Population Growth, Hysteresis and Development Outcomes in Sub-Saharan African Economies – A Case of Nigeria

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Abstract

This study seeks to investigate if unemployment has been persistence and further examines the effect of population growth on the persistence level of unemployment in Nigeria. Consequent upon these, we trace the impacts that both portends for development outcomes in Nigeria for the period 1970-2012. The technique of analysis is the Auto-Regressive Distributed Lag (ARDL) Bound test for long-run impacts and equilibrium conditions while we re-parametised the model for short-run impact analyses. We found evidence for hysteretic unemployment in Nigeria and that population growth does not play a role in the persistence of unemployment (hysteresis) in Nigeria. More so, our results show that age structure does not matter for development outcomes and that Nigeria is not yet undergoing demographic transition. Interestingly, the results further show that unemployment is a causal factor for population growth. While population growth serves as demographic gift for development outcomes in the short-run, it

impacts negatively, albeit negligibly, on development outcomes in the long-run situation. We, therefore, recommend policies and programmes that will improve on the absorptive capacity, engender entrepreneurial abilities and promote prudent economic resources in Nigeria.

Keywords: Population, Unemployment, Hysteresis, Fertility, Development, ARDL.
JEL Classifications: J11, E24, J64, J13, O1, C4.

**For correspondences and reprints*

1. INTRODUCTION

The debate on the effect of increasing population on development outcomes has enjoyed strong research patronage. Yet, it remains an empirical issue less resolved. The population-poverty cycle thesis, which was mainly couched on the standard neoclassical theory that was advanced by Solow (1956), has always provides the needed theoretical proposition for explaining the vicious cycle of poverty due to increasing population. Solow (1956) neoclassical theory was only a refinement of the Malthusian theory which, holds an extreme position and presupposes that the world population has to be controlled so as to avoid global food crisis due to an impending population explosion. On the other extreme of the continuum was the Marxist hypothesis which was anchored on the neocolonial dependence theory of under-development. Marx (1971) posited that increasing population is a desirable phenomenon for growth of economies and its developmental agenda. To him, this was the privilege enjoyed by the developed nations as large population creates large markets for the produced goods and services and, then, translates to increased aggregate demand for these economies. Corroborating this was Rostow (1959) in his avowed stages of development where the stage of high mass consumption (which was enhanced by high population) was considered as one 'cherished' and important stage of development.

These extremes theoretical dichotomy have since provoked empirical investigations into the relationship between population growth and economic development which later led to a hybrid position referred to as the consensus view (Todaro & Smith, 2011). However, this view has produced mixed results too. The examples of the East Asian countries; especially the cases of China and India are very instructive as to the fact that increasing population might not be a problem in itself but non-population factors could. However, the fact that the African region which accounted for a considerable proportion in the world population over the years is faced with the attendant cases of under-development across the economies of African continent suggests no consensus has been reached yet. China and India are the two most populous nations in the world; the former is the second largest economy in the World; after United States, to a tune of US$10Trillion in gross domestic product (GDP) while the latter is not under-performing either (Internet World Stats, 2012). On the ladder of development indices, however, China and India fall way back behind in terms of democratic principles and governance – which serves as the bedrock of voice and accountability. Again, while Africa remains the fastest growing continent; growing at a rate of 5 percent annually; even in the face of global economic cum financial crisis (World Bank, 2010), it is still characterized with high and increasing population indices; accounting for 15.2 percent of the world population (Population Reference Bureau, 2012). Nigeria presents a good example of Africa in terms of highest and increasing population. It is the most populous black nation in the world (seventh in the world) with a population of 170 million in 2012 (Internet World Stats, 2012). Nigeria represents about 2.35 percent of the world's total population and 20 percent of the total population of sub-Saharan Africa and still; the world's 26th largest economy and Africa's largest; worth US$510Billion in 2013 (NBS, 2014) – after the GDP rebasing. Taking it altogether, however, two-thirds of the world's extreme poor are concentrated in just five countries: India, China, Nigeria, Bangladesh and Democratic Republic of Congo (World Bank, 2013).

In Nigeria, the problem of growing unemployment in the face of growing economy; a concept known as jobless growth (see Tella and Ayinde, 2015) could mean that unemployment has remains persistence in the country – a concept

known as hysteresis. On the other hand, we argue that unemployment might not be persistent, after all, if annual increase in population is considered to be continually more than the yearly rate of employment. According to Iweala (2014), about 1.5million jobs are created annually but 1.8million graduated from both the private and public tertiary institutions annually and as such it is only a matter of few years before the alarming rate of unemployment; which appears persistence and stood at 23.9 percent in 2013, vanishes. However, the happenings of a meager 4,556 job openings at the National Immigration Service (NIS) where more than 500,000 graduates applied ran counter to the claim presented above (Punch, 2014). It is in this direction that we seek to investigate the existence of unemployment persistence (hysteresis) in Nigeria; where we further examine the role played by population in the persistence level of unemployment rate (hysteresis) and then assess the implication these portend for development outcomes in Nigeria. Apart from this introductory section, this study is further divided into four other sections. Section 2 review available literature while section 3 set the framework for empirical investigations. In section 4, estimations are conducted and discussions of findings were made while the section 5 accommodates the conclusion and policy recommendations.

