Augmented Dickey-Fuller (ADF) stationarity test, Granger Causality and Co-integration tests. The study revealed that population growth has significant impact on economic growth with a sustainable long run equilibrium relationship. They also found evidence of unidirectional causality from population growth to economic growth. In Kenya, according to Thuku, Paul and Almadi (2013), there is bi-directional Granger causality relationship on a long-run between population growth and economic growth, besides supporting the hypothesis that population is driving economic growth in the country. Furthermore, Aidi, Emecheta and Ngwudiobu (2017) examined the causal relationship between population growth and economic growth in Nigeria with annual time series data from 1970 to 2013. From the adopted Granger-Causality technique, the result indicate that population growth did not granger cause economic growth in Nigeria during the period of the study. However, it revealed that economic growth is not a cause of population growth, but recommended government investment in education for human capital development in the country.

Similarly, Dominic, Oluwatoyin and Fagbeminiyi (2016) examined the factors driving population growth in the Nigeria economy using the Johansen co-integration econometric technique. The findings revealed a long run relationship between infant mortality and maternal mortality rates influencing population growth in Nigeria. Some other studies found Nigerian population causing economic downturn as the Malthusian theory. Theodore (2006) examined the environmental effect of Nigerian population and revealed that the effects of population growth in Nigeria is mostly on the living standards, energy consumption, carbon emissions, air pollution and human congestion, resources use and the environmental degradation on the Nigerian landscape. They predicted the landscape will not be able to sustain the increase in population growth for a very long period of time if nothing is done to checkmate the rapid population growth. Pimentel, Huang, Cordova and Pimentel (1997) showed that world population grow geometrically, and that pressure is being placed on arable land, water, energy, and biological resources in providing adequate supply of food, which is a challenge to sustainable development. The number of malnourished has increased globally, indicating a combination of insufficient food, low incomes, and inadequate distribution of food especially in China with her huge population.

Proceedings of the 22nd SMART iSTEAMS SPRING Multidisciplinary Conference *in Collaboration with*
The ICT University Foundations, USA &
Institute of Elerical & Electronics Engineers Nigeria Section Compter Chapter
www.isteams.net/spring2019

Looking into the Africa scenario, Hall, Dawson, Macdiarmid, Matthews, and Smith, (2016) revealed that because of the huge population in Africa, an estimated one in four people still lack adequate food for healthy life. They examined the potential impact of population growth and climate change on food security in Africa up to the year 2050, using a modeling framework termed FEEDME (Food Estimation and Export for Diet and Malnutrition Evaluation) in estimating the impacts of future climate changes. They made use of IPCC Special Report on Emissions Scenarios projections and projected population growth on food availability and prevalent undernourishment in 44 African countries. The findings from the study showed that predictable rapid population growth will be the leading cause of change in food insecurity and widespread undernourishment in Africa. Further investigating the effect of population growth in Nigeria with respect to food security, Abdulrahaman (2013) examined the level of population growth and agricultural commodity output in Nigeria using secondary annual time series data with linear regression model analysis. The findings revealed a null hypothesis as there is no significant effect between population growth and food security in Nigeria. This implies that the Nigerian population significantly accounts for food insecurity in Nigeria.

The literature reviews on population and economic growth have been informing. The theoretical and empirical review revealed a thematic idealization of how population evolves in our society. However, population constitutes a challenge to environmental protection, safe living and food security in some of the studies. The problem with increase in population on development was mostly noticed in populated areas without proper investment in education. From the studies reviewed, it is difficult to establish how population growth affects economic growth negatively, except for Abdulrahaman (2013) that captured how population growth accounts for food insecurity in Nigeria. Nevertheless, population growth accounts for pollution, emission, food security and pressure on government infrastructure among others. Hence, population growth can affects an economy other than just economic growth (output from that economy) but measures to estimating how population growth affects sustainable development of an economy are not substantial.

3. RESEARCH METHODOLOGY

This study examined the drivers of the population growth by investigating the casual relationship between population and economic growth in Nigeria. It particularly looked at the drivers of population growth in Nigeria and the causal relationship between population and economic growth in the populous Nigerian economy from 1990 to 2017. Change in fertility rate, economic growth rate, population growth rate and education were the variables considered in the research design as they have transmission or interactive causal nature. The sources of the variables for this study are from the World Development Indicators' database of 2019. The model of this research design can measure feedback interactions and autoregression. A schematic of the aforementioned research design is as follows: discussion of the essential variables essential, sources of data, model specifications and analytical technique.

