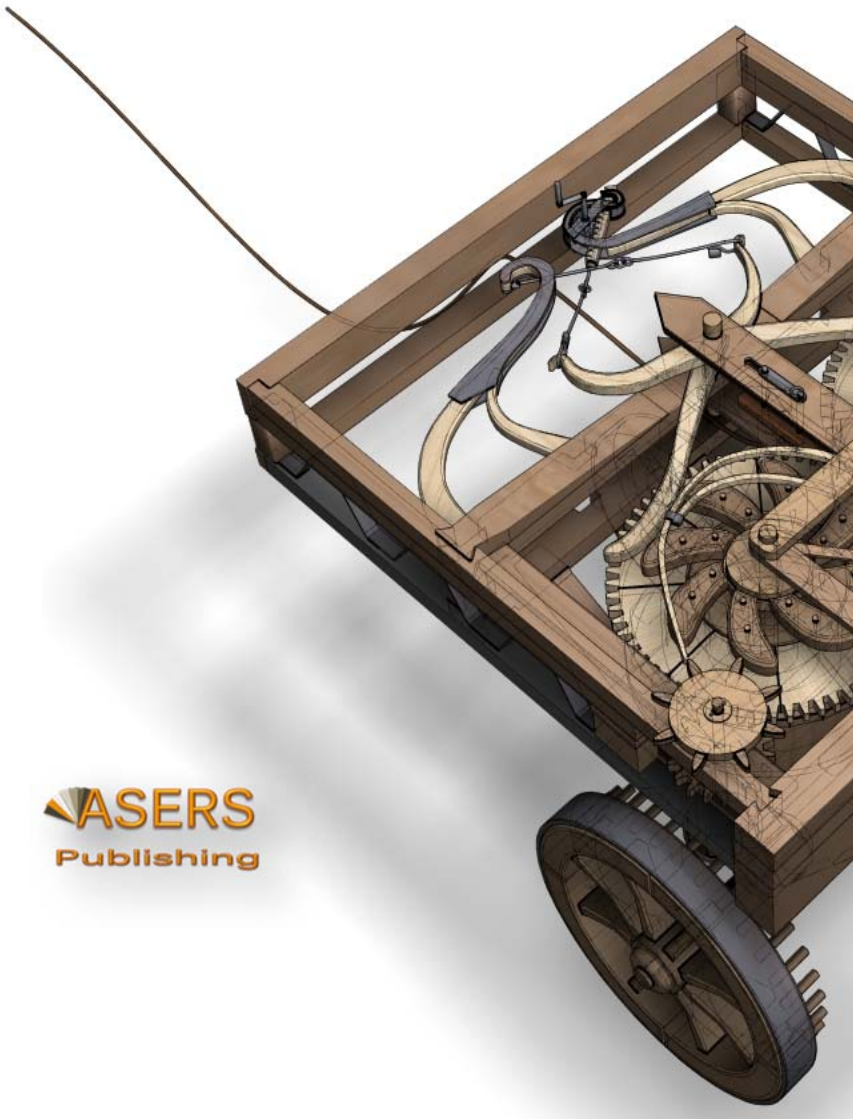
Theoretical and Practical Research in Economic Fields



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DEMOGRAPHIC CHANGES AND ECONOMIC PERFORMANCE IN NIGERIA: AN EMPIRICAL INVESTIGATION

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Abstract:

Demographic changes in Nigeria are associated with divers' outcomes. This ranges from unemployment with figures ranging from 14 percent per annum for the entire population to 30 percent for the youth, coupled with stagnating economic performance. Ordinarily the growth of population could be to the advantage of a country in terms of the sheer size of its domestic market, better division of labour, and increased productivity through improvement in the ratio of labour force to population etc but the story may not always be the same for every economy. This study therefore investigated the extent to which demographic changes in Nigeria impact on economic performance in the country, as well as the direction of interaction between population changes and economic performance in Nigeria from 1970-2016. To achieve this, the study adopted Ordinary Least Squares (OLS) and Autoregressive Model (VAR) and found that fertility levels remain moderately high while the death rate drops especially infant mortality, leading to a larger population in Nigeria. Following the research findings, this study recommends that government should enact strict laws prohibiting early sex and marriage among youths. This early engagement on sex and marriage, the paper argued, will increase the mortality rate in Nigeria as a result of sexual infection, unwanted pregnancy as well as reduction in economic performance of the country. Also, serious public enlightenment campaigns should be mounted by government agencies, the mass media, radio, television, chiefs, churches, schools, mosques, home videos, etc. to send across the message that emphasizes the need and importance of family planning, healthy and improved living conditions for the people through population control.

Keywords: demographic changes, population growth, economic performance.

JEL Classification: J10; J11.

Introduction

In recent times, there have been widely noted demographic changes in Nigeria population, thereby asserting more and more pressure on government spending and general output in the country. It is commonly believed that economic growth leads population to live better, have longer lives and good health. Malthus argued that societies may experience considerable technological and social progress, but maintained that population growth overwhelms the means of sustenance, (Isuigo-Abanihe 2009, Akokuwebe and Okunola 2015, Adenola and Saibu 2017).

