AN INVESTIGATION INTO THE EFFECTS OF SOME DEMOGRAPHIC PARAMETERS ON ECONOMIC AND POPULATION GROWTHS IN NIGERIA

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Abstract

The work aimed at investigating the effects of some demographic parameters on economic and population growths in Nigeria. As studied in the existing literatures, there are some rebellious voices and argument that population and demographic change may not be the central to the state of development for developing economy in a country like Nigeria. Therefore, we subjected this contradicting long lasting argument using other parameters like level of corruptions, poor governance and Labour force. We applied Granger Casuality, Ardl Approach to Cointegration, Model Specification and ARDL Tests using the available data in other to dismantle this problem. The finding showed that the ARDL bound which revealed there exist long-run relationship between the GDP, BR and DR. and this implies that GDP can be predicted from BR and DR in the long run. The result from Estimated Parameters yield that economic growth is positively affected by birth rate and negatively affected by death rate. Model 3 tested the effects of changes in annual GDP, labour force, annual health expenditure and corruption level on annual changes in population. The related results showed that the factors mention significantly affected the economic growth in Nigeria. However Model 2 is an argumentation of model 1 after inclusion of additional variables to see how the model will perform after adding of other relevant variables, such as annual net migration (difference between immigration and emigration), annual health expenditure in Nigeria, total labour force and corruption level. The results revealed that level of corruption and poor governance has negatively impacted on the economic growth in Nigeria.

Keywords: *Granger Casuality, Ardl Approach, Cointegration, Economic, Population, Growths, Labour Force, Health Expenditure, Corruption level, GDP.*

Introduction

Background to the Study

Nigeria is the most populous country in Africa and the eighth most populous country in the world. With 182 million inhabitants (African development Bank Group, 2013) in 2015, Nigeria accounted for 5% of births globally (and one fifth of all births on the African continent) but by 2050 it is projected that one in every ten children worldwide will be born in Nigeria, indicating a significant increase in both the absolute number of births and children in Nigeria over the course of the outlook. Despite declining fertility, Nigeria's population is expected to continue to grow to 262 million by 2030 and 398 million by 2050 on current trends (African Population Studies, 2014). Many scholars laid hands relatively to this area using different statistical techniques to study economic status in Nigeria. However, Nwosu *et al.* (2014) studied and investigated the time series role of population growth on economic growth in Nigeria and how economic growth is effected through population growth. Their

study extends the literature by employing a linear model to analysed economic growth fluctuations against population growth. The study employed annual secondary observation from 1960 to 2008. The empirical results were based on Augmented Dickey-Fuller (ADF) stationarity test combined with Granger Causality and Cointegration tests. Folake and Olufemi (2017) examined the relationship between demographic change and economic growth in Nigeria. While evidence in the literature tilted to the negative effect of population on economic growth in many of the emerging economies, there are some dissenting voices that argue that population and more specifically demographic change may not be central to the state of development of developing economy like Nigeria. Their work therefore, subjects this contradicting position to econometric analysis. Based on time series data and using fully modified ordinary least square estimation technique, the results showed that among the several macroeconomic variables that may affect economic growth in Nigeria population changes is missing.

The recurring performance inconsistency of the economy of Nigeria serves as motivation for this research work. Vast of literatures showed that, Nigerian economy has neglected the two important factors of birth and death rates in predicting the performance of its economy. Lack of proper documentation of the birth and death rate in Nigeria has led to ineffective economic planning which is also part of the problem confronting Nigeria. The researchers agreed with other economists with suggestion that the rapid increase in population may be due to the effect of three important factors; which are birth rate, death rate and net migration. If increasing in population is brought about as a result of increase in birth rate, there will be higher percentage of young people and children in the population. However, if it is by a decrease in death rate, then, there will be an increase in the total number of old people in the population. Furthermore, if an increase in population is brought about as a result of a higher net migration, then, there will be a larger number of people between ages of 16 and 50years (Burch, 2003). Nigeria population is increasing mostly due to the effect of the first factor, that is, high birth rate (Kolawole, 2017). The growth rate of population needs to be studied, monitored and managed properly with conscious efforts. If not, it can militate against all efforts of government to fulfill its commitment by improving the quality of live and standard of living of the people.