3.1 Discussion of the essential variables for this study
A discus of each of these variables; fertility rate, economic growth rate, population growth rate and education is germane for investigating the causal relationship between population and economic growth besides their definitions.

Fertility Rate is the expected number of children to be born per woman (or per 1,000 women) if they were to pass through the childbearing years bearing children according to a current schedule of age-specific fertility rates. This is directly related with the population growth of an economy.

Proceedings of the 22nd SMART iSTEAMS SPRING Multidisciplinary Conference *in Collaboration with*
The ICT University Foundations, USA &
Institute of Elerical & Electronics Engineers Nigeria Section Compter Chapter
www.isteams.net/spring2019

Economic Growth Rate is the change in goods and services produced in a given economy over a period of time, usually a year. Such changes reflects effect of policies and economic progress from other economic indicators like education and population even fertility rate as the case may be in Nigeria.

Population Growth Rate has to do with the rate of change in the number of people in a given locality (Nigeria as the case may be) over a given period of time usually a year. Among other variables, birth and death rate as well as education and economic conditions are crucial factors that may drive population growth rate. A dive into this study would contribute to the discussion.

Education: this has to do with making the human resources (population) more useful in an economy. It is the act or process of imparting or acquiring general knowledge, developing the powers of reasoning and judgment, and generally of preparing oneself or others intellectually for mature life.

3.3 Type, sources and measurement of data
Table 1 presents the type, sources and measurement of the data used to represent each variable in the study.

Table 1: Type, Sources and Measurement of Data

S/N	VARIABLE	TYPE	SOURECE
1	Population Growth rate	Secondary time series data	WDI database 2019
2	Fertility rate	Secondary time series data	WDI database 2019
3	Economic growth rate	Secondary time series data	WDI database 2019
4	Education	Secondary time series data	WDI database 2019

3.4 Model specifications
The study adopted the optimum population theory as its basis and considering population size of the country in relation to the resources of the country at a particular time. Expressing how population growth and other related variables like fertility rate, education interrelates with economic growth, this study establish the Vector Autoregression (VAR) model as thus:

$$\text{VAR (j)} \quad Y_t = \alpha + \phi_1 Y_{t-1} + ... + \phi_j Y_{t-j} + \varepsilon_t \tag{1}$$

Where Y_t is a 4x1 vector of endogenous variables, α is a 4x1 vector of intercepts, Y_{t-j} is a vector of lagged variables (exogenous per time in the study), while ε_t is the disturbance terms, and ϕ is a 4x4 matrix of coefficients. The VAR model shows auto-regressive model that allows dynamic relationship than the normal static Ordinary Least Square (OLS) estimation. From equation 1, a matrix form can be deduced to derive the standard VAR representation with the defined symbols as follows:

$$\text{VAR (1)} \begin{bmatrix} POPG_t \\ FRATE_t \\ EDU_t \\ GDPN_t \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \\ \alpha_4 \end{bmatrix} + \begin{bmatrix} \phi_{11} & \phi_{12} & \phi_{13} & \phi_{14} \\ \phi_{21} & \phi_{22} & \phi_{23} & \phi_{24} \\ \phi_{31} & \phi_{32} & \phi_{33} & \phi_{34} \\ \phi_{41} & \phi_{42} & \phi_{43} & \phi_{44} \end{bmatrix} \begin{bmatrix} POPG_{t-1} \\ FRATE_{t-1} \\ EDU_{t-1} \\ GDPN_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{bmatrix} \tag{2}$$

Proceedings of the 22nd SMART iSTEAMS SPRING Multidisciplinary Conference *in Collaboration with*
The ICT University Foundations, USA &
Institute of Elerical & Electronics Engineers Nigeria Section Compter Chapter
www.isteams.net/spring2019

Equation 2 can be expressed in linear form as thus:

$$VAR_{(p)} \approx \vec{Y}_t = \alpha + \vec{\phi}_1 Y_{t-1} + \vec{\phi}_2 Y_{t-2} + ... + \vec{\phi}_p Y_{t-p} \tag{3}$$

Where *p* represents the number of lagged periods which is determined through the popular criteria on lag length criteria selection test and *Y* the variables used in the model (as equation 2) as thus:

The VAR technique from equation 3 is the data set from 1990 to 2017, p is equal to lag length three (p=3). Testing for unit roots and lag length criteria are carried out to avoid spurious estimates (Sims, 1980; Gujarati and Sangeetha, 2007). A crucial assumption in using VAR is that the variables have to be stationary at levels. From appendix 1, the variables are stationary at level except education that was stationary after first difference with lag length three as appropriate.