Demographic changes have constituted a powerful source of economic performance dynamics. Evidences have shown that one third of the rapid growth in the "Asian Tigers" in the 1970s and 1980s can be ascribed to demographic changes, partly explained by the direct effect of a larger share of workers in the population, and partly by the indirect effect of increased saving and investment (Bloom and Humair 2010) and (Bloom, Canning and Malaney 2000). Nigeria population grows faster than these Asian Tigers, yet one of the economic challenges facing Nigeria is the low GDP growth rates. Does this have anything to do with demographic changes?

For instance, population indicators in Nigeria show that Nigeria's population has more than doubled since 1960. Presently, based on the last census results 2006, Nigeria's population is over 140million, showing annual estimated growth rate of over 3 percent. It is then a fact that the rate of population increase in Nigeria is clearly unsustainable and; could directly or indirectly affects macroeconomic performance, (Nwakeze and Omoju 2011). As such, the average per capita GDP growth rate for Nigeria in the time period 1976–2010 was only half of the world average, and far below that of the Asian Tiger countries, even with the changing population.

Assessing Nigeria economic performance further, Nathan and Okon (2013) observed that the GDP per capita figures for Nigeria from 2000 to 2010 show that the economic status of the country is significantly worrisome. The contributions of oil rents to GDP for Nigeria indicates that Nigeria is over dependent on oil at the expense of other sectors of the economy and corruption assessment scores suggest that Nigeria is more corrupt, implying weak institutions. Decomposing the economy into oil and the non-oil GDP contributions, non-oil GDP share was 89.28% of overall GDP growth while oil sector contracted by 10% in 2010. And in 2011 non- oil GDP grew by 8.85%, compared with 8.51% in 2010, while oil GDP grew by -0.57% in 2011 compared to 5.25% in 2010. Thus, the non-oil sectors were the major growth drivers of the economy, contributing over 101.22% to real Gross Domestic Product growth in 2011.

Further evidence from the economic performance indicates that the population dependency ratio in Nigeria is over 80 percent while the fertility rate is over 5.01 children per woman. These are high figures compared with world averages, and are associated with poor educational performance, poor health, lower survival capabilities, general resource dilution, and diminished access to public resources, such as health and education, poor quality and low labor force participation by women, low per capita incomes, which are all outcomes known to increase poverty and inequality, (Nkang 2009). According to Fasoranti and Ofonyelu (2013), the Nigeria population changes have been very significant in affecting her age structure of patients demanding for health care. This has resulted in medical innovation in disease treatments and controls. The impacts have been improved fertility rate (through improved health facilities and saving of lives) and reduction in number of the formerly-known chronic diseases in the country, such as leprosy, measles, polio, etc. It is noted that Nigeria's fertility shows no decrease except in 1990s, and then only a moderate decline, (Nwanosike, Ikpeze and Ugbor 2015). A 10% fall in fertility is often taken as marking the onset of a significant population changes; by that measure the Nigerian population changes could be said to be in constant motion, (McNicoll 2011).This evidence is indeed not favorable.

It therefore appears that Nigeria demographic profile creates challenges instead of opportunities. Ordinarily the growth of population could be to the advantage of a country in terms of the sheer size of its domestic market, better division of labour, and increased productivity through improvement in the ratio of labour force to population as well as enhancement of its political and military power. But population growth in Nigeria is 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, (Nwosu, Dike and Okwara 2014).

According to Anaele (2010), the Nigerian economy is unable to absorb millions of school leavers into formal employment. Nigeria for instance, with an annual population of about 3 million leaving school can only absorb about 10% of this in formal employment. This is because the economy's job creation rate cannot keep pace with the school outputs as well as the job-destruction rate. Comparing the unemployment situation with our population size, we can then appreciate the enormity of our population problem. This is compounded by non-

existence of an aggressive population control policy, as the dynamics of Nigerian population continue to reinforce the population increase and its attendant negative consequences on the economy and its people, (Anaele 2010). Hence, it looks like Nigeria has become a mere big country, rather than a progressing economy. This is because, the employment opportunities generated is not sufficient to absorb the country's growing pool of labour. The efforts of governments of Nigeria to feed her peoples and also provide quality social services for them are being frustrated by rapid population growth, coupled with the beliefs about the value of children as gifts from above. One may now wonder if Nigeria has been trapped by Malthusian postulation.

From the fore going, it is clear that discussing the issue of demographic changes and economic performance is very vital. Interestingly, not many studies have investigated this relationship in Nigeria. Few studies such as Adewole (2012) and Nwosu, Dike and Okwara (2014), focused on population and economic growth but this current study takes a deeper look at the dynamics of demographic changes (including other variables) apart from population growth alone. Specifically, this study focuses on ascertaining the extent demographic changes in Nigeria impact on output productivity in the country. It also ascertains the direction of interaction between demographic changes and output in Nigeria. This is pertinent now considering the pattern of demographic changes relative to the economic productivity now. This portends serious economic concern to the nation's economy now. The rest of the paper is structured as follows: Section 2 looks at the review of literature, while section 3 is focused on the methodology. Chapter 4 presents the results and discussion, while the paper is concluded in section 5.

1. Review of Literature

1.1. Theoretical Underpinning of Population Changes

There have been arguments on the issue of population/demographic change and it implication on the economic performance. Prominent amongst such include contributions of the classicalists, the socialist and the new demographic views. Though, population changes was however, made popular by Thomas Robert Malthus, in his arguments about how and why population changes. In his works, *An Essay on the Principle of Population* seeks to explain the natural pushes and pulls of population fluctuation. Malthus' theory consists of principles, the first of which states that human population grows at a geometric rate, or exponentially with each generation. His second principle points to the difference between this geometric rate of growth for human populations and the arithmetic rate of food production, which means that with each generation, the food supply will only increase by the same set number.

