
THE ECONOMICS OF POPULATION STRUCTURE IN NIGERIA

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ABSTRACT

The study examines the economics in the Nigerian population structure to reveal the dynamics and potentials of the population beyond the almost 200 million persons. The theoretical and empirical literature is replete with contenting debates and outcomes of the effect of population but few have analysed the discuss of population structure, especially in the context of populated developing countries like Nigeria. The descriptive narrative from the J Billeter index indicated that Nigeria population is a youthful population, which pose a huge potential and sensitive to economic growth. Hence, the prospect for economic growth (demographic dividend) hangs on the investment in human capital especially in equipping the dominating working-age population and economically engaging them. if not a demographic disaster is expected in the form of restive and unemployed youths.

1.0. Background to the study

Population of a country, which is the number of persons living in that country, have come to mean different thing to the demographer and the economist (Sinding, 2009). Malthus (1798) called it human population. The demographer sees population as the "scientific study of human populations, primarily with respect to their size, structure, and development according to the Van De Walle Multilingual Demographic Dictionary in 1982. They study fertility, mortality, and migration from a variety of different viewpoints including sociology, economics, anthropology etc. to capture all about human population. In addition, population economists analyse the application of economic analysis to the study of human populations, including size, growth, density, distribution, and vital statistics of population in an economy.

To the economist, policymakers, and economy planners, population projections are used to measure future demand for food, water, energy, and services, and to forecast future demographic characteristics. It is further used to know how many able and dependent persons are in such economy, how much is can be saved and invested in human capital. It can go a long way to predict future economic growth, welfare, and health situations to come. From a population structure according to Charles and Philipp (2014), the old dis-save, while workers save; the more

old people there are, the less saving there will be and more consumption with expenses especially medical expenses and care mostly from the working-age population. Hence, the structure of a population in an economy means a lot for economic development in such an economy.

UN 2011 report showed world population adds 82 million yearly mostly in less developed countries. Population is a great challenge to enduring economic growth and spells doom for highly populated economies (Malthus, 1798). Yegorov (2009) captured how population density reduces endowment per capita and influences demand of monopolistic product (stimulate technologists) in an optimal population density for economic growth, but did not recognise the dynamics and potential in the age structure of the population density for economic development (Boserup, 1965). Population structure of high working-age (15-64) is an asset for economic growth (demographic dividend) if equipped with requisite skill and engaged productively (Bloom, Canning, and Sevilla, 2003). UN press (2013) asserts that Nigeria population is one of the fastest growing (2.7% as at 2014) and is projected to be the third most populous nation in the world behind India and China in 2050. Hence, the examination of the economics of population structure in Nigeria (WDI, 2015).

To Allen (1999), there are both important positive and negative impacts of population growth. Population is a critical factor in development plan of any nation and germane to have a count of the number and structure of population (Okafor, 2004). According to Udaabah (2002), population is central problem of economic development, especially when the population of a nation expands fast as national income. Hence, reducing per capita income and affecting other socio economic fabric of an economy. Malthus (1798) opined that human populations grow exponentially (i.e., 1, 2, 4, 8, 16, 32, 64, 128, 256, doubling with each cycle) while food production grows at an arithmetic rate (i.e. 1, 2, 3, 4, 5, 6, 7, 8, 9, repeated addition of a uniform increment in each uniform interval of time, usually 25 years per cycle). With this scenario of arithmetic food growth with simultaneous geometric human population growth, Malthus predicted a future when humans would starve. To avoid such a catastrophe, Malthus urged control of population growth as a way out without looking at the structure of human population. Bloom Carvani and Servila (2003) emphasised human population is a critical issue; it is the structure of the population that matters with respect to economic growth. From the study of population to the demographers and economists, a benefit from population called demographic dividend was hypothesised. This is when the majority of the population are in the working-age bracket. Such population structure avails an economy more economically active population that would save and contributed to economic growth if equipped with the requisite skills and engage in economic activities (Bloom and Canning, 2006). This would practically flood an economy with quality human population that increased the rate of production more than what Malthus

professed and save take care of the other groups in the population structure. From audit of developed nations, nations have practically took advantage of population structure to develop with the right economic policies in place. In addition, developing nations like Africa and Nigeria in particular is blessed with youthful population (Ekperiware, 2016). However, the prospect of this window of opportunity to develop may be an illusion if the right policies such as investment in human capital formation and employment opportunities to make such labour force additive in the production process of such an economy.