3.5 Analytical techniques
To analyse the causal effect mainly among education (EDU), population growth (POPG), fertility rate (FRATE) and economic growth (GDPG), the Multivariate Granger Causality (MGC) model specification was employed. In the parlance of Granger causality, there are three possible causality hypothesis: unidirectional, bidirectional/multidirectional, and independent. For unidirectional, the past values of one variable predicts the current values of the other variable(s). For bidirectional, there is a feedback prediction from both or among the variables. In independent, neither unidirectional nor bidirectional possibilities hold (Gujarati and Sangeetha, 2007). The multivariate granger causality framework is specified as follow:

$$GDPG_t = \sum_{j=1}^{n} \theta_j GDPG_{t-j} + \sum_{i=1}^{n} \varphi_i EDU_{t-i} + \sum_{p=1}^{n} \lambda_p FRATE_{t-p} + \sum_{h=1}^{n} \nabla_h POPG_{t-h} + u_{1t} \tag{4}$$

$$EDU_t = \sum_{j=1}^{n} \beta_j GDPG_{t-j} + \sum_{i=1}^{n} \delta_i EDU_{t-i} + \sum_{p=1}^{n} \ell_p FRATE_{t-p} + \sum_{h=1}^{n} \wp_h POPG_{t-h} + u_{2t} \tag{5}$$

$$FRATE_t = \sum_{j=1}^{n} \varpi_j GDPG_{t-j} + \sum_{i=1}^{n} \pi_i EDU_{t-i} + \sum_{p=1}^{n} \mu_p FRATE_{t-p} + \sum_{h=1}^{n} \int_h POPG_{t-h} + u_{3t} \tag{6}$$

$$POPG_t = \sum_{j=1}^{n} \notin_j GDPG_{t-j} + \sum_{i=1}^{n} \eta_i EDU_{t-i} + \sum_{p=1}^{n} \xi_p FRATE_{t-p} + \sum_{h=1}^{n} \iota_h POPG_{t-h} + u_{4t} \tag{7}$$

Where the error terms ($u_{1t}, u_{2t}, u_{3t}, u_{4t}$) are assumed uncorrelated, equation 4, 5, 6 and 7 specification are used to test whether the information relevant in the prediction of the respective dependent variables per time; EDU, FRATE, POPG and GDPG are contained solely in the time series data of these variables. $FRATE_t$ denotes fertility rate at time t while $FRATE_{t-p}$ is the lagged value of fertility rate, EDU_t denotes gross % of secondary school enrolment at time t while EDU_{t-i} is the lagged value of gross secondary school enrolment, $POPG_t$ denotes population growth at time t while $POPG_{t-i}$ is the lagged value of population growth rate, and $GDPG_t$ denotes economic growth rate at time t while $GDPG_{t-j}$ is the lagged value of economic growth rate. Causality runs from the independent variables when the coefficients of the lagged independent variables are statistically different from zero in each respective equations (4, 5, 6 and 7).

4. RESULT PRESENTATION AND ANALYSIS

Table 2: VAR Granger Causality/Block Exogeneity Wald Tests

Dependent variable: GDPG			
Excluded	Chi-sq	df	Prob.
EDU	1.572589	3	0.6656
FRATE	7.617044	3	0.0546
POPG	0.257486	3	0.9678
All	20.73409	9	0.0139
Dependent variable: EDU			
Excluded	Chi-sq	df	Prob.
GDPG	9.277111	3	0.0258
FRATE	13.59494	3	0.0035
POPG	8.264542	3	0.0408
All	32.07058	9	0.0002
Dependent variable: FRATE			
Excluded	Chi-sq	df	Prob.
GDPG	1.107092	3	0.7754
EDU	16.42721	3	0.0009
POPG	2.22098	3	0.5278
All	38.31966	9	0
Dependent variable: POPG			
Excluded	Chi-sq	df	Prob.
GDPG	12.54197	3	0.0057
EDU	1.557212	3	0.6691
FRATE	4.717972	3	0.1937
All	26.08723	9	0.002