Plato in his opinion saw large population as a source of political, economic and military strength of a nation. He maintained that the growth of dense population is generally favourable to the maintenance and increase of imperial power. Economists such as J.S. Mill and J.M. Keynes supported his theory whereas others, especially, sociologists, have argued against it. According to them, the widespread poverty and misery of the working class people was, not due to an eternal law of nature as propounded by Malthus but to the misconceived organization of society. Socialists like Marxist-Lenists on the other hand argue that resources are not always scarce to care for the changing population, but the problem lies more with how they are distributed in the society. Karl Marx went one step further and argued that starvation was caused by the unequal distribution of the wealth and its accumulation by capitalists. It has nothing to do with the population changes. Population is dependent on economic and social organization. The problems of overpopulation and limits to resources, as enunciated by Malthus, are inherent and inevitable features associated with the capitalist system of production.

In the Recent time, demographers have generally examined trends in the population with the attendant postulation of demographic transition theory. Demographic Transition theorists believe that countries all over the world will follow trends of the advanced countries. In other words, the Third World countries will ultimately attain demographic stability. The theory suggests that societies pass through the following stages in the process of change. These transition stages are explained as follows:

Pre-transition stage characterized by high and fluctuating birth and death rates with little population growth.

- Stage I: High birth rates and declining death rates with rapid population growth;
- Stage II: Low birth and death rates with slow population growth;
- Stage III: Birth and death rates both decline appreciably leading to zero population growth.

The theory holds that pre-industrial societies were characterized by stable populations which had both a high death rate and birth rate. It postulates a little and slows population growth. The theory states that the high mortality rates characteristic of undeveloped areas will decline before fertility rates which are also high, relative

always resulted in a fall in the standard of living due to the rather severe limits to the technical progress in agriculture as pointed out by Malthus. This prompted Clark, (2007) and Minh, (2012) to state that income levels before the nineteenth century could not escape the Malthusian equilibrium due to the very low rate of technological advance in all economies.

During the transition population, growth and changes in the age structure of the population are inevitable, if appropriate policies are pursued (Ingle and Suryawanshi 2011).

1.2. Empirical Literature

Studies abound that establishes that demographic structure can have be related to economic growth either positively or negatively. For instance, Wei and Hao (2010) studied demographic structure and economic growth in China. The paper focused on the economic influence of demographic change in the Chinese setting from1989 to 2004. Adopting the growth equation, the empirical results of their work showed that changes in demographic structure have helped to improve the economic growth in China since 1989. Song (2013) in another study, examined the effects of demographic changes on economic growth from 1965 to 2009 in thirteen Asian countries. Using OLS regressions which was ran using pooled data, the results revealed that the young population and the total population had negative growth impact on the economic growth of the selected Asian countries. On the other hand the ratio of the working population showed positive impact on economic growth in those countries in the study.

Another paper written by Crespo, Cuaresma, Lutz and Sanderson (2013) utilized the dynamic panel GMM methods in investigating the relationship between education, age structure, and economic growth in 105 countries. The results clearly showed that there is no evidence that changes in age structure affect labor productivity once the effect of human capital dynamics is controlled for. The paper concluded that since it is the key in enhancing productivity and income growth, the advancement in human capital development is to be given serious consideration. Furthermore, Wang (2013) analyses the economic and distributional effects of demographic transition using the integrated recursive dynamic computable general equilibrium (CGE) model. The results revealed that due to nature of the demographic transition in China coupled with high cost of labor force, the population aging slow down China's economy growth rate. Again, Zhang, Zhang and Zhang (2015) in their paper examined the economic implications of demographic age structure in the context of regional development in China. In order to extend the development accounting framework, the authors incorporated age structure which was duly applied in the use of a panel data set of 28 Chinese provinces. Their outcome states that changes in age structure, as reflected by shifts in both the size and internal demographic composition of the working-age population, are significantly correlated with provincial economic growth rates.

In another recent study, Adenola and Saibu (2017) investigated the relationship between demographic change and economic growth in Nigeria. The study adopted fully modified ordinary least square estimation technique, and the results reveal that among the several macroeconomic variables that may affect economic growth in Nigeria, exchange rate, inflation rate and fixed capital formation were observed to be significant drivers of economic growth in Nigeria while population changes is insignificant (although positive). The paper concludes that for population growth to ensure sustainable ling run growth, the economic productive capacity of the nation must be expanded.

To empirically investigate the impact of population changes on output performance, Onwuka (2005) tests the association between population growth and economic development in Nigeria between 1980 and 2003 and found that growth in population outweighs that of output and this has hindered the capacity of successive governments to efficiently provide social services to the people, thereby negatively affecting development. The study contention, that curbs on population growth through appropriate policies that would integrate the country's population programmers into the mainstream development efforts are necessary so as to witness higher per capita consumption of social services by the citizens which ultimately would boost their access to the benefits of development. The same conclusion was made by Kudrna, Chung and Woodland (2015) in the dynamic fiscal effects of demographic shift in Australia.