Evidently, the single most vital economic topic in a population census is to determine who is economically active and who is not for policymaking (United Nation, 2009). The 2001 UN Human Dev Report (UNHDR) showed that under 15 years in the UK, Ghana, and Zambia were 19.1%, 41.1%, and 46.5%. Their Population growth rates are 0.1%, 2.1%, and 2.3%. Mortality rates per 1,000 are 6, 63, and 112 respectively. Evidently, their educational and economic development status indicated that the UK standard far above Ghana and Zambia. This clearly showed that the most important thing the developed nations often look at is the quality of the population than the number. Hence, the importance of examination of the Nigerian population structure and economic growth performance from 1970 to 2014 is germane. Hence, this study examines the economics in the Nigerian population structure to reveal the dynamics and potentials of the population beyond the numbers.

2.0. Literature Review

The literature presents studies of countries with varied population structure and size, but how this correlates with human capital formation and economic growth are examined here.

The literature is replete with diverse theoretical viewpoints on the nature of economic growth with respect to structure of population as well as the quality of the population.

2.1. Theoretical Literature Review

The importance of population structure in relation to economic development has attracted several postulates of economic theories of population. In deference to the orientation of this study, it is needful to look at three polarised theoretical perspectives of population structure: population size, youthful population, and aging population, and in an economy, or it's the quality of the population that matters? These has also generated three theoretical schools of thought on population; the pessimists, optimists, and neutralists. The optimists believed that population is an asset for economic growth, the pessimists see population as anti-growth, while the neutralist or the liberal school is indifferent, that population can be positive or negative to economic growth

depending on other factors such as age, the quality of the population and the opportunities available for the population.

Theoretically, the debate of population growth and population structure, which matters for economic development, is increasingly gathering momentum. The Solow-Swan growth model established the linkage between population growth and economic growth (Barro and Sala-i-Martin, 2004). In addition, many previous studies in economics on the subject matter had adopted the model. The neoclassical model, which assumed constant return to scale and diminishing marginal return to factors of production, the output per worker is a function of capital per worker, which is determined by savings per worker, population growth, and capital depreciation rates. While at the Steady-State, output per worker is constant and the total output grows at the rate of population growth, the population growth rate is critical in determining the steady state in the first place as Malthus postulated (1798). If the population growth rate decreases, the steady-state level of output per worker increases. Thus, the Solow-Swan model theoretically predicts a negative impact of population growth on economic growth at steady state. More so, if the population is dominated with dependent population ratio than independent population ratio, this put pressure on savings and reduces per capita income in the society (Coale and Hoover, 1958, Yegorov, 2009).

Population pessimist like Malthus (1798) believed population is detrimental to economic development, as it tends to hike up demographic overhead while overwhelming capital accumulation. On the other hand, population optimist or boomster like Bloom et al., (2003) stressed the importance of population growth in advancing productivity, promoting technological innovation and capturing economies of scale with the right economic policies (Kuznets 1967 and Simon 1981). Still, some studies found no significant effects of population growth on economic growth, giving rise to population neutralism or liberal population theory.

Furthermore, besides population size with respect to economic development, the population structure of such size has come to be relevant for economic policies and development. Literature holds that a working-age dominating population accounts more for economic growth than non-working population. The global life expectancy is 65 years, and this is projected to increase to 75 years by 2050 with Japan having the highest life expectancy since 2000 (Weil, 2006; Bloom et al., 2010; Lee et al., 2011). Most of the literature also argues that there is a negative relationship between population ageing and economic growth (Bloom et al., 2010; Walder and Döring, 2012).

Nagarajan, Teixeira, and Silva (2016) highlighted the main mechanisms through which population ageing affects economic growth: consumption and saving patterns, public social expenditure, and human capital. The fall in income after retirement has enabled households to adjust their consumption and savings according to their financial capacity hence their investment

too. Hence, an elderly household will alter its savings, investment, and consumption substantially after retirement (e.g., Nardi et al., 2010; Aguila (2010); Aguila et al., 2011).