2. LITERATURE REVIEW

The theoretical literature on population, (un)employment as well as development outcomes largely revolves around seven propositions which entail the orthodox view including the Malthusian theory proposed by Marx (1971) and the Neo-Malthusian theories championed by Coale-Hoover (1958); the Neo-Classical Exogenous theory pronounced by Solow (1956); the Endogenous thesis of Mankiw, Romer and Weil (1992); the continuum view popularized by Bloom and Williamson (1998) and the revisionists' thesis which encapsulates the three International Population Conferences held at a decade intervals beginning with the first in 1974; and lastly the consensus view which seems to typified the current thinking on the relationship between population changes and development outcomes. Specifically, Marx (1971) envisioned an impending food

crisis due to emergent population explosion and, thus, suggested that the exponentially growing population should be put at check.

A refinement was done to Marx (1971) position by Coale-Hoover (1958) where they predicted that high population growth causes poor socio-economic development due to increasing social expenditure on education and health for the increasing youthful population. Solow (1956) exogenises technological changes and assumed away the effect of human capital development in his neoclassical theory and with the diminishing return to capital, development outcomes is only a reflection of the growing population at the steady state but the latter impact negatively on the latter at the transition stage – a re-affirmation of the orthodox view which was couched on the Harrod-Domar model. Through a re-parameterisation of the Solow (1956) model, MRW (1992) found a 2:1 relationship between population growth and development outcomes but endogenising human capital development; makes the relationship larger to a tune of 1:2 ratio (see Klasen and Lawson, 2007). Besides, the continuum view is popularized by Bloom and Williamson (1998). The two extreme views of this continuum opines that population growth could be a demographic burden if accorded with its attendant negative effects and could also be a demographic gift if followed with its attendants positive effects. Booms and Williamson (1998) posited that as a continuum, the negative effect of population growth occur in the short-run while the positive effects occur in the long-run but the fruition rests largely on some macroeconomic collateral effects. Population growth as a demographic gift lends credence to the market size argument and the human capital development hypothesis.

However, the first revisionist thesis which was pronounced at the International Population Conference in 1974 suggested that a reverse causation with the link flowing from development to population growth on the prediction that it is under-development that produces rapid population. Extending this argument, we posited that the lack of economic empowerment to men and women within the labour force bracket (an analogy for persistent unemployment) could be responsible for increasing population through high fertility rate. Nonetheless, another revisionist theory at the International Population Conference in 1984

predicted the neutrality of population growth and indicated that it does not matter for development outcomes and neither did the reverse relation. Later, a paradigm shift at the International Conference on Population and Development (ICPD) in 1994 re-affirmed the second revisionist theory but introduces a qualitative factor such as human right as a precursor to sustainable development where woman empowerment, equity and equality were considered key factors to population and development-related programmes. Today, the current thinking is that the link between population growth and development outcomes remain inconclusive and complex but the relations hold more for individuals and households than the economy as a whole. The consensus view presupposes that population growth is not the primary cause of development problems but could be detrimental to economic growth and development if rapid.

From the empirical standpoints, Imiosi, Olatunji and Ubi-Abai (2013) investigated the impact of population on the level of unemployment in least developed countries with focus on the Nigerian economy. Their study was completely devoid of any theoretical framework and technique of analysis suffered on the platter of descriptive analyses. Among other factors, the authors concluded that lack of population control was partly responsible for increasing the level of unemployment in Nigeria. Also, Inyang and Simon (2012) examined unemployment and persistent poverty in the Niger Delta Region of Nigeria as a constraint to sustainable development. Their study was also devoid of either any technique or theoretical framework but only provided descriptive statistics. The paper identified unemployment and poverty has impacted negatively on the lives of the people and sustainable development programmes in the region. Again, Priskawetz, Kogel, Saunderson and Scherbov (2004) investigated the effects of age structure on economic growth in India using a probabilistic forecasting. The study followed Bloom and Williamson (1998) framework but introduced probabilistic population projection instead of a deterministic one due to the peculiarity of the Indian economy. The results obtained indicated a negative and significant effect of youth dependency ratio and the output per working age person in the base year and a positive and significant effect of social infrastructure. Given only demographic uncertainty, they found a 95 percent

chance that the predicted growth rate of output per working age person in 2035 will be between 3.8 and 4.6 as against 4.1 percent in 1995-2000. Klassen and Gottingen (2007) examined the impact of population growth on economic growth and poverty reduction in Uganda. The authors employed panel data estimations and found strong empirical evidence that indicated that the high population growth in Uganda put considerable break on her per capita growth prospects.

3. METHODOLOGY

3.1 Theoretical Framework and Model Specification

The theoretical framework for this study largely hinge on the continuum view postulated by Bloom and Williamson (1998) but not without tracing the direction of linkage to properly situate the causal variable between population growth and development outcomes in Nigeria.

Considering the standard neoclassical growth model advanced by Cass (1965) and Koopmans (1965) with the reduced form equation as thus;

$$y^* = X\beta \quad \text{.....(1)}$$

Where; y^* is the steady state income and x is a vector of variables that affect the steady state levels of total factor productivity and capital intensity.

Given an adjustment process to the steady state given as:

$$g_y = \lambda(y^* - y) \quad \text{.....(2)}$$

Where; y is the actual income; λ is the adjustment factor and g_y is output per capita and y* is the steady state income as earlier defined.

Substituting equation (2) into (1) yields and introducing error term ε; we have:

$$g_y = \lambda\beta X - \lambda y + \varepsilon \quad \text{.....(3)}$$

Bloom, Canning and Malaney (1999) modified equation (3) to the income per capita form rather than the form of output per worker in which the model was specified by Bloom and Williamson (1998). The latter authors enthused that both forms equate with a demographically stable economy but the former authors suggested that age structure effect is imperatively included for an economy in transition; yielding:

$$g_{\tilde{y}} = -\lambda_{\tilde{y}} + \lambda \log(\frac{L}{P}) + \lambda \beta X + g_{workers} - g_{pop} + \varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4)$$

Where; $(\frac{L}{P})$ is the worker per capita indicated as the ratio of labour force to total population while the g_{worker} is the growth of working age population and g_{pop} is the growth of total population.