Similarly, Nwosu, Dike and Okwara (2014) adopted time series from 1960 to 2008 to investigate role of population growth on economic growth in Nigeria and how economic growth is effected through population growth. The empirical results support evidence of unidirectional causality between population growth and economic growth. The study also found that there is a sustainable long run equilibrium relationship between economic growth and population growth. The study suggests that Government should make concerted effort to check population growth rate. The study concludes that any population growth that occurs too fast will have diminishing returns or create a circumstance where economic growth is stagnating.

Adopting a different methodology, Adewole (2012) examines the effect of population on economic development in Nigeria using trend analysis with the scope spanning between 1981 and 2007. The study revealed that population growth has positive and significant impact on economic sustainability proxied as real gross domestic product (RGDP) and Per Capita Income. Though, Nikulina and Khomenko (2014) noted that interdependence of demographic and economic development of a region can be confirmed by identifying demographic and economic process channels. Considering the demographic changes in particular, changes in cohort size, female labor force participation and migration, influence the dynamics of wage rate profiles Anders (1992) suggests that there are demographic effects on wage rate profiles, although they are usually rather small. On the other hand, Sarel (1995) examined the effects of demographic dynamics on the measured rates of economic growth. The study however found relative productivity among different age groups. While, Anna-Maria and Shankha (2014) asserted mortality transition that is not accompanied by improving morbidity causes slower demographic and economic change.

1.3. Demographic Efforts and Policies in Nigeria

A country's population level depends on its fertility and mortality rates and the changes of these two rates are determined by population policy. Population policy is a government's effort to plan or influence demographic variables such as fertility, mortality and migration towards national development, (World Economic Forum 2014).

In Nigeria National population plan or policy was notably absent and government denial of the need for birth control until 1988. Official statements mildly in support of birth control began to be issued in the 1970s, and a National Population Council was established to formulate and coordinate policy in 1988. The national policy on population was put in place with the main aim of reducing population growth rate through voluntary fertility regulation. The policy encourages the voluntary regulation of the number of children which a woman should have to four, with the year 2000 set as the target year by which 80% of the woman should attain the limit (Ojo 1997 and Anaele 2010). Of course, this initial effort encountered policy inaction persistently.

Eventually, some strengthening of goals took place under President Obasanjo on January, 4, 2004 policy statement that called, inter alia, for "progress towards demographic transition to reasonable birth rates and low death rates." Full country-wide access to contraceptive services was envisaged and the target set of a decline in total fertility of 0.6 children every five years. Within this era, Nigeria's demographic profile has been characterized by high growth, its youthful nature – almost half of the population is under 15 years of age – rapid urbanization, high adolescent maternal mortality and high-risk pregnancies, (McNicoll 2011).

Consequently, the country's National Population Policy 2006 cited in Anaele (2010) was based on certain key principles and targets:

- To achieve a balance between population growth rate and available resources;
- To achieve a reduction of the national population growth rate to ≤ 2% by the year 2015;
- To achieve a reduction in total fertility rate of at least 0.6 children every five years;
- To reduce the infant mortality rate to 35 per live birth by 2015;
- To reduce the child mortality rate to 45 per 1000 live birth by 2015;
- To reduce maternal mortality ratio to 125 per 100,000 live birth by 2010 and 75 by 2015.

This implies that there is concomitant effect of population factors on the well-being and quality of life of all Nigerians. Following adoption of the national population policy, an institutional framework for implementation of the policy was put in place in 2008, comprising the National Council on Population Management to be chaired by the president, a population advisory group and a population technical working group. A strategic plan was approved in 2008 and a multi-sector, multi-tiered approach to implementation was adopted, (World Economic Forum 2014).

With all these, implementation of the national policy has been dismal. As a consequence, Successive DHS surveys record Nigeria's women and children still have high preventable morbidity, maternal mortality, early marriage and adolescent pregnancy with the resulting complications. The country has a persistently high, unmet need for contraception among women in all states (just 10% of currently married women were using a modern method of contraception, chiefly condoms and injectables) and across all geopolitical zones, ethnic and religious groupings, (NDHS 2008).

However, Nigeria's commitments announced at the London 2012 Summit are yet to be fully implemented despite initial optimism. The commitments include increasing the federal government's budget allocation for family planning commodities to $11.5 million annually, at least until 2016, to raise the contraceptive prevalence rate by 2% annually and save the lives of 23,000 women, (World Economic Forum 2014). Effective management of the National population program is a national priority which demands the commitment and support of all

stakeholders, policy makers in government and private sectors, Non-governmental groups, mass media and the general public.