Increase in retirement age and immigration, according to some studies has in fact help to overcome the decrease in the labour force and the negative effect of aging population and economic growth (Bloom et al., 2010; Peng and Fei, 2013). Elgin and Tumen (2010) further state that as switch from traditional production (with young workers) to new human capital oriented production (with elderly workers) would reduce the effect of decline in human capital as a result of aging population. Hence, with proper policies, ageing population will affect neither production or growth dynamics. Elgin and Tumen (2010) also stressed that modern economies rely more on machines than the labour force. Thus, with technology and experience, aging population would have significant effect on productivity.

However, contrasting view of this phenomenon holds. According to Lisenkova et al., (2012), increase in retirement age will help to offset a decreasing labour market, but workers of different ages are not perfect substitutes and so there will definitely be a decline in productivity per worker. Hence, population ageing will decrease a country's stock of human capital and subsequently exert a negative influence on economic growth as observed in some empirical studies of countries with aging population (Narciso, 2010; Ludwig et al., 2011).

In summary from the theoretical review showed that there is more to population than laying emphasis on the total size of the population of an economy. Looking at population in general would mislead the exact influence and opportunities policy thrust would be to contribute to economic development in any economy. Hence, emphasis on the structure of the population avails the opportunity to split population of an economy into different grouping that pose different implications and prospects on economic development rather than look at the population in general. Such population groupings are; dependent population, independent population, child dependent ratio, age dependent ratio, working-age population, aging population, growing population, economically active population, economically dependent population, pre-productive population, productive population, and post-productive population (Ekperiware, 2016).

The structure of population also entails the age structure and dependent and independent population of a country.

Beside a clear difference between labour-force and working-age population (Weber, 2010), there is a correlation and sometimes used interchangeably, where there is total willingness of able working-age population as in this study. The working-age group of a population is the most economically active and human asset in a country. There are also other grouping like general dependency ratio (DR), child dependency ratio (CDR), aged dependency ratio (ADR),

and economic dependency ratio (EDR). The DR focuses on the number of children and aged persons in comparison to the working age group.

$$WP = \frac{P_{15-64}}{P_{total}}$$

$$DR = EDR = \frac{P_{0-14} + P_{65+}}{P_{15-64}}$$

$$CDR = \frac{P_{0-14}}{P_{15-64}}$$

$$ADR = \frac{P_{65+}}{P_{15-64}}$$

$$EDR = \frac{P_{total} - WP}{WP}$$

The EDR is closely connected with production activity index and shows how many people depend on one worker. EDR equals DR when working-age population is the same as labour-force (Weber, 2010). While CDR may be high in less developed countries linked with increasing population, ADR may be associated with developed countries found in the bracket of aging population. However, the Economically Active Rate (EAR), which is rate of the working-age population, is the most promising and crucial for long-run economic growth.

$$EAR = \frac{P_{15-64}}{P_{total}}$$

To capture a growing population based on age, Billeter (1954) further specified population structure into three groups.

- Pre-productive (children generation): age 0–14
- Productive (parents' generation): age 15–64
- Post-productive (grand-parents' generation): age 65+

$$J = \frac{P_{0-14} - P_{65+}}{P_{15-64}}$$

Billeter index shows that a positive ratio indicates pre-productive generation, while a negative ratio reveals aging generation. All these indices have effect on long-run economic growth because they either feed or contribute to economic growth of a nation.

2.2. Empirical Literature Review

Song and Ghosh (2013), using an economic growth model empirically examined demographic change and economic growth in Asia from 1960 to 2009 in the light of the significant demographic changes taking place in Asian countries. The findings indicated negative

effects of growth in the total population and the young population on economic growth while showing positive effects of growth in the working-age population and the working-age population ratio. So the economic growth experienced in the Asian countries can be attributed to the favourable demographic transition to more working-age population.

Bloom, Canning and Malaney (2000), using OLS regressions investigated a two-way causality between demographic changes and economic growth. The study found a negative effect of growth in total population size and positive effect of growth in working-age population on economic growth. Also, a negative impact of higher income on fertility rates was established. Hence, the East Asia economic growth may have been attributed to favourable population structure with dominating working-age population.