The aim of this work is to investigate the effects of some demographic parameters on economic and population growths in Nigeria, under which we would like determine the existence of relationship between the birth rate, death rate in Nigerian economy, also to determine whether there is relationship between annual health budget, labour force, corruption level, net migration and population growth in Nigeria and finally, to determine the impact of health expenditure, labour force, corruption level, net migration on GDP and PG in Nigeria using the available data at hand.

Material and Methods

This chapter described the various methods and techniques used to collect and analyze the data gathered for the study to gain a deeper understanding of the topic under study. However, the methods used for data analysis were most appropriate to assist in achieving the objectives of the study:

Method of Data Analysis

The data collected for this research were analysed using Pesaran and Shin (1999) Autoregressive Distributed Lag (ARDL) Bounds co-integration Testing approach and this method was also used in Onwuka and Babayemi (2017). Indeed, there are many different methods used in testing for causal relationship between two or more time series variables. Such methods include: Engle-Granger (1987) 2-step procedure; Johansen (1988) and Johansen and Juselius (1990) Full Information Maximum Likelihood approach; Toda-Yamamoto (1995) augmented VAR approach; Davidson and Hinkley (1997); and Pesaran *et al.* (2001). For this reason, this study adopted Autoregressive Distributed Lag (ARDL) Bounds Testing approach and Multiple regression.

Granger Casuality

There occurs on some occasions a difficulty in deciding the direction of causality between two related variables and also whether or not feedback is occurring. A standard bivariate dynamic structural model on which the Granger test is based can be expressed as in the maintained structure, x and y are jointly determined endogenous variables .Cross-spectral methods provide a useful way of describing the relationship between two (or more) variables when one is causing the other(s).

$$\Delta y_t = \Sigma\alpha_i \ \Delta y_{t-1} + \Sigma\beta_i \Delta x_{t-1} + U_t \quad .. (1)$$

$$\Delta x_t = \Sigma j_i \Delta x_{t-1} + \Sigma k_i \ \Delta y_{t-1} + V_t \quad \ldots (2)$$

In examining the direction of causality between any two variables, the Granger procedure has gained a lot of popularity, partly due to its simplicity. This procedure further saves degrees of freedom which in relatively small samples are an important advantage. Generally, in Granger causality test, there are three possible scenarios; unidirectional causality from X to Y or from Y to X, bidirectional causality between X and Y and independent causality of X and Y. According to the concept of Granger causality, X causes Y " if and only if the past values of X help to predict the changes of Y. While, Y causes X " if and only if the past values of Y help to predict the changes of X.

ARDL Approach to Cointegration

An ARDL approach as introduced by Pesaran *et al.* (2001) was adopted to explore the long-run relationship among the variables. An ARDL model is a regression of one variable on its own past and on the present and past values of a number of other variables. The ARDL has various practical advantages: first, this approach was used to test the existence of a relationship between the variables, and this is applicable regardless whether the underlying regressors are stationary. The variables are not required to be I(0) or I(1) or fractionally integrated. The ARDL model does not require a unique level of integration of the variables. A stochastic process is said to be stationary if its mean and variance are constant over time, i.e. time invariant. By contrast, a non-stationary time series will have a time-varying mean or a time-varying variance or both which renders many alternative statistical tests invalid). Second, the ARDL model takes sufficient numbers of lags into consideration to capture the

data generating process in a general-to-specific modeling framework. In addition to the above two mentioned advantages, the ARDL co-integration model is efficient and unbiased and at the same time, is able to capture the short-run and long-run components of the model simultaneously. A dynamic Error Correction Model (ECM) can be derived from the ARDL through a simple linear transformation (Banerjee et al., 1993). The ECM integrates the short-run dynamics with the long-run equilibrium, without losing the long-run information. In order to determine the optimal lag-length incorporated into the model and select the ARDL model to be estimated, the study employs the information criteria.