2. Methodology and Models

The objective of this study is to examine the nature of causation between economic performance in Nigeria and demographic changes and also check the actual impact of demographic changes on economic performance in Nigeria. To achieve the above objectives, the Ordinary Least Squares (OLS) method and Autoregressive model (VAR) were adopted because of the inclusion of other variables of interest apart from the core variables population growth rate and real Gross Domestic Product which was used as a proxy for economic performance. The Ordinary Least Squares (OLS) method was adopted as a result of the intuitive nature and mathematical simplicity compared to maximum likelihood (Gujarati and Porter 2009). Vector autoregression (VAR) is a statistical model used to capture the linear interdependencies among multiple time series. VAR models generalize the univariate autoregression (AR) models by allowing for more than one evolving variable. However, a simple log-linear regression will be used in analyzing the effect of population growth on economic performance in Nigeria from 1970 to 2016 and it is expressed as;

$$RGDP = f(POP) \tag{1}$$

The equation (1) is bi-variable model specification of the effect of population changes on economic performance. We can extend the bi-variate model into a multivariate regression model till maintaining Occam's razor's Principle of parsimony, by using some demographic variables or indicators to depict the population changes. This is, these indicators will give us a true picture of the effects of population changes on economic performance in Nigeria, thereby reduce the pressure on the error term, as well as giving us a better prediction. This is stated as thus:

$$RGDP = f(PopR, Mort, FR, LF) \tag{2}$$

Equation (3) can be expanded further by including other control variables that affect population.

$$RGDP = f(PopR, Mort, FR, LF, Health, ExEdu) \tag{3}$$

Thus, we can express the econometric form of the model (equation 3) in logarithm to measure percentage change, or the growth rate in economic performance (RGDP) for an absolute change in the regressors (demographic variables). Special feature of the double-log model is the assumption that the elasticity coefficient between the dependent and independents remains constant throughout. Another feature of the model is that $\hat{\alpha}$ and $\hat{\beta}_t$ are unbiased estimates of α and β_t, and the slope coefficient β_t measures the elasticity of Y with respect to X, that is, the percentage change in regressand (Y) for a given (small) percentage change in regressor (X), (Gujarati 2004).

$$InRGDP_t = \alpha_o + \beta_1 InPopR_t + \beta_2 Mort_t + \beta_3 InFR_t + \beta_4 InLF_t + \beta_5 Inhealth_t + \beta_6 InExEdu_t + \mu_t \tag{4}$$

where: RGDP = real gross domestic product proxy for economic performance, Mort. = mortality rate, FER = fertility rate, LF = labour force, Heal = health expenditure, Edu = expenditure on education, and In = natural logarithm.

This model is in line with Malthus postulation, which he argued that population growth is becoming over populated and available resources are timeless and not enough. This study further expresses the nature of interaction between population changes and economic performance, using Granger causality test. This is to determine the direction of causality between economic performance proxy by real gross domestic product and population changes components (variables). The demographic indicators used here to proxy population changes are; mortality rate, fertility rate, labour force, health expenditure and expenditure on education. The Granger causality functional form can be specified as follows:

$$RGDPt = \sum_{i}^{n} \alpha_1 pop_{t-i} + \sum_{j}^{n} \beta_j RGDP_{t-j} + \varepsilon_{1t} 5 \tag{5}$$

$$pop_t = \sum_{i}^{m} \alpha_i RGDP_{t-i} + \sum_{j}^{m} \beta_j pop_{t-j} + \varepsilon_{2t}$$

Note: pop_{t-i} in equation (5) is proxy for all the demographic variables that will be entering the model as noted in equation (4). This is in attempt to keep the model specification concise. Again, we will extend this Granger test to multivariable causality through the technique of Vector Autoregression (VAR). This is because of VAR's ability to consider multivariate equations, where ε_t's are the impulses or innovations of the VAR model. We shall apply the probability value at 5% to ascertain the direction of Granger causality between the variables of interest. The study covers the periods from 1970 to 2016. The choice of the period is due to availability of data. The data was obtained from Central Bank of Nigeria Statistical Bulletin and World Development Indicators.

3. Results and Interpretation

The unit root test is carried out to know whether the mean value and variances of the variables are time invariant, that is, constant over time. The unit root test for stationarity is applied using the Augmented Dickey Fuller (ADF) test at 5% critical value and the result is presented below as Table 1 with the null hypothesis being that the series has a unit root if the t- statistics is less than the critical value at (5%), otherwise the study rejects. The summary of the result is presented below as Table 1.

Table 1. Unit Root Test Result summary

Variables	ADF stat	Crit.value at 5%	Order of Integration
RGDP	-6.010889	-3.518090	I(1)
FERT	-11.04112	-3.634233	I(1)
POP	-3.451753	-2.951125	I(1)
LF	-6.87119	-3.523623	I(1)
MORT	-4.92898	-3.526609	I(1)
HEAL	3.121431	-2.931404	I(1)
EDU	-4.50493	-2.93694	I(1)

Source: Researchers' computation

From Table 1, it can be observed that all the variables were stationary after taking their first difference. This means that these variables were integrated of order one; I (1). The variables were tested basically at 5% critical. The models were further subjected to the test of multicollinearity and it was confirmed that there is no pair-wise correlation coefficient that is in excess of 0.8, hence, they cannot be said to be collinear.

Furthermore, the augmented Engle-Granger (AEG) test was employed to validate the co-integration test hypothesis which state that; reject H_O if the absolute value of the ADF test statistic is greater than the absolute critical value at the chosen level of significance for the generated residual series; otherwise, do not reject H_O. The result of the co-integration is presented in Table 2 below:

Table 2. Co-integration test result

Variable	t-ADF	Critical values		
		1%	5%)	10%
μ_{t-1}	-6.174988	-3.689194	-2.971853	-2.625121

Source: Researchers' computation

From the Table 2, since the absolute value of t-ADF is greater than the critical values, at 5% level, that is |-6.174988| > |-2.971853|, we therefore do not reject H_o and conclude that there exists cointegration among the variables *i.e*. there is a long run relationship among the variables of the model at the chosen critical level. Hence are co-integrated. This result differs significantly from Anaele, (2010) and Adenola and Saibu, (2017) who found that no long run relationship exists between population changes and economic performance.