Population aging according to Maestas, Mullen, and Powell (2016) is widely assumed to have detrimental effects on economic growth with few empirical evidence of the magnitude of its effects. With USA aging population, they use predicted variation in the rate of population aging across U.S. states over the period 1980-2010 to estimate the economic impact of aging on state output per capita. Their findings showed that a 10% increase in the fraction of the population ages 60+ decreases the growth rate of GDP per capita by 5.5%. They found that two-thirds of the reduction in economic growth is due to slower growth in the labour productivity of workers across the age distribution, while one-third arise from slower labour force growth. They further forecasted annual GDP growth reduction due to population aging by 1.2 percentage points this decade and 0.6 percentage points next decade.

Using bibliometric techniques from 144 articles on ageing population and economic growth gathered from Scopus, Nagarajan, Teixeira, and Silva (2013) found that ageing has increasingly attracted more researchers within economics-related literature, studies have revealed the willingness of researchers to evaluate less immediate mechanisms relating ageing and economic growth in areas like; consumption and saving patterns, and human capital. They also found a growing need in ageing researches to testing economic phenomena with real-world data against economic theory. Multivariate analyses have become more prominent since 2006 with a continuous fall in empirical analyses based on 'Mathematical modelling. The effect of an ageing population on economic growth has been mostly negative, but it does vary with the empirical methodologies used. They also found that very few or a complete lack of studies on developing and less developed countries.

Drummond, Thakoor, and Yu (2014) assert that demographic transition played a significant role in the economic growth of countries like South Korea, Taiwan, Hong Kong, and Singapore. They define demographic dividend as a demographic transition characterised by an

increase in the working-age population, which provides a country with a window of opportunity to optimise higher economic growth. According to Aro (2011), the demographic transition principles through decline in mortality and fertility with a high proportion of the working-age population that fuelled the Asian Tigers' economic growth are available in Africa. Yet, the right policies and programmes are necessary in order to take the advantage of this development opportunity by investing in human capital formation.

Countries that have responded to demographic transition have recorded huge economic progress. Hence, the United Nation (2009) opines that the single most vital economic topic in a population census is to determine who is economically active and who is not. For instance, the United Nations Human Development Report (UNHDR) for 2001 showed that the percentages of the population under the age of 15 in the UK, Ghana, and Zambia were 19.1%, 41.1%, and 46.5% respectively. The annual population growth rates of UK, Ghana, and Zambia were 0.1%, 2.1%, and 2.3% respectively. In addition, infant mortality rates per 1,000 in the same countries were 6, 63, and 112 respectively. This shows that demographic transition has some correlation with economic growth. This is because the UK stands far higher than Ghana and Zambia comparatively in terms of economic development (Goff, 2003). For demographic dividend process to begin, countries must prioritise strategic investments to lower fertility (children per woman), improve health, and invest in human capital. This would lead to having a smaller school-age population and a larger working-age population. A sufficient condition to achieve demographic dividend invest in human capital formation and the pace of job creation to keep up with the number of people that need employment and to maintain high levels of economic growth (Bloom *et al.*, 2003).

The second demographic dividend appears in the form of greater accumulation of wealth and greater investments in human capital. However, one concern is the possibility of more aged population as in the case of China with time (Banister, Bloom, and Rosenberg, 2010). In reality, rapid population growth in Nigeria may slow down economic development (Malthus, 1798). This may further make it difficult for the formation of human capital (education and health) and the reduction of high poverty rate (Rosenzweig, 1987, Bloom *et al.*, 2003:13). A study by Jean-Pierre Guengant for the French Development Agency (AFD) posits a yearly population growth of 2.5 per cent and an economic growth of 5 per cent per annum. This will take almost 30 years to double the income per capita. This is presumed to be a low start if Nigeria wants to catch-up with the rich countries.