Equation (4) is predicated on the premise that apart from the impact of steady-state population growth on economic growth, the age structure of the population can also matter for economic growth. The age structure of the population is largely determined by the stage of a country in the demographic transition from high to low fertility levels (see Bloom et. al., 1999). This implies that a higher ratio of workers per capita leads to a higher steady state level of income per capita in the long-run. Bloom et. al., (1999) argued that the model specified above indicates that demographic variables only matter in the accounting sense as no change is predicted in workers per capita and, consequently, no impact on income per capita if population growth leaves the ratio of workers to total population unchanged. The authors, thus, contended that a rapidly growing work force may affect income per capita if the economy has difficulties in absorbing new workers. Hence, the empirical model specified below rightly captured investigating unemployment hysteresis on income per capita:

$$g_{\tilde{y}} = -\lambda_{1_{\tilde{y}}} + \lambda_2 \log(\frac{L}{P}) + \gamma_1 gr_{emp} + \gamma_2 gr_{pop} + \gamma_3 \beta X + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(5a)$$

Where; gr_{emp} is the growth rate of employment to capture growth rate of working population in equation (4); X indicates control variable(s); taking in this study the unemployment rate and the fertility ratio. The use of log is to deflate or scale down a volume variable (see Gujarati, 2011). As such, we remove log from the ratio of labour force to the total population (i.e. workers per capita) as a semi-logarithmic specification seeks to transform the implication of the investigation (see Justin & Dinardo, 2009). Since our focuses on unemployment, we reverse gr_{emp} for the rate of unemployment and therefore, we have;

$$g_{\tilde{y}} = \alpha_0 + \alpha_1(\frac{L}{P}) + \alpha_2 gr_{pop} + \alpha_3 fert + \alpha_4 unempr + \varepsilon$$

.....……(5b)

In this study, however, we further modify the dependent variable of growth per capita in the main model of equation (5a) so as to properly situate developmental outcome as a multidimensional concept (Todaro and Smith, 2011). For the indicators of development outcomes, we modified the index developed by Mehrotra (2006) to suit the peculiarity of the Nigerian economy and its developmental pace. Mehrotra (2006) index consist of different indicators of development bordering on health, infrastructure, environment and education. He used air passenger carried per capita, railways passenger of 1000km per annum and telephone main lines in use of 100 per inhabitants as the variables for infrastructure; GDP per unit of energy use of PPP (purchasing power parity) US$ per kg of oil equivalent and carbon-dioxide emission of kg per 1995 US$ GDP as environmental variables; primary and tertiary school enrolment as educational variables while infant mortality rate (per 1,000 live births) and immunization DPT (percentage of children under 12 months) as variables for the levels of public health. Mehrotra (2006) applied weight to these variables with respect to their importance in the cross-country set employed to obtain an index given as;

$$index_{i,j} = \frac{(\text{var}\, i, j - \min\, j)}{(\max_j - \min_j)} \text{.....……...(6)}$$

And a socio-economic development index (SEDI) given as;

$$SEDI_i = \frac{\sum_{j=1}^{J} index_{i,j}}{j} \text{...……..(7)}$$

Where; i denotes across the numbers of indicators and j is the number of countries considered. We modified this composite index into an indicator of development outcomes after considering the fact that our study is a time-series study; unlike the cross-country study of Mehrotra (2006). Also, our choice of variables for the indicators of socio-economic development of health, infrastructure, environment and education is strictly based on the pace of development in Nigeria. Primary and secondary school enrolment are the variables of education indicator; infant mortality rate and life expectancy are

variables of public health. Since Nigeria is said to still be more than 70 percent rural (NBS, 2012), we foreclose on the infrastructural indicator as a component

of development outcomes in Nigeria. Rather than use environment as an indicator, we use energy consumption variable as a variable that is more far-reaching than the former. Also, we consider economic indicator as a strong factor in measuring economic well being of Nigerians and we use the Gross National Income per capita. Instead of using weight within a cross-sectional framework, we obtain the average values of the variables in a time-series study such as this. Our socio-economic development indicator (SEDI) is therefore represented as;

$$SEDI_i = \frac{\sum_{n=1}^{N} \text{var}}{N} \text{.....}\text{.....(8)}$$

The equation above suggests that all the indicators of development as identified above (from the first; n=1, to the last, N) are summed together and divided by the total number of individual indicators and taken as the composite index of the socio-economic development indicator (SEDI) presented within a behavioural framework as thus;

$$SEDI = \alpha_0 + \alpha_1(\frac{L}{P}) + \alpha_2 gr_{pop} + \alpha_3 fert + \alpha_4 unempr + \varepsilon \text{.....(9)}$$

Where; SEDI indicates development outcomes; unempr denotes unemployment rate; grpop is the population growth rate; fert is the fertility rate; (L/P) serves as the workers per capita and ε_t is the white noise error term.

3.2 Techniques of Analyses

The technique to analyze the relationship between population changes, hysteresis and development outcomes follow a systematic procedure where we conduct pre-estimation tests through a battery of unit-root and stationarity tests and in order to trace the direction of linkage for the case of Nigeria, perform the granger causality test. Essentially, we seek to undertake this empirical analysis by formulating and re-parameterizing an Auto-Regressive Distributed Lag (ARDL) model. Through this technique, we will be able to conduct both the long-run and short-dynamics of population changes and development outcomes; as postulated by Blooms and Williamson (1998). The ARDL model – as a dynamic model –has

a rich theoretical documentation in the studies of Enders (1995); Johnston and Dinardo (2009) and Charemza and Deadman (1997). This technique has many

merits over the Engle-Granger Cointegration and it is even more efficient with more valid estimates. This technique is path-dependent and its traces the horizon of impacts which could be immediate, short-run or of long run responses.