The existence of cointegration among the variable of the model which we verified above necessitates the need for the postulation of the Error Correction Model (ECM). This model aims to link the short run dynamics with the long run equilibrium. In the ECM, the coefficient of the differenced variables reflects the short run dynamics. In this model, all the variables conform to the a priori expectation, except labour force. The coefficient of -0.134065 implies that about 13% (-0.134065 x 100%) of the equilibrium error will be corrected in the next period. The result of the ECM is presented Table 3.

From the result, error correction model (ECM) showed that demographic changes in Nigeria significant impact on economic performance in the long run. However, the ECM revealed that Fertility rate, Mortality rate and Labour force have negative impact on economic performance in the short run, while Education expenditure and health spending have positive impact on economic performance in the short run. This shows that present

value of the dependent variable adjusts more slowly to changes in the independent variables (demographic variables). Although, the negative effect of labour force on economic performance can be associated to unemployment that characterized the Nigerian labour Force.

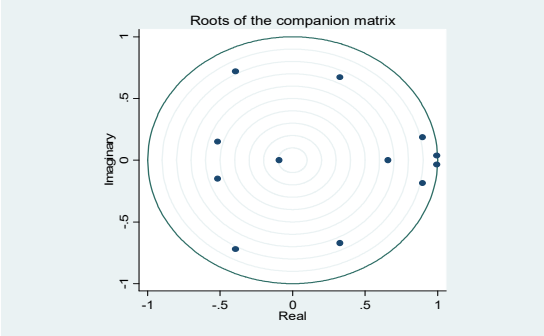
Table 3. The Error Correction Model result

Variables	Coefficient	Std Error	t- Statistic	Prob.
C	1.5	1.9	0.792649	0.4364
D(Pop)	5.71	6.35	0.899348	0.3782
D(Fert)	-1.01	2.80	-0.361986	0.7208
D(Mort)	-3.27	1.04	-3.144363	0.0042
D(Edu)	6.889207	3.490476	1.973716	0.0611
D(Lf)	-0.161844	0.064809	-2.497236	0.0205
D(Heal)	3166342.	627088.3	5.049276	0.0000
ECM(-1)	-0.134065	0.065937	2.033226	0.0543
	R^2 = 0.618706	Adjusted R^2=0.514716		

Source: Researchers' computation

To ensure sufficient condition of the model prescription, the study carried out a stability test on a VAR model, since the result of the model will be used for forecasting. Essentially, the necessary and sufficient condition for stability is that all characteristic roots lie inside the unit circle, (Nwanosike and Okafor 2015). In other words, using the Eignevalue stability condition, VAR satisfies stability condition if all the Eigenvalues lie inside the unit circle. The result obtained in this study is graphically presented as follows in Figure 1.

Figure 1. VAR satisfies stability condition



Source: Researchers' Estimation using Stata

From the above diagram, it is evident that all the Eigenvalues lie inside the unit circle. Thus, VAR satisfies stability condition and any form of forecasting done with the model is reliable. Hence, the model is not a spurious regression. The models having satisfied the pre-diagnostic tests, therefore further the analysis by presenting the results of the OLS regression estimates for equations (4) which captures the extent population changes in Nigeria impact on economic performance in the country.

Table 4. OLS Regression Result for model 1: Dependent variable = log[6] (RGDP)

Variables	Coefficient	t-stat	p-value	
Pop	7.757954	3.94852	0.0003	
Fert	31.21959	5.45348	0.0000	R^2= 0.9512
Mort	-1.706062	-0.32314	0.7484	
Edu	0.217529	2.21155	0.0333	Adj R^2 =0.9433
Health	4.725715	1.666347	0.1041	
LF	5.135786	3.06220	0.0041	F-Prob=0.0000
Const	-203.1868	-4.20260	0.0002	

Source: Researchers' computation

[6] The log form of the variables was used to scale down the data and measure the rate change of both the dependent and independent variables.

The result is presented Table 2, where real gross domestic product (RGDP) is proxy for output productivity, is used the dependent variable, (see Table 2). From the regression result in Table 2, the signs of its coefficients conform to the standard economic theory which postulates that population changes enhance economic performance. The R^2 is 0.9512, implying that the model explained about 95% of the total variation in economic performance (real gross domestic product). The t – statistics reported in the table 2 are all significant except the t- statistic for expenditure on health and mortality rate which could imply that effort on health sector through funding to reduce mortality rate. While the F - probability of 0.000 suggests that the overall model is significant and hence the results are robust and reliable.

From the result, the coefficients of the variables, expenditure on education, labour force and fertility are positive and in conformity to the standard economic theory supporting them. For instance, the elasticity of economic performance (RGDP) with respect to population growth is about 7.7580, suggesting that if population growth increases by 1 percent, on average, the economic performance will increase by about 7.76 percent, while a percent increase in labour force, on average, will result to 5.14 percent increase in economic performance as in line with the postulation of economic theories. This implies that the percentage change in regressand (economic performance) for a given (small) percentage change in regressors (Pop, LF, Mort, Heal, Edu and Fert) are summarized in Table 2 about. This is in agreement with Adewole (2012) and Nwosu, Dike and Okwara (2014) findings that there exist positive relationship between population growth and economic development in Nigeria from 1960 to 2008.