In addition, the UN population policy document reported that since 2011 the world population has surpassed 7 billion as was estimated and currently grows at an additional 82 million persons yearly (United Nations, 2013). It further noted that most of the future population growth is expected to occur in developing countries, which is a concern for sustained economic growth. However, human resources development could significantly reduce the concern about

population and, in fact, be an engine of economic development (Bloom *et al.*, 2003:39; Harry, 2010; Ajibade, 2013).

According to Weber (2010), variables responsible for demographic changes (population structure) are; fertility rate, mortality rate, and migration. Fertility rate, which is the average number of children a woman bears during her lifetime, affects population dynamics, sociological reasoning in terms of declining family size in younger cohorts, and economic rationale because of high expectations of young people and income decline (Weber, 2010). Migration is the permanent or semi-permanent change of normal residence for a person, a family, or a household from one location to another also accounts for demographic change. Hence, population structure is changes through the flows of births, deaths, and migration. The structure of population also entails the age structure and dependent and independent population of a country.

Another study that contributed to the debate of population growth and economic growth is Gideon, Gachanja, and Obere(2013). They examined three assertions concerning population, these include; population growth stimulates economic growth, population growth adversely affects economic growth, and population growth is a neutral factor in economic growth and it is determined outside standard growth models. They studied these relationships between economic growth and population growth in Kenya using Vector Auto Regression (VAR) estimation technique with annual time series data for the period 1963 to 2009. The results indicated that population growth and economic growths correlate positively, and that an increase in population affected economic growth positively in Kenya. The test showed that causality runs in both directions. The bi-directional causality runs from population growth to economic growth, and vice versa. This portrays that a mutually reinforcing bilateral causality between population growth and economic growth existed in Kenya. Hence, the study supports the first assertion and a feedback mechanism.

In another similar study, Ceyhun and Semih (2012) were interested in providing answers to the question, ‘can sustained economic growth and declining population coexist?’ Their theoretical framework predicted a constant creation of young workforce towards human capital-oriented technologies that support an ageing population called ‘endogenous efficiency-augmenting mechanism. This is to replace the increasing degree of falling returns to human capital in traditional production technologies. The study disclosed that the degree of increasing returns to human capital has been falling over time in the world along with population growth rates, and increasing returns to human capital and population growth rates. This suggests that sustained economic growth and a declining population can coexist through the long-run endogenous efficiency-augmenting human capital mechanism.

In a granger causality study, Tsen and Furuoka (2006) studied the nexus between population and economic growth in Asian economies. The study revealed a bidirectional granger causality between population growth and economic growth for Japan, Korea, and Thailand. For

China, Singapore, and the Philippines, unidirectional causality drives from population growth to economic growth. For Hong Kong and Malaysia, economic growth granger causes population growth. No causality was found between population growth and economic growth in the case of Taiwan and Indonesia. This shows that, the relationship between population growth and economic growth is not straightforward. Population growth could be beneficial or detrimental to economic growth and economic growth could have an impact on population growth.

Examining the role of human capital in a high fertility scenario, Akintunde, Olomola, and Oladeji (2013) examined the effect of life expectancy and fertility on economic growth in thirty-five SSA countries from 1970 to 2005. The study is motivated by the high population in SSA and low economic development, compared to other regions of the world. The dynamic panel data analysis show that total fertility rate negatively impacts on economic growth while, life expectancy at birth shows a positive influence on economic growth. The study suggests that SSA region needs to address the high population growth like the developed countries.

Paying emphasis on the demographic transitions and human capital in developed countries, Basu, Barik, and Arokiasamy (2013) examined demographic component in BRICS countries using panel data analysis. They asserted that demographic transition is changes in age structure due to reduction in both mortality as well as fertility. Many developed countries are at the last stage of the demographic transition whereas most of the African countries are at the second stage of it. Good for many developing nations, the second to third stage of demographic transition is associated with the stage of demographic dividend. Demographic dividend according to them is the window of opportunity to a nation for rapid economic growth through human capital development if effective policies are in place. The study reveals that the potential growth of BRICS economies is largely dependent on the skill formation capacity of its working age population. However, life expectancy at birth shows positive effect in BRICS regression, though not statistically significant.