The attractions of the ARDL technique over the conventional multivariate cointegration are well documented in the study of Mah (2000) and following Johnston and Dinardo (2009), we can represent the general form, thus;

$$y_t = \alpha + \beta x_t + \delta z_t + e_t$$

.....(10)

In the context of our study, we obtain a compact form of the ARDL form, given as;

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 \sum_{i=1}^{N} X_{t-i} + \beta_3 \sum_{i=1}^{N} Z_{t-1} + \varepsilon_t \quad \text{..... (11)}$$

Incorporating equation (9) into equation (11) yields an autoregressive distributed lag model where the lagged dependent variable (SEDI) coupled with the current and lagged independent variables are added as independent variables. The term $t = 0$ relates to the current variable while T is the number of optimal lag length appropriate for the model specified; which will be obtained through a lag selection criteria.

$$SEDI = \beta_0 + \beta_1 SEDI_{t-1} + \beta_2 \sum_{t=0}^{T} (\frac{L}{P})_{t-i} + \beta_3 \sum_{t=0}^{T} gr_{pop}{}_{t-i} + \beta_4 \sum_{t=0}^{T} fert_{t-i} + \beta_5 \sum_{t=0}^{T} unempr_{t-i} + \varepsilon_t \quad \text{.....(12)}$$

The ARDL technique involves estimating the unrestricted error correction model. Through this model, the short-run effects and long-run equilibrium relationship can be obtained simultaneously. The re-paramatized ARDL model yields the short-run framework for Vector Error Correction Model (VECM) detailed in the equation below:

$$\Delta y_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \Delta y_{t-i} + \sum_{i=1}^{q} \delta_i \Delta x_{t-i} + \sum_{i=1}^{r} \varepsilon_i \Delta z_{t-i} + \lambda_1 y_{t-1} + \lambda_2 x_{t-1} + \lambda_3 z_{t-1} + u_t \quad \text{...(13)}$$

The first part of equation with β, δ and ε represents the short run dynamics of the model whereas the second part with λs represents the long run relationship. The null hypothesis in the equation is $\lambda_1 = \lambda_2 = \lambda_3 = 0$, which means the non-existence of the long run relationship.

For the behavior model of the short-run dynamics, we incorporate equation (9) into equation (13) to yield the model of the equation (14) specified below;

$$\Delta SEDI = \beta_0 + \beta_1 \Delta SEDI_{t-1} + \beta_2 \Delta \sum_{t=0}^{T} (\frac{L}{P})_{t-i} + \beta_3 \Delta \sum_{t=0}^{T} gr_{pop}{}_{t-i} + \beta_4 \Delta \sum_{t=0}^{T} fert_{t-i} + \beta_5 \Delta \sum_{t=0}^{T} unempr_{t-i} + ECM(-1)_t \quad (14)$$

Where; ECM(-1) is the error correction term that indicates how development outcomes would return back to equilibrium when affected by economic shocks. It should be noted that we seek to declare all the variables as endogenous within the Vector Autoregressive (VAR) framework and conduct a lag selection criteria test to choose the optimal lag length while the ARDL bound test operates with the upper and lower critical values provided by Pesaran et. al., (2001). Prior to this test, we conduct the unit-root test in order to ascertain the stationarity of the series as well as variables included in our model. Concomitantly, this also serves as a way to ascertaining if unemployment has been persistence in Nigeria. A unit-root condition of unemployment conventionally suggests its persistence (see Blanchard and Summer, 1986). More so, the unit-root test serves as a precondition to ascertaining the appropriateness of the technique of analysis. Aside that ARDL Bound test is more appropriate for small sample study; the series order must be mix (see Pesaran et. al., 2001).

3.3 Scope and Data Sources

The scope of analysis for this study spans the period 1970-2012. We consider this period interval appropriate for our study as it permits enough time span to investigate the issue of population growth and its consequent effect(s) on unemployment and development outcomes in a developing economy such as Nigeria. This period provides us the benefit of examining the demographic transition of Nigeria as reflected in the fertility rate. The data employed for this study are mainly secondary data. These include the fertility rate and population statistics which were sourced from the World Development Indicator (WDI) 2013 and the National Population Commission (NPC) 2006 respectively; the rate of unemployment are obtained from the archives of the National Bureau of

Statistics (NBS); while the collections of indices for building our composite index of socio-economic development indicator (SEDI) such as the energy

consumption, primary and secondary school enrolment to capture literacy level as well as education attainment in Nigeria, GNI per capita, infant mortality rate and life expectancy as indicator of public health; were all obtained from the WDI (2013). The growth rate of Gross Domestic Product (GDPgr) which was only used for descriptive analysis was obtained from the Central Bank of Nigeria Annual Statistical Bulletin (CBN, 2013).