In testing the objective two of this research work which is to determine the direction of interaction between population and economic performance, a mulit-variate Granger causality test was conducted as specified in equation (5). 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 .

Table 5. Summary of Granger Causality Test at lag (1)

VARIABLES (LAG 1)	RGDP	FERT	MORT	EDU	HEAL	LABOUR
RGDP	0	133.04* (0.000)	30.946** (0.000)	10.186** (0.000)	360.91* (0.000)	12.116* (0.000)
FERT	2.5833 (0.275)	0	20.042** (0.000)	0.42427 (0.809)	18.96** (0.000)	5.5985 (0.061)
MORT	15.214** (0.000)	337.07** (0.000)	0	3.1737 (0.205)	96.182** (0.000)	88.788** (0.000)
EDU	19.27** (0.000)	7.1144 (0.029)	3.9909 (0.136)	0	35.942** (0.000)	2.6072 (0.272)
HEAL	7.0676 (0.029)	44.608** (0.000)	14.461** (0.000)	21.289** (0.000)	0	6.9575 (0.031)
LABOUR	4.15 (0.126)	46.204* (0.000)	14.257** (0.000)	0.19103 (0.909)	7.0423 (0.030)	O

Researchers' computation using STAT 11.0

The granger causality null hypothesis states that Y does not Granger cause X. From the Table 3, there exist a causal relationship between the asterisk (*) variables in the model at the 5 percent level of significance. That is, there is a causal relationship between LABOUR & FERT, RGDP & HEAL, RGDP & LABOUR, RGDP & FERT, FERT & RGDP, FERT & EDU, FERT & LABOUR, MORT & EDU, EDU & FERT, EDU & MORT, EDU & LABOUR, HEAL & RGDP at 5% level of significance as in line with Nwosu, Dike, and Okwara (2014). The result is summarized in the Table 3.

Hence, the null hypothesis X does not Granger because Y is rejected at the 5 percent level of significance where "X and Y" represents the cause and effect variables. The result further shown that there is no causal relationship between and among the non-asterisk (*) parameters at 5% level of significance for LABOUR & EDU, FERT &RGDP, FERT & EDU, FERT & LABOUR etc as show in the Table 3.

In other words, the null hypothesis of X does not Granger because Y is accepted at the 5 percent level of significance. Furthermore, the result shows uni-directional causality between RGDP & FERT, RGDP & HEAL, RGDP & LABOUR and LABOUR & FERT as shown in the causality table with one asterisk (*). All other variables marked and indicated with two (**) exhibited bi-directional causality effects as shown in the Table 3. Note that the values in the brackets represent the probability values at two degrees of freedom.

4. Discussion and Findings

The study reveals fertility rate and mortality rate as the true determinants of population changes in the economy. Following the arguments of the research findings, the Nigeria population growth rate of 3.3 per cent per annum suggests a population doubling with the implications of the increasing rate for the future size of the population, and the ability of the economy to grow commensurately to cope with the increase in population size. The study found that the fertility rate remains moderately high of about 31% while the mortality rate drops to 1.7% especially infant mortality. Children under five are no longer dying at such high rates due to improve healthcare (high health and education expenditure), leading to a larger population in Nigeria.

The results of our estimate from 1970 -2016 confirm study's a priori expectation about crude population growth (proxy with fertility and mortality rate) and economic development in Nigeria. A priori, an increase in the crude population growth rate through increased birth rate and decrease in the death rate will induce economic growth to accelerate. From the study, a 1% increase in crude population growth leads to 7.8% increase in the output productivity. This is relatively and could be attributed to poor population planning technique and implementations which have resulted to unemployment in Nigeria. This finding is in line with the observation of Anaele (2010) that the policy of reducing number of births without placing upper boundary on the number of children a family should have is a serious flaw. Population policy must be concerned with controlling the number of persons in a country, the rate of growth, among others, hence, it is not out of place to specify the number of children a family should have.

The study further revealed that high population growth in Nigeria is not proportional to economic performance and growth in the country. Early studies like Adewole (2012) and Nwosu, Dike and Okwara (2014) asserted that population growth influence real gross domestic product (RGDP) positively. This can be justify by uni-direction causality between RGDP and Labour force in Table 3. This could be so because labour force in Nigeria is dominated by unemployed man power (labour force). In principle, high number of working-aged people implies more productivity and more economic growth. The opposite is the case in Nigeria situation. No wonder NUDP, (2012) observed that 14 million Nigerians are unemployed, and that unemployment rate increased 19.7% in 2009, 21.1% in 2010 & 23.9% in 2011. As such, Nigeria is one of the 15 hotspots countries in Sub- Sahara Africa currently experiencing high rates of population growth and high projected declines in agricultural production.

Finally, the result unveiled that at the country's current level of population changes seen to be a burden to development instead of benefit to the economy as postulated by Neo-classicalists that population growth is correlated to technological advancement and positive economic outcomes. This is deducted from the result in Table 2 where health expenditure (Heal) has negative relationship with economic performance. This is similar to Olayinka (2011) argument that population grows but capacities of the population are not developed to sufficiently drive growth, hence, the majority of the population will be experiencing poor health care or have low life expectancy.