In a comparative study between Nigeria and Ghana, Awobode (2015) examined labour-force participation and economic growth. The study used both descriptive and econometric techniques with time series data from 1990 to 2012 such as female labour-force participation rate, economic growth rate, primary enrolment, secondary enrolment, and fertility rate sourced from Central Bank of Nigeria Statistical Bulletin, Ghana Statistical Bulletin, World Development Indicators, Federal Reserve Economic Data, and International Labour Organisation Statistics. The descriptive analysis showed that Nigeria recorded lower (55.5%) labour-force participation compared to Ghana (70.4%) in 2010. In Ghana, fertility rate and secondary enrolment positively determine female labour-force participation while in Nigeria, only primary enrolment accounts for female labour-force participation. The granger causality test between female labour-force participation and economic growth showed that causality runs from female labour-force to economic growth. The study showed that demographic transition is higher in Ghana than Nigeria

but only recognised the effect of enrolment on female labour-force participation instead of the entire labour-force participation. However, the study failed to examine likely feedback among human capital formation, labour-force participation, and economic growth.

Bashir, Herath, and Gebremedhin (2012) looked at population density and human capital spread. They studied the relationship between higher education growth, population density and economic growth in West Virginia. They used three endogenous variables (income per capita change, education change and population density) in a simultaneous equation with three-stage least squares (3SLS) estimation method from 2000 to 2010. The result indicates that education growth and population density positively relate to income growth in income equation. For higher education equation, one per cent change in income growth increases educational growth by 1.7 per cent. This may be because high income leads to more savings and investment in education. Such savings and investment may further lead to improved educational facilities, healthcare facilities and other local amenities that eventually increase job creation.

For population growth equation, the study showed that highly educated people control family size in West Virginia. This shows that countries that report high initial percentage of income are more likely to have higher growth rate of education compared to other countries. In addition, higher investment in education occurs with higher income level, and the educated were found to be less populated. Furthermore, the revealed significant and positive relationship between unemployment rates and population density indicates that lower income and lower education with high unemployment rate may lead to bigger family sizes.

3.0. *Trend Analysis of Population Structure and economic indicators*

Population structure is in different brackets, described by such parameters as general dependency ratio (DR), child dependency ratio (CDR), aged dependency ratio (ADR), economic dependency ratio (EDR), and working-age population (WP). The ratio of each of these aforementioned parameters has implication for economic growth. This is because population transition at any point in time influences how population affects economic growth (Choudhry and Elhorst, 2010; Wang, Chen and Huang, 2013). An examination of population structure to show how promising (pre-productive and productive stages of population transition) or aging, of the Nigerian population structure is vital (Billeter, 1954).

The DR focuses on the number of children and aged persons in comparison to the working-age group. Hence, this group constitutes the dependent population in an economy. Precisely, it comprises the number of persons that depends on the working-age population in an economy. The DR trend in Nigeria from Table 3.1 peaked in 1987 with 0.92 but in 2014, it dropped to 0.88. Since DR is less than one (1) all through the period, it shows that, in the Nigerian economy, not more than one person is depending on a working-age person and it means

less dependent population than independent population. The DR, also called Economic Dependent Ratio (EDR) if the working-age population is proxied as labour-force of the country, constitute the number of persons the labour-force is taking care of. The EDR is closely connected to the activity index, which also shows how many people depend on one worker. From Table 3.1, it reveals that more of the population is tilting toward independence as EDR fell from 0.92 in 1988 to 0.88 in 2014. This indicates that the population is promising (the country possesses productive-age population) and this could translate to an improved productivity and standard of living in the Nigerian economy if such human resources are productively engaged.

According to Rosenzweig (1987), the higher the dependent population, the lower the ratio at which the economy can provide for human capital formation and eventual economic growth. Bloom et al. (2003) and Bloom, Canning, and Fink (2008) further state that if the number of persons depending on the working population is increasing, there is tendency that savings would fall. A fall in savings will affect human capital formation for both the dependent population and the independent population. This will impede the working-age population acquiring more skills to increase productivity. Table 3.1 and table 3.2 presents the dependency ratio (DR), child dependency ratio (CDR), aged dependency ratio (ADR), economically active ratio (EAR), J Billeter, and life expectancy at birth (LEXPR) while their growth rates are presented in the appendix.