4 ESTIMATIONS AND DISCUSSION OF FINDINGS

4.1 Descriptive Statistics and Stylized Facts

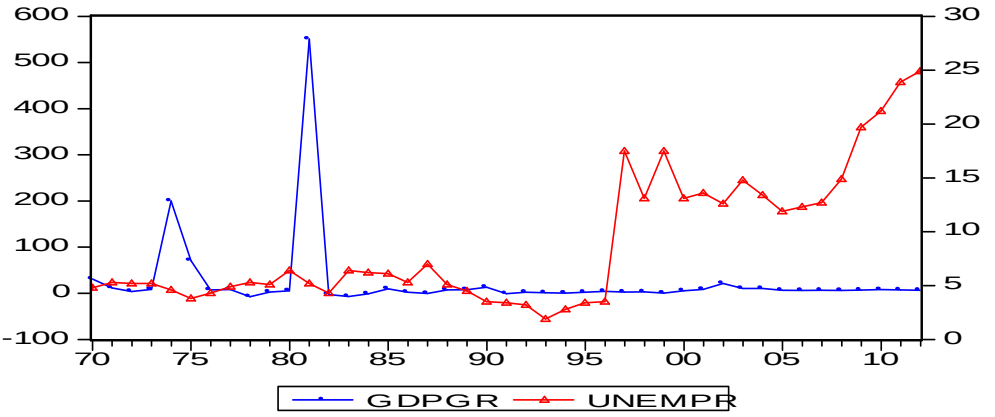
Table 1: Statistical Properties

	POPGR	UNEMP_RATE	GDPGR	SEDI	FERT	LABO_POP
Mean	2.606644	9.023810	24.17099	238.3432	6.249095	0.986122
Median	2.527151	5.700000	6.240432	225.7233	6.302000	0.981453
Maximum	4.018732	24.90000	550.5329	368.6044	6.787000	1.010600
Minimum	2.353444	1.900000	-7.322224	173.0571	5.489000	0.975342
Std. Dev.	0.292908	6.233458	89.10446	49.05188	0.443787	0.010793
Skewness	3.006949	0.995554	5.269448	1.109436	-0.243474	0.712215
Kurtosis	14.12092	2.910180	30.80647	3.530434	1.559300	2.169261
Jarque-Bera	279.7233	6.952008	1547.469	9.108317	4.047288	4.758478
Probability	0.000000	0.030931	0.000000	0.010523	0.132173	0.092621
Sum	109.4791	379.0000	1015.181	10010.41	262.4620	41.41712
Sum Sq. Dev.	3.517596	1593.096	325523.8	98649.58	8.074834	0.004776
Observations	42	42	42	42	42	42

Source: E-views Output

As detailed in Table 1, the statistical properties of these variables indicate only the rate of unemployment (proxied as UNEMP_RATE) and the socio-economic development indicator (proxied as SEDI) are mesokurtic in nature with values of 2.91 and 3.53 respectively. These values hover around the benchmark value of 3.0 for kurtosis. The Jarque-bera statistics suggests that the fertility rate (proxied as FERT) and the worker per capita (proxied as LABO_POP) are normally distributed with probability values of 0.13 and 0.09. This shows that the null hypothesis of normality cannot be rejected at the 5 percent level since the probability values are greater than the 0.05 level of significance. The implication is that both the rate of fertility and that of workers' level of productivity are evenly distributed around the population. However, the population growth rate (proxied as POPGR), the unemployment rate (proxied as UNEMP_RATE), the growth rate of GDP (proxied GDPGR) and the socio-economic development indicator (an indicator for development outcomes – proxied SEDI) with 0.00, 0.00 and 0.01 probability values are not normally distributed around the population of the country. This is so in that the null hypothesis of normality is rejected as the probability values are less than 0.05. The standard deviation show that most of the variables disperse substantially from their mean values. This is especially for the case of growth of GDP (proxied as GDPGR) and the SEDI with 89.1 and 49.05 values respectively (see Table 1).

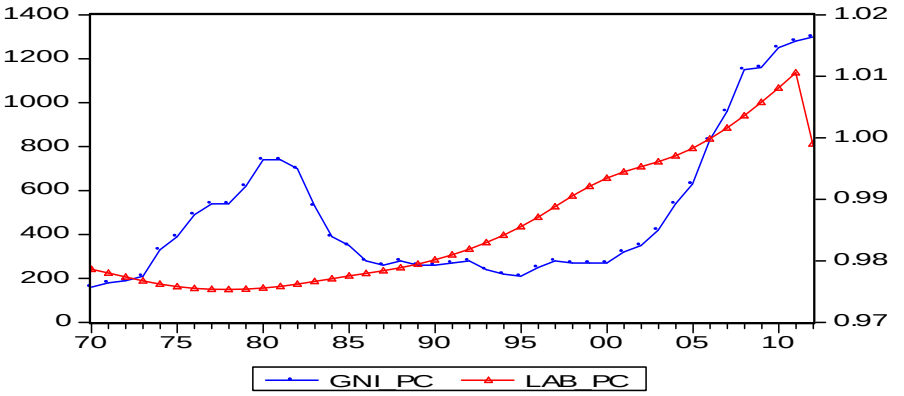
Figure 1: Trend of Economic Growth and Unemployment Rate in Nigeria (1970-2012)



Source: Authors

The trend depicted in figure 1 above shows that the growth process of the Nigerian economy was truly cyclical between 1975 and 2001 with the most volatile period being 1980-1982 with a growth rate of 550 percent in 1981 but declines to negative values between 1982 to 1984 to the tune of -2.7, 7.1 and 1.1 percents respectively. Closely followed is the growth of 200 percent and 70.7 percent for the period 1974 and 1975. Since the year 2005, however, the growth process of the Nigerian economy has stopped oscillating and stabilizes at about 5.5 percent annual growth. For the rate of unemployment, it is instructive to note that very much when the economic growth stabilizes, the rate of unemployment still continues on an upward swing. In 2005, the unemployment rate was 11.9 and continues increasing from year to year since then. Specifically, the rate of unemployment rate for the period 2006 through 2012 were 12.3, 12.7, 14.9, 19.7, 21.2, 23.9 and 24.9 respectively while the contemporaneous figures for the growth rate for the periods 2005 through 2012 were 6.5, 6.03, 6.45, 6.0, 6.95, 7.98, 7.45 and 6.58 percent respectively. This suggests that very much after the growth process of the Nigerian economy has stopped oscillating; its rate of unemployment has continue rising. One implication of this finding is that unemployment is not mean-reverting in Nigeria and does not follow the natural rate of unemployment hypothesis. This signaled the indication of unemployment hysteresis in Nigeria for which we want to account for the role of population growth; and the impact of both on development outcomes in Nigeria.