Source:Author's computation (2019)

The VAR granger causality test from Table 2 showed that fertility rate was the only variable that granger causes economic growth. This implies that fertility rate of women in Nigeria have ingredients that causes economic growth to change. More so, the overall granger causality indicates that all the variables (POPG, FRATE and EDU) significantly granger causes GDPG to change in the Nigerian economy. However, the direct granger causality of population on economic growth was only significant at a high rate degree of freedom and p-value. Table 2 also revealed that economic growth significantly granger causes population growth in Nigeria, implying that the economic resources in the country have a way of reflecting on the number of people in the country. Fertility rate and gross secondary enrolment (EDU) significantly exhibited bi-directional granger causality. It is also worth noting that all the variables (POPG, FRATE and GDPG) significantly contributed in causing gross secondary enrolment (EDU) in the country.

Proceedings of the 22nd SMART iSTEAMS SPRING Multidisciplinary Conference *in Collaboration with*
The ICT University Foundations, USA &
Institute of Elerical & Electronics Engineers Nigeria Section Compter Chapter
www.isteams.net/spring2019

The analysis so far shows that fertility rate and education are core intermediate variables in discussing population growth and economic growth in the populous Nigerian economy. Fertility rate and education of the population are two essential components of not only population growth but on economic growth. This granger causality finding that fertility is an essential variable in determining economic growth suggest that the number of children a woman in a country have is central to the population size of such an economy. Hence, one can deduce from the analysis that fertility rate which according to other studies is a major driver of population growth (Ogunleye, Owolabi and Mubarak, 2018) affects development.

The experienced relationship between population and economic growth in Nigeria is an indication that economic growth is a variable determining the country's population. From the foregoing, it is obvious that population growth and economic growth in Nigeria exhibits unidirectional granger causality running from economic growth to population growth. Logically, it indicates that there is a transmission mechanism from fertility rate. The high potential number of children from a woman which is 5.67 in 2017 from WDI data base might be as a result of conducive environment for child upbringing. More so, the findings from the granger causality indicates that fertility rate granger causes population growth but only at almost 20% level of significant, which is not too impressive statistically.

School enrolment from the findings is a significant component of fertility rate in the country. Although, the potential number of children per woman dropped slightly, the nature of causality is topical for us to determine whether it's positive or negative granger causality. But, literarily school enrolment supposed to reduce fertility rate in a populated economy like Nigeria. This is because policies would have been in place by now to finding a way of equipping the population with requisite education to make them more useful in the production process which will lead to demographic dividend rather than demographic disaster. A demographic disaster may likely be the Nigerian case if school enrolment positively increases fertility rate in the country.

5. CONCLUSION AND RECOMMENDATIONS

The causality analysis from the study revealed that fertility rate granger causes economic growth. Economic growth significantly granger causes population growth in Nigeria, thereby exhibiting unidirectional granger causality running from economic growth to population growth. Fertility rate and gross secondary enrolment (EDU) significantly exhibited bi-directional granger causality while all the variables (POPG, FRATE and GDPG) significantly accounts for gross secondary enrolment (EDU) in the country. Therefore, economic growth contributes to Nigeria population and the number of children each women can potentially have in Nigeria contributes to the kind of economic growth Nigeria can have. Fertility and secondary education are intermediate variables in the discus of population and economic growth in Nigeria. The policy direction of education and fertility rate in the country can significantly reveal how population and economic growth relate. Hence, the study recommends that educational and fertility rate policies through all stakeholders such as the family, government, NGOs, international bodies and religious bodies should tilt toward ensuring the Nigerian population achieve demographic dividend than demographic disaster.