Table 3.1: Summary of Population Dynamics in Nigeria (1970-2014)

YEAR	DR	CDR	ADR	EDR	EAR	J Billeter	LEXP GROWTH
1970	0.8314	0.7797	0.0517	0.8314	0.5460	0.7280	0.975526
1971	0.8394	0.7872	0.0522	0.8394	0.5437	0.7350	1.012492
1972	0.8460	0.7935	0.0525	0.8460	0.5417	0.7410	1.037668
1973	0.8512	0.7987	0.0525	0.8512	0.5402	0.7461	1.053772
1974	0.8550	0.8027	0.0524	0.8550	0.5391	0.7503	1.056611
1975	0.8578	0.8057	0.0521	0.8578	0.5383	0.7536	1.054684
1976	0.8662	0.8137	0.0524	0.8662	0.5359	0.7613	1.052646
1977	0.8714	0.8189	0.0526	0.8714	0.5343	0.7663	1.032695
1978	0.8747	0.8221	0.0525	0.8747	0.5334	0.7696	0.990048
1979	0.8767	0.8244	0.0523	0.8767	0.5328	0.7721	0.923302
1980	0.8780	0.8259	0.0521	0.8780	0.5325	0.7738	0.813672
1981	0.8899	0.8370	0.0529	0.8899	0.5291	0.7841	0.664327
1982	0.8997	0.8461	0.0536	0.8997	0.5264	0.7926	0.501476
1983	0.9074	0.8534	0.0540	0.9074	0.5243	0.7994	0.337584

1984	0.9128	0.8584	0.0543	0.9128	0.5228	0.8041	0.182647
1985	0.9156	0.8611	0.0545	0.9156	0.5220	0.8066	0.04547
1986	0.9215	0.8665	0.0550	0.9215	0.5204	0.8115	-0.05834
1987	0.9237	0.8684	0.0553	0.9237	0.5198	0.8131	-0.11804
1988	0.9228	0.8675	0.0554	0.9228	0.5201	0.8121	-0.13129
1989	0.9194	0.8641	0.0552	0.9194	0.5210	0.8089	-0.11521
1990	0.9137	0.8588	0.0549	0.9137	0.5225	0.8039	-0.0858
1991	0.9127	0.8575	0.0551	0.9127	0.5228	0.8024	-0.05059
1992	0.9090	0.8539	0.0551	0.9090	0.5238	0.7988	-0.02604
1993	0.9031	0.8482	0.0549	0.9031	0.5255	0.7933	-0.00461
1994	0.8955	0.8410	0.0545	0.8955	0.5276	0.7865	0.027626
1995	0.8867	0.8327	0.0540	0.8867	0.5300	0.7787	0.06183
1996	0.8843	0.8303	0.0540	0.8843	0.5307	0.7763	0.09902
1997	0.8799	0.8262	0.0537	0.8799	0.5319	0.7725	0.140038
1998	0.8744	0.8211	0.0533	0.8744	0.5335	0.7677	0.196794
1999	0.8684	0.8156	0.0528	0.8684	0.5352	0.7628	0.273508
2000	0.8624	0.8102	0.0522	0.8624	0.5369	0.7580	0.388892
2001	0.8639	0.8116	0.0523	0.8639	0.5365	0.7594	0.548559
2002	0.8643	0.8122	0.0521	0.8643	0.5364	0.7600	0.71699
2003	0.8640	0.8122	0.0518	0.8640	0.5365	0.7604	0.877456
2004	0.8633	0.8119	0.0514	0.8633	0.5367	0.7605	1.01386
2005	0.8623	0.8114	0.0509	0.8623	0.5370	0.7606	1.111297
2006	0.8673	0.8160	0.0513	0.8673	0.5355	0.7647	1.156993
2007	0.8706	0.8191	0.0515	0.8706	0.5346	0.7676	1.148407
2008	0.8728	0.8212	0.0516	0.8728	0.5340	0.7696	1.090788
2009	0.8741	0.8226	0.0515	0.8741	0.5336	0.7711	1.004789
2010	0.8746	0.8234	0.0512	0.8746	0.5334	0.7722	0.898024
2011	0.8782	0.8266	0.0517	0.8782	0.5324	0.7749	0.789157
2012	0.8807	0.8288	0.0519	0.8807	0.5317	0.7769	0.704721
2013	0.8816	0.8297	0.0519	0.8816	0.5315	0.7778	0.642892
2014	0.8804	0.8287	0.0517	0.8804	0.5318	0.7770	-0.6664