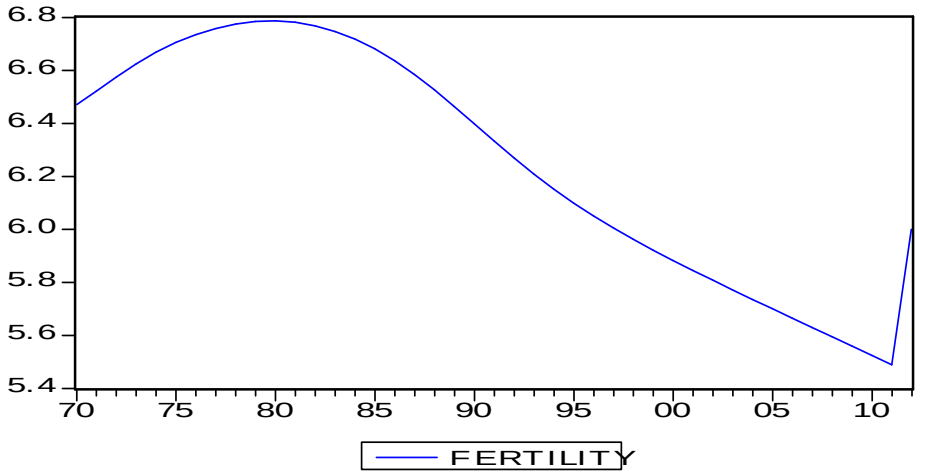
Figure 2: Workers Per-Capita and Gross Income Per-Capita in Nigeria (1970-2012)



Source: Authors

The trend depicted in figure 2 above relates to age structure of population growth on development outcomes (as indicated by the Gross Income Per-Capita) in Nigeria in line with the proposition of Bloom et. al., (1999); for an economy in transition. However, the trend above contradicts the proposition of a positive relationship between workers per capita (proxied as LAB_PC) and income per capita (proxied as GNI_PC) since an inverse trend exists for these two variables in the case of Nigeria for the periods 1970-2011. Specifically, for high workers per capita for the periods 1970-1973; high income per capita exists while for low workers per capita between 1974 and 1989; there exist high income per capita. Similarly, the same contemporaneous trend exists between the two variables in Nigeria for the periods 1990-2005 and 2006-2012 respectively. This implies that the age structure might not necessarily matter for economic growth and developmental outcomes in Nigeria in the long-run. This implies that the Nigeria economy appears not be undergoing a demographic transition into the long-run situation. This is further entrenched with the trend of fertility rate for Nigeria for the periods 1970-2012 (see figure 3 below). The fertility rate decreases continuously since 1983 but picked again in 2011; truncating the seemingly demographic transition process.

Figure 3: Fertility rate in Nigeria (1970-2012



Source: Author

4.2 Estimations and Discussion of findings

Table 2: Unit-Root Tests (Augmented Dickey Fuller Test)

Variable	At Levels	At Order 1	Order of Integration
FERT	-2.0136***a	-	I(0)
GDPGR	-6.4344*a	-	I(0)
LABO_POP	-0.1998	-2.112**c	I(1)
POPGR	-0.7468	-3.6817*c	I(1)
SEDI	-3.4199**a	-	I(0)
UNEMP_RATE	0.5015	-3.6817*a	I(1)

Source: Authors. Note: *, **, * denotes stationarity at the 1%, 5% and 10% level of stationarity significance respectively while [a, b, c] denotes intercept, trend and intercept and none respectively as the test equation included in the unit-root model.**

The unit-root test provided in Table 2 above indicates that the variables for our empirical estimations are divided evenly across being stationary and of unit-root. This is because the fertility rate (proxied as FERT), the growth rate of GDP (proxied as GDPGR) and the socio-economic indicator (proxied as SEDI); as an indicator for development outcomes, are all stationary and non-unit-root at the

10%, 1% and 5% levels of significance respectively; at the the intercept. On the other hand, the workers per capita (proxied as LABO_POP), population (proxied as POP) and the rate of unemployment (proxied as UNEMP_RATE) were all unit-root and all have to be integrated at order 1 before becoming stationary at the 5%, 1% and 1% levels of significance respectively but at different test equation of none, none and at intercept. This lends credence to the assertion by Granger and Newbold (1974) that most economic series exhibit unit-root. Furthermore, the mix of unit-root and stationarity of these series suggests that the most appropriate technique of analyses should be the Auto-Regressive Distributed Lag (ARDL) Bound test which is employed in this study. More so, the unit-root nature of unemployment rate (proxied as UNEMP_RATE) strengthened the trend in figure 1 that the level of unemployment has been persistence in Nigeria (Blanchard and Summer, 1986).

Table 3: Lag Selection Criteria

Lag length	LR	AIC	SC	HQ
4	56.991*	-6.059*	0.405*	-3.759*
3	97.709	-3.570	1.343	-1.822
2	217.090	-0.323	3.039	0.873
1	431.592	6.466	8.276	7.110
0	NA	18.494	18.752	18.586

Source: E-views Output. Note: LR: Modified LR test Statistics; AIC: Akaike Information Criterion; SC: Schwarz Information Criterion; HQ: Hannan-Quinn Information Criterion.