5. Policy Recommendations

From the research findings on demographic changes and economic performance in Nigeria, the following research policy recommendations were suggested:

- There should be a Reversal of the legislative law permitting 11 years old children to engage in sexual intercourse. This is because early engagement on sex and marriage will increase the mortality rate as a result of sexual infection, unwanted pregnancy and complication from child bearing. Hence, the legislation should rise the minimum age for sexual affair to 14 years, which is the average puberty age. It will help to reduce population growth especially reduction in total fertility rate of at least 0.6 children and infant mortality rate to 35 per live birth.
- There should be law and it implementation on the number of children a couple is to born. The Nigeria population policy talks of reducing number of births without placing upper boundary on the number of children a family should have. To achieve a reduction of the national population growth rate identified in the work to 2 percent or lower, the government must stipulate maximum number of children a couple can have and oversee the implementation. And there must be an incentive from the government to those that adhered to the rule as well as Provision of family planning services.
- Provision of employment through functional industrial base and economic growth against poverty. This is because increase in greater opportunities for the population through industrialization is positive drive for economic performance and development. Hence, there should be prioritization of education, jobs and health care through increased expenditure on education and health.

- Serious public enlightenment campaigns should be mounted by government agencies, the mass media, radio, television, chiefs, churches, schools, mosques, home videos, etc. to send across the message of the need and importance of family planning, healthy and improved living conditions for the people through population control.

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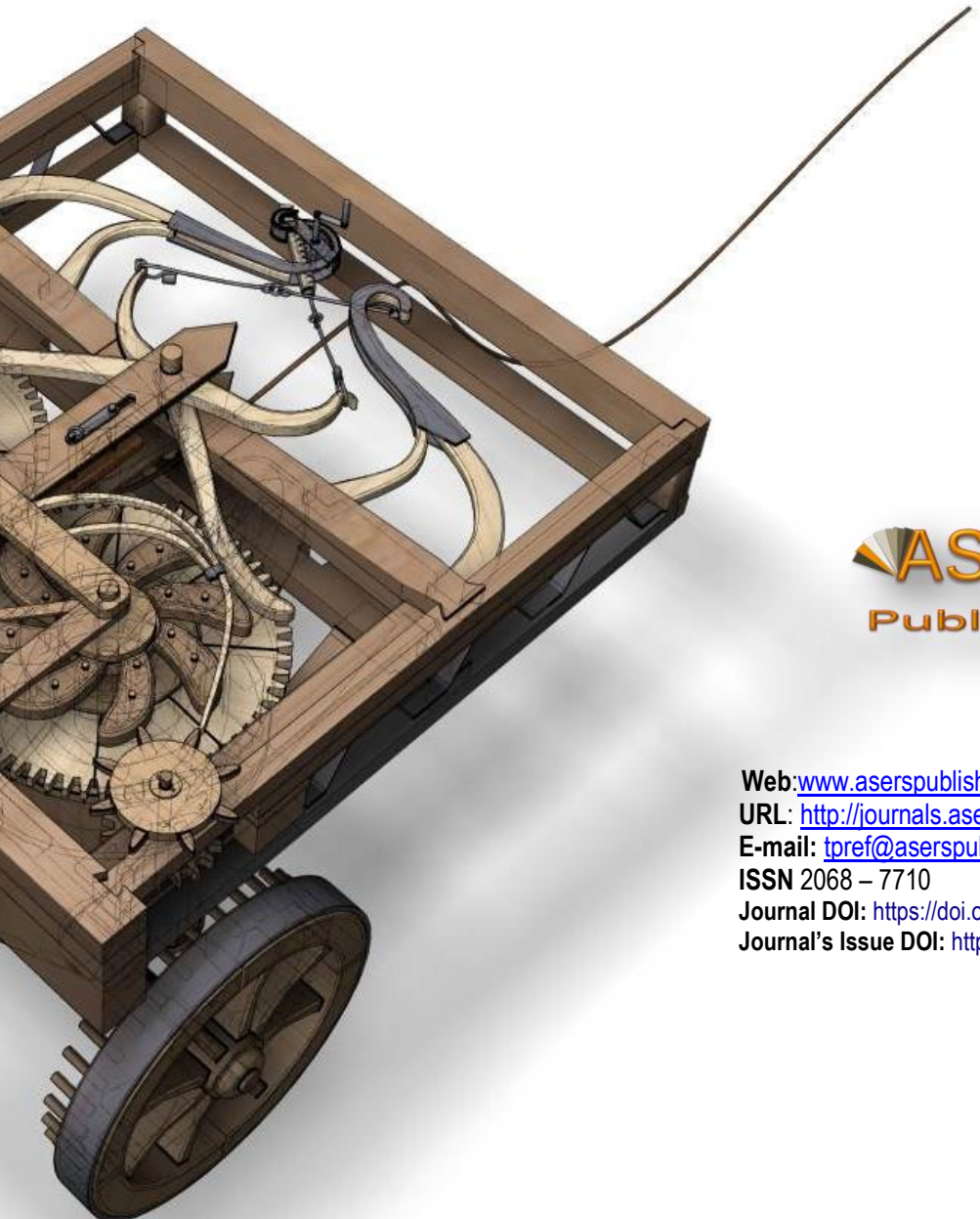

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