Model Specification

The study tested three models in order to be able to put the study in a proper perspective. The models for the study comprises of three different equations as described below:

Model 1

Model 1 measures the relationship between annual changes in gross domestic product (GDP) as dependent variable and annual changes as the independent variables which are changes in birth and death rates. Thus, the model will try to predict how changes in birth and death rates cause changes in GDP.

$$\Delta GDP = \beta_1 + \beta_2 \Delta BR + \beta_3 \Delta DR + e \quad (3)$$

where:

ΔGDP =rate of change in gross domestic product is used to measure the economic growth of

Nigeria.

ΔBR = birth rate

ΔDR = death rate

B_1 = is the equation's constant.

B_2= coefficient of birth rate.

B_3= the coefficient of death rate.

e= the error term of the equation

ARDL TESTS

The ARDL approach as introduced by Pesaran *et al.* (1999) was adopted to explore the long-run relationship among our variables of birth rate and death rate. An ARDL model is a regression of one variable on its own past and on the present and past values of a number of other variables. Pesaran *et al* (1996) proposed the Autoregressive Distributed Lag (ARDL) approach to co integration or bound procedure for a long-run relationship, irrespective of whether the underlying variables are I(0), I(1) or a combination of both. F-test tests for significance of the lagged levels of the variables. The null hypothesis of no co integration is

H0 :k1 = k2 = ki = 0 . It is tested against the alternative hypothesis of at least one non-zero result, i.e. H1: k1 ≠ 0 or k2 ≠ 0 or ki ≠ 0. While the calculated F-statistics is compared with the critical values; where F-statistic exceeds the upper bound level, the null hypothesis is rejected, which shows the existence of co-integration. But, if F-statistic falls below the lower bound, null hypothesis cannot be rejected, implying the absence of co-integration. It is inconclusive if it falls within the upper and lower bounds. The result of the ARDL bound testing show that there is co integration since the F-statistics is higher than the upper bound critical value in model 1 and model 3 where ARDL tests were run.

Model 2

Model 2 is an argumentation of model 1 after inclusion of additional variables to see how the model will perform after adding of other relevant variables. The variables that are included are annual net migration (difference between immigration and emigration), annual health expenditure in Nigeria, total labour force and corruption level. These are added because one, the level of development of the health sector in Nigeria has significant impact on what happen to death and birth rates, two, the level of corruption which is sign of poor governance level in Nigeria has significant impact on what happen to annual health expenditure (budget) and by extension what happen to development of the health sector. Corruption and poor governance have detrimental impacts to what happen to the entire economy. Labour force potential is affected by the size of the total population and labour force is also related to GDP, as active labour force contributes to the growth of GDP. Here in the study labour force potential is the entire working age population. Multiple regression were used in model (2 and 3) due to insufficient variables (not up to 30).

$$\Delta GDP = \beta_1 + \beta_2 \Delta BR + \beta_3 \Delta DR + \beta_4 \Delta NM + \beta_5 \Delta LF + \beta_6 \Delta HE + \beta_7 \Delta\, CP + e \quad (4)$$

Where,

MN = net migration (difference between immigration and emigration)

LF = labour force potential means working age population

HE = annual health expenditure

CP = corruption level

Model 3

Model 3 tested the effects of changes in annual GDP, labour force, annual health expenditure and corruption level on annual changes in population. This will show how Nigerian population changes in relation to these variables. This is very important for demographic analysis by policy makers.

$$\Delta PG = \beta_1 + \beta_2 \Delta GDP + \beta_3 \Delta LF + \beta_4 \Delta HE + \beta_5 \Delta CP + e \quad \ldots (5)$$

Where, PG = population growth

Results and Discussion

Table 1: Result of ADF after First Differencing from 1985 to 2018

Statistics	Lag Length	Critical value	Test comp	P Values
GDP	0	5% level (-2.95711)	-4.105485	0.0032
BR	2	5% level (-2.963972)	-3.620496	0.0113
DR	2	5% level (-1.952910)	-1.72423	0.0401

The results in Table: 4.04 revealed that GDP became stationary after first differencing while birth rate and death rate became after second differencing, However the time series procedure that accommodate these Pattern of order.