Proceedings of the 22nd SMART iSTEAMS SPRING Multidisciplinary Conference *in Collaboration with*
The ICT University Foundations, USA &
Institute of Elerical & Electronics Engineers Nigeria Section Compter Chapter
www.isteams.net/spring2019

REFERENCES

1. Abdulrahaman, S. (2013). Population growth and food security in Nigeria (2010-2012), Arabian Journal of Business and Management Review (Nigerian Chapter) Vol. 1, No. 3, http://arabianjbmr.com/pdfs/NG_VOL_1_3/5.pdf

2. Adewole, A. O. (2012). Effect of population on economic development in Nigeria: a quantitative assessment, International Journal of Physical and Social Sciences, IJPSS Volume 2, Issue 5 ISSN: 2249-5894, http://www.ijmra.us, https://pdfs.semanticscholar.org/d526/bf61afd44f9eb70b118efd610dcc71a3f19a.pdf

3. Aidi, H. O., Emecheta, C. and Ngwudiobu, I. M. (2017). Population and Economic Growth in Nigeria: is there an Empirical Evidence of Causality? International Journal Advances in Social Science and Humanities Available online at: www.ijassh.com, file:///C:/Users/Dr%20M.%20C.%20Ekperiware/Downloads/0804022016IJASSH.pdf

4. Bloom, D. E and Freeman, R. B. (1989). Population Growth, Labor Supply, and Employment in Developing Countries, Population and Development Review, pp. 381-414, DOI: 10.3386/w1837, https://www.nber.org/papers/w1837

5. Dominic, A., Oluwatoyin, M. A. and Fagbeminiyi, F. F. (2016). The Determinants of Population Growth in Nigeria: A Co-Integration Approach, The International Journal of Humanities & Social Studies (ISSN 2321 - 9203) www.theijhss.com

6. Ekperiware, M. C. and Tenny, L. Z. (2017). The Economics of Population Structure in Nigeria, International Journal of Economics, Business and Management Research, Vol. 1, No. 03, http://ijebmr.com

7. Eli, H. T., Mohammed, I. D. and Amade, P. (2015). Impact of Population Growth on Economic Growth in Nigeria (1980-2010). IOSR Journal of Humanities and Social Science (IOSR-JHSS) Volume 20, Issue 4, Ver. V (Apr. 2015), PP 115-123 e-ISSN: 2279-0837, p-ISSN: 2279-0845. www.iosrjournals.org, DOI: 10.9790/0837-2045115123 www.iosrjournals.org

8. Gao, S. S. and Shao, J. L. (2016). The Relationship between China's Population Structure Change in Minority Areas, Economic Growth and Demographic Dividend—Based on an Empirical Analysis of Time Series Data from 1992 to 2012. Open Journal of Business and Management, 4, 266-272. http://dx.doi.org/10.4236/ojbm.2016.42028.

9. Gujarati, N. D. and Sangeetha (2007). Basic Econometrics 4/e, The McGraw-Hill companies, Special India edition page 304-331, 278-279.

10. Hall, C., Dawson, T. P., Macdiarmid, J. I., Matthews, R. B. and Smith, P. (2016). The Impact of Population Growth and Climate Change on Food Security in Africa; Looking Ahead to 2050, School of the Environment, University of Dundee, Scotland, UK, https://core.ac.uk/download/pdf/152415586.pdf.

11. Iwejingi, S. F. (2011). Population Growth, Environmental Degradation and Human Health in Nigeria. Pakistan Journal of Social Sciences, 8(4), 187-191, DOI: 10.3923/pjssci.2011.187.191

12. Jhingan, M. L. (2005). The Economic development and planning, 38th Edition, Vrinda Publications (P) limited Delhi, India.

13. Nwosu, C., Dike, A. O and Okwara, K. K. (2014). The Effects of Population Growth on Economic Growth in Nigeria, the International Journal Of Engineering And Science (IJES), Volume, 3, Issue 11, Pages| 07-18, ISSN (e): 2319 – 1813 ISSN (p): 2319 – 1805, www.theijes.com

14. Ogunleye, O. O., Owolabi, O. A. and Mubarak, M. (2018). Population Growth and Economic Growth in Nigeria: An Appraisal, International Journal of Management, Accounting and Economics, Vol. 5, No. 5, ISSN 2383-2126 (Online), file:///C:/Users/Dr%20M.%20C.%20Ekperiware/Downloads/Populationgrowthandeconomicgrowth.pdf

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15. Pimentel, D., Huang, X., Cordova, A. and Pimentel, M. (1997). Impact of Population Growth on Food Supplies and Environment, Population and Environment 19(1):9-14, DOI: 10.1023/A:1024693414602, https://www.researchgate.net/publication/226470116_Impact_of_Population_Growth_on_Food_Supplies_and_Environment

16. Schramm, (2011). Population-Control-Policies and their Implications for Economic Growth in China, Department of Economics at the University of Zurich, http://www.econ.uzh.ch/ipcdp/theses/BA_NoemiSchramm.pdf.