Table 3 above stipulates the optimum lag selection criteria adequate for the Auto-Regressive Distributed Lag (ARDL) framework; as the technique of analysis for this study. The collection of modified likelihood ratio (LR), Akaike Information Criterion (AIC), Schwarz Criterion and the Hannan-Quinn (HQ) criterion suggest that the adequate lag length is at an order of 4.

Table 4: Granger Causality Test

Null Hypothesis	**F-statistics**
SEDI does not Granger Cause POPGR POPGR does not Granger Cause SEDI	74.652 (2.E-13) 0.783 (0.465)
UNEMP_RATE does not Granger Cause POPGR POPGR does not Granger Cause UNEMP_RATE	3.812 (0.032) 0.277 (0.760)
UNEMP_RATE does not Granger Cause SEDI SEDI does not Granger Cause UNEMP_RATE	0.255 (0.776) 0.947 (0.398)

Source: E-views Output – see Appendix. Note: Figures in parenthesis are the probabilities of significance.

Predicated on the null hypothesis that X does not granger causes Y, where X and Y are alternating variables such as the socio economic development indicator; as an indicator of development outcomes; proxied as SEDI, population growth (proxied as POPGR) and the unemployment rate (proxied as UNEMP_RATE); the test indicate that unemployment Granger causes population growth in Nigeria. This is so in that the null hypothesis that unemployment does not granger causes population growth is rejected at the 5 percent level of significance with 3.812 F-statistics ratio with probability values of 0.032. This finding lend credence to the submission established through the first revolutionist theory popularized at the International Population Conference in 1974; that it is the lack of economic empowerment that led to population growth of an economy. It furthers corroborated the second revisionist theory advanced at the International Population Conference in 1984; which presupposes the neutrality of population growth because the null hypotheses that population growth does not Granger causes unemployment rate and the socio-economic development are respectively accepted at the 5 percent level of significance. The coefficient for the former is 0.277 with 0.760 probability values while the latter coefficient is 0.783 with 0.465 probability value. These findings; which are obtained for lag period 2, hold even at the optimum lag length of 4 where only the rate of unemployment granger causes population growth in Nigeria (see Appendix 2B).

Table 5: ARDL Long-Run Equilibrium Condition

F-statistics for Testing the Existence of Long-Run Equilibrium Condition

Computed F-statistics Prob. (F-statistics)	14.99* (0.000)
Bound Testing Critical Values at 5%	Upper Bound: 4.01 Lower Bound: 2.86

Source: Pesaran et. al., (2001) * denotes rejecting the null hypothesis of no cointegration at 5 percent level.

The range of the critical values at 1 percent and 10 percent levels are 5.06; 3.76 and 3.52; 2.45 respectively.

Given the comparison of the computed F-statistics ratio (14.99) and the Upper Bound critical value of 4.01 set by Pesaran et. al., (2001); which are presented in Table 5 as the Bound testing critical values, it suggests that there exists a long-run equilibrium condition among the variables included in the model of estimation. The implication is that the variables have equilibrium condition(s) that keep them together into the long-run situation.

Table 6: ARDL Long-Run and Short-Run (ARDL-ECM) Impact Analyses

ARDL Long-Run Impact Coefficients. Optimal Ordering: (1,0,0,0,0)				**Short-Run (ARDL-ECM) Impact Analyses. Optimal Ordering: (2,1,2,2,1).**			
Variable	**Coefficient**	**T-Stat**	**Prob.**	**Variable**	**Coefficient**	**T-Stat.**	**Prob.**
C	360.186	0.567	0.955	C	19144.1	2.376	0.024
SEDI(-1)	0.984	2.521	0.018	SEDI(-2)	1.589	4.018	0.000
LABO_POP	-5059.942	-0.626	0.536	LABO_POP	-2500.2	-0.068	0.505
-	-	-		LABO_POP(-1)	-14840.04	-2.178	0.037
POPGR	-5.887	-0.131	0.897	POPGR(-2)	74.990	1.967	0.058
FERT	-12.010	-0.099	0.921	FERT(-2)	-382.97	-2.731	0.010
UNEMP_RATE	-0.613	-0.336	0.740	UNEMP_RATE	-1.814	-1.136	0.265
-	-	-	-	UNEMP_RATE-	4.976	1.872	0.071

				(1)			
-	-	-	-	ECM(-1)	-0.866	-2.177	0.037
R^2	0.83			R^2	0.83		
Adj. R^2	0.78			Adj. R^2	0.78		
DW Stat.	1.92			DW Stat.	2.15		
F-statistic ratio	16.08			F-statistic ratio	18.64		
Prob.(F-stat.)	0.000			Prob.(F-stat.)	0.000		

Source: E-Views Output; Note: SEDI is the Dependent Variable for both cases

Table 6 detailed both the short-run and long-run impact analyses of population growth, unemployment and development outcomes in Nigeria. The coefficient

obtained suggests that the previous level of development outcomes (proxied as SEDI) in Nigeria have positively significant impacts on its current level; both in the short-run and long-run situations with 1.589 coefficient and 4.018 T-statistics values for the former and 0.984 coefficient with 2.521 T-statistics value for the latter. For the short-run, the error correction coefficient is properly-signed with -0.866 and significant with absolute T-statistics value of 2.177. The implication is that development outcomes in Nigeria will recover by a spate of 86.6 percent when affected by economic shock annually; suggesting that it takes about a year and one-eight for full recovery back to the equilibrium level. In the short-run, the previous levels of the duo variables of population growth (proxied as POPGR(-2)) and rate of unemployment (proxied as UNEMP_RATE(-1)) both have positive cum significant relationship to development outcomes in Nigeria with a coefficient of 74.990 and absolute T-statistics value of 1.967 for the former; 4.976 coefficient cum 1.872 T-statistics for the latter; at the 10 percent level of significance. In the long-run, however, these variables of population growth and unemployment have negative but insignificant relationship to development outcomes in Nigeria.