Table 2: Result of the ARDL Bound Test for the Long-run relationship (GD, DR & BR)

Test statistics	Values		K
F statistic	4.611010		
	Significant	(0)Bound	(1)Bound
CValue Bound	5%	3.1	3.87

The result in Table 4.05 showed the ARDL bound which revealed there exist long-run relationship between the GDP, BR and DR. This implies that GDP can be predicted from BR and DR in the long run.

Table 3: Results of Estimated Parameters in Model 1

Variables	**Co-officient**	**Std error**	**t-stat**	**P value**
Birth rate	6.444×10^{11}	0.018	3.591	.0014
Death rate	-1.28×10^{11}	0.0158	-8.07448	.0000
Constant	3.891×10^{10}	0.052	-0.7417	.4687

Model 1 measures the effects of birth rate and death rate on economic growth (GDP). The result showed that economic growth is positively affected by birth rate and negatively affected by death rate.

The results in Table 4.06 revealed that the two variables (.i.e BR and DR) are highly statistically significant. The impact of BR was enormous on GDP while that of DR was negatively large. These results had demonstrated that so far continuous population growth in Nigeria is favorable to economic growth of the nation while death, as expected a priori, is unfavorable to economic growth in Nigeria. This result is an indication of the fact that Nigeria is not facing the problem of over population. There is still much scope for population growth in the country, considering the agricultural, natural resources and industrial potentials of Nigeria. India has population that is more than six times the size of Nigeria's but the size of its landmass is about three times the size of Nigeria. But despite that its economy continues to grow.

However, since it is not too viable to predict GDP from only birth rate and death rate of its state, the research also investigated other variables that are also vital to the prediction of GDP such as NM, CL, HE, BR, DR, and PG. These variables are of limited observations (i.e. 24 observations), this showed that multiple regression could be used as against earlier method of time series.

Multiple Regression Estimation

The results of the multiple regressions were of two types. Firstly, the estimation of relationship between GDP and NM, CL, HE, BR, DR, and PG was carried out and interpreted, the second estimation was between the PG and NM, CL, HE, BR, DR, and PG, also interpreted. Data were generated between 1995 to 2018.

To measure the effect of other variables such as net migration, labour force, health expenditure and corruption on economic growth within the general model that test the effects of birth rate and death rate on economic growth, model 2 is regressed. The dependent variable is economic growth while the independent variables are birth rate, death rate, net migration, labour force, health expenditure and corruption. The result shows that in addition to death rate and birth rate which we found statistically significant in model 1, labour force is also statistically significant with a P-value of 0.0052 which is below the required 0.05 for validation in statistical analysis. Labour force negatively affects affect economic growth. This can be interpreted to mean economic growth is more favorably to use of modern technology and less labour force. This has important implication for the use of modern technology in our work places. Other variables were not found to be statistically significant.

Table 4: Results of regression analysis on model 2

GDP is the dependent variable			
	Coefficient	**t-test**	**P-value**
Birth Rate	**1.79×10^{11}**	**4.881816**	**0.0001**
Death Rate	**-1.87×10^{11}**	**-5.027583**	**0.0001**
Net Migration (NM)	**158133.5**	**0.422057**	*0.6783*
Labour Force (LF)	**-3.26×10^{10}**	**-3.207386**	**0.00525**
Health Expenditure (HE)	**-3.20×10^{10}**	**-1.397365**	**0.18036**
Corruption Perception (CP)	**-6.74×10^{08}**	**-0.659497**	**0.5184**

Model 3:

Model 3: The determinants of population growth in Nigeria model, tests the effects of changes in annual GDP, labour force, annual health expenditure and corruption level on annual changes in population. The model showed how Nigerian population changes in relation to these variables. This is very important for demographic analysis by policy makers and private businesses during their investments decisions. Thus, model 3 regressed GDP, labour force, health expenditure and corruption on population growth. The result shows that all, except health expenditure, are statistically significant; see table 4.06 and the appendix section for the details about the tests. The test shows the influence of economic growth, labour force and corruption on the growth of population in Nigeria. Thus, population growth in Nigeria is positively affected by level of economic growth, labour force size and participation and the general corruption level in Nigeria. Economic growth has the implication of increasing wealth and making people more prosperous. It tendency to reduce poverty will naturally make people to marry more wives and increase children. Labour is a source of getting income to feed oneself and family, thus as more people get into the workforce, some of these workers will get married. Those, that are already married will increase the number of wives under their custody or increase the number of children they give birth to. Corruption is very harmful to the development of any country in the world. It have tendency to increase the number of poor people in a country, thereby making having children and more wives difficult. Thus, corruption is naturally anti population growth.

Hypothesis Validation

The followings are the major hypothesis that this dissertation set out to test:

H_0: there is no relationship between birth and death rates and the economy of Nigeria.

H_1: there is a relationship between birth and death rates and the economy of Nigeria.

H_0: there is no relationship between population growth, annual health budget, labour forces, corruption level and the economy of Nigeria..

H_1: there is a relationship between population growth, annual health budget, labour forces, corruption level and the economy of Nigeria.

H_0: Nigerian population growth is not influenced by GDP, annual health expenditure, labour force and corruption level.

H_1: Nigerian population growth is influenced by GDP, annual health expenditure, labour force and corruption level.

The result from model 1 shows that economic growth is positively affected by birth rate and negatively affected by death rate. The two variables are statistically significant. Thus, the null hypothesis that says 'there is no relationship between birth and death rates and the economy of Nigeria' is rejected base on strong statistical significant of these variables of 0.000 and 0.000 respectively. Since all the dependent variables are significant, the acceptance of alternative hypothesis is 100%. The second null hypothesis that says 'there is no relationship between population growth, annual health budget, working age population, corruption level and the economy of Nigeria' is accepted as only labour is statistically significant in affecting GDP. The rejection of the alternative hypothesis is at the rate of 75%. The third null hypothesis says 'Nigerian population growth is not influenced by GDP, annual health expenditure, labour force and corruption level'. This hypothesis is rejected and the alternative hypothesis that says 'Nigerian population growth is influenced by GDP, annual health expenditure, labour force and corruption level' is accepted based on strong statistical significance of 0.000, 0.00 and 0.0286, respectively. The rate of acceptance of the alternative hypothesis is 75

Conclusions

The research aimed at investigating some demographic parameters on the effects of birth and death rates on economic and population growths in Nigeria. Model 1 measures the relationship between annual changes in gross domestic product (GDP) as dependent variable and annual changes in the independent variables which are changes in birth and death rates. Thus, the model will try to predict how changes in birth and death rates cause changes in GDP.

However Model 2 is an argumentation of model 1 after inclusion of additional variables to see how the model will perform after adding of other relevant variables. The variables that were included are annual net migration (difference between immigration and emigration), annual health expenditure in Nigeria, total labour force and corruption level. The finding shows that, the level of development of the health sector in Nigeria has significant impact on what happen to death and birth rates, also the level of corruption which is sign of poor governance in Nigeria has significant impact on what happen to annual health expenditure (budget) and by extension what happen to development of the health sector. Corruption and poor governance have detrimental impacts to what happen to the entire economy. Labour

force potential is affected by the size of the total population and labour force is also related to GDP, as active labour force contributes to the growth of GDP.

Multiple regressions were used in model (2 and 3) due to insufficient variables (not up to 30).

Finally model 3 tested the effects of changes in annual GDP, labour force, annual health expenditure and corruption level on annual changes in population. This will show how Nigerian population changes in relation to these variables. This is very important for demographic analysis by policy makers.

Recommendation

We recommend that the subsequent researchers into related economic challenges should adopt more statistical and different variables expected to hinder the positive changes and or bring about any positive changes in the Nigerian economy and world at large.

Suggestion for Further Research

The researchers suggest the adaptation of more complex and advanced statistical tools other than the one employed in this study that could thoroughly looks in to Nigerian population growth and its relationship with economic growth problems for better solutions and resolutions.

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