17. Sims C. (1980). Macroeconomics and reality. Econometrical. 48 (1):1-48.

18. Theodore, O. I. (2006). The Effects of Population Growth in Nigeria, Journal of Applied Sciences. Volume 6 (6): 1332-1337, DOI: 10.3923/jas.2006.1332.1337, https://scialert.net/fulltextmobile/?doi=jas.2006.1332.1337

19. Thuku, G. K., Paul, G. and Almadi, O. (2013). The impact of population change on economic growth in Kenya, International Journal of Economics and Management Sciences, Vol. 2, No. 6, 2013, pp. 43-60, https://www.omicsonline.org/open-access/the-impact-of-population-change-on-economic-growth-in-kenya-2162-6359-2-137.pdf

20. United Nations Report (2017). World Population Prospects: The 2017 Revision, United Nations, Department of Economics and Social Affairs, https://www.un.org/development/desa/publications/world-population-prospects-the-2017-revision.html

21. United Nations (2019). World Economic Situation and Prospects 2019, United Nations, New York, https://www.un.org/development/desa/dpad/ o, https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2019_BOOK-web.pdf

22. WDI (2019). https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2019_BOOK-web.pdf

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Appendix 1: 2019 World Development Indicators' Data of Nigeria population growth Rate, GDP growth Rate, Fertility Rate and Gross School Enrolment

	POPG	GDPG	FRATE	EDU
1990	2.58	11.78	6.49	24.71
1991	2.55	0.36	6.44	25.62
1992	2.52	4.63	6.40	24.86
1993	2.50	-2.04	6.35	25.07
1994	2.49	-1.81	6.30	25.18
1995	2.49	-0.07	6.26	25.04
1996	2.49	4.20	6.22	25.10
1997	2.49	2.94	6.19	25.11
1998	2.49	2.58	6.16	25.08
1999	2.50	0.58	6.13	23.54
2000	2.50	5.02	6.11	24.59
2001	2.51	5.92	6.08	27.02
2002	2.52	15.33	6.06	29.59
2003	2.54	7.35	6.04	27.07
2004	2.56	9.25	6.01	34.98
2005	2.59	6.44	5.99	34.94
2006	2.61	6.06	5.96	34.44
2007	2.63	6.59	5.93	31.85
2008	2.65	6.76	5.90	35.37
2009	2.66	8.04	5.87	39.21
2010	2.67	8.01	5.84	44.20
2011	2.67	5.31	5.80	45.54
2012	2.68	4.23	5.76	47.16
2013	2.67	6.67	5.71	56.18
2014	2.66	6.31	5.65	45.60
2015	2.64	2.65	5.59	46.76
2016	2.62	-1.62	5.53	41.98
2017	2.60	0.81	5.67	44.78

Source: WDI, 2019

Appendix 2: Augmented Dickey Fuller Unit Root Test Results

Variable	Level					First Difference					Result
	Coefficient	t-statsistics	5%critical value	0.10%	P value	Coefficient	t-sta tistics	5%critical	0.10%	P value	Order of Integration
EDU	-0.40	-2.53	-3.59	-3.22	0.31	-1.31	-6.60	-3.60	-3.23	0.00	I(1)
POPG	**-0.16**	**-4.28**	**-3.05**	**-2.66**	**0.00**	-0.10	-1.50	-3.03	-2.65	0.51	I(0)
GDPG	**-0.57**	**-3.32**	**-2.97**	**-2.63**	**0.02**	-1.36	-8.54	-2.98	-2.63	0.00	I(0)
FRATE	**-0.16**	**-3.33**	**-2.99**	**-2.63**	**0.02**	-1.90	-2.61	-2.99	-2.63	0.10	I(0)

Source: Author's computation (2019)