The long-run coefficients are -5.887 for population growth and -0.613 for unemployment rate with absolute T-statistics value of 0.131 and 0.336

respectively. Interestingly, the results further show population growth in Nigeria serves as a demographic gift for development outcomes in the short-run but negatively negligible in the long-run situation. However, both the worker per capital (proxied as LABO_POP) and fertility rate (proxied as FERT) are negatively related to development outcomes in Nigeria; both in the short- and long-run situations but significant only in the short-run. This implies that age structure does not matter development outcomes since positive interaction is expected. In effect, these findings corroborates the fact that Nigerian economy is not yet undergoing transition; demographically. The coefficients of determinations and its adjusted components (that is, the R^2 and adjusted R^2) for both the short-run and long-run converge at the rate of 0.83 and 0.78 respectively. This indicates that the variables all together accounted for 78 percent respective movement in the explained variable of SEDI (an indicator for development outcomes) for both the short-run dynamics and long-run situations.

Also, the contemporaneous Durbin Watson statistics of 2.15 and 1.92 for the short- and long-run situations indicate that the model does not suffer from first order serial correlation problem while the F-statistics ratio of 18.463 and 16.08 confirms that the model does not suffer from specification error.

4.3 Diagnostic Tests and Robustness Checks

Table 7: Residual and Stability Tests

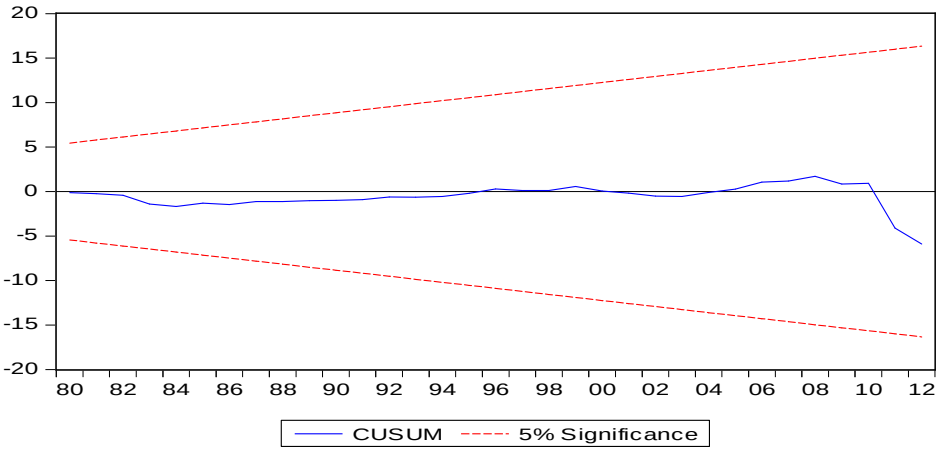
Test Statistics	**F-statistics**	**Prob. (F-statistics)**
Breusch-Godfrey Serial Correlation Test	1.491	0.241
Heteroscedasticity Breusch-Pagan-Godfrey Test	6.914	0.000

Correlogram of Residual	Lag1: 1.696 Lag 2: 0.047	0.193 0.408

Source: E-views Output

The residual tests which are performed on the re-parameterised ARDL model (ARDL-ECM) are to confirm the reliability of the estimates obtained for our analysis and validity for policy suggestions. The serial correlation test of Breusch-Godfrey test, Breusch Pagan heteroscedasticity test and the Correlogram of Residual test tests; except for the Heteroscedasticity test; are most insignificant at the 5 percent level. This suggests that the estimates obtained are valid and reliable. For the stability of our result, the CUSUM test is performed (see figure 7 above). The diagram show that the results obtained lie between the confidence interval and do not jolt outside of the bound.

Figure 4: Stability Test



Source: Author

5. CONCLUSION AND RECOMMENDATION

This study concludes that there is presence of unemployment persistence (hysteresis) in Nigeria and that; due to the acceptance of the null hypothesis that

population growth do not granger causes unemployment; population growth does not play a role in the persistence of unemployment (hysteresis) in Nigeria. More so, age structure does not matter for development outcomes and we further found that Nigeria is not yet undergoing demographic transition. Unemployment is a causal factor for population growth and the otherwise does not hold while population growth, as a demographic gift, is only a short-run phenomenom for development outcomes in Nigeria as it negatively but negligibly matter for the long-run situation. From the foregoing, the following policy suggestions are recommended:

- Since population growth serves as demographic gift but impacts negatively, although negligible, on development outcomes in the long-run, government should embark on policy programmes that will allow for improved absorptive capacity; through increase economic opportunities, of the growing population in Nigeria.
- Given that unemployment granger causes population growth, the government should stimulate aggregate demand in the economy and provide enabling
-
-
- environment to engender the entrepreneurial abilities of Nigerians; especially the women-folks.
- On the basis that age structure does not matter for growth and development outcomes in Nigeria; government should ensure education and human capital development of different age grade; especially the youthful population, are made more qualitative and creative as this would ensure the active population of the economy is made productive to contribute substantially to the economy.
- Since Nigeria is not yet undergoing demographic transition, there should be more prudent economic resources and sound fiscal policy management to ensure that the per capita income increase tremendously**.**

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