Source: WDI, 2015 and computed by author

$$\text{Where } EDR = \frac{P_{total} - WP}{WP}, \quad DR = \frac{P_{0-14} + P_{65+}}{P_{15-64}}, \quad EAR = \frac{P_{15-64}}{P_{total}}, \quad WP = \frac{P_{15-64}}{P_{total}}, \quad J = \frac{P_{0-14} - P_{65+}}{P_{15-64}},$$

$$CDR = \frac{P_{0-14}}{P_{15-64}}, \quad ADR = \frac{P_{65+}}{P_{15-64}}$$

EDR is the same as DR because in this study the working-age population is proxied as the labour-force of the country. EAR is the same as working-age population because they are the most economically active population that constitute the labour-force of an economy. In addition, where there is a willingness to work in a country, the working-age population is assumed the labour-force of that economy.

The Child Dependency Ratio (CDR) (Table 4.1) includes population aged zero to 14 years of age, which may be high in less developed countries linked with increasing population. The Aged Dependency Ratio (ADR) includes aged population from 65 years and above. This ADR may be associated with developed countries where majority of the dependent population are found within bracket of the aging population. Evidently, Maestas, Mullen, and Powell (2014) examine differential aging patterns (transition) at the state level in the United States between 1980 and 2010 to isolate the effect of aging population on economic growth. Their study 10% increase in the fraction of the population age 60+ decreasing GDP per capita by 5.7%. To capture a growing population based on age, Billeter (1954) further specifies the EDR into three groups.

- Pre-productive (children generation): age 0–14
- Productive (parents' generation): age 15–64
- Post-productive (grandparents' generation): age 65+

J Billeter index (Table 3.1) shows that a positive ratio indicates pre-productive generation, while a negative ratio reveals an aging generation (Weber, 2010). All these indices have effect on long-run economic growth because they either feed or contribute to the economic growth of a nation. Throughout the study period, the Nigerian population structure exhibited positive J Billeter index, which indicates that the Nigerian population is a pre-productive (youthful) population and is promising for long-run economic growth if the required investment in human capital formation is made to equip the youths. The J Billeter index in 1970 is 0.73, it peaked in 1987 (0.81), and in 2014 is now 0.78. The above 50% J Billeter index shows that the Nigerian economy is yet to enter its potential productive generation.

According to Ogunleye (2015), a child education cost about 40 per cent's adult consumption. On the other hand, if more of the dependent population are in the pre-productive age, such economy is promising (pre-productive), as in the nearest future they would enter the productive age group (economic active group), and if equipped with the requisite skills would be an asset to long-run economic growth. Hence, there is a trade-off to sacrifice in the present by investing in human capital for enduring economic growth in the future. The dependent population is of both children and the aged population. An examination of these two groups is also pertinent to substantiate if the population is growing (promising) or aging.

Looking at the Nigerian population structure from economic perspective, the EDR, CDR, ADR, EAR, and J Billeter shows that the Nigerian population structure is youthful and possesses the first requirement for the first demographic dividend. The extent to which such working-age population can be an asset for economic growth and improves the standard of living (second demographic dividend) lies in its ability to possess the skills required in the production process and even create jobs. Hence, a need to examine the trend and place emphasis on investment on human capital formation to ensure that the Nigerian population positively accounts for economic growth. This is because a pool of working-age population with no skill of production would rather be a catastrophe to economic growth (Bloom et al., 2003).

Table 3.2: Growth Rate of Population Structure in Nigeria (1970-2014)

YEAR	GDR	GCDR	GADR	GEAR	GLF	Gbille	GLEXP	GFR	POPG
1970	0.15	0.22	-0.89	-0.07	2.25	0.30	0.99	0.72	2.29
1971	0.96	0.96	0.97	-0.44	1.91	0.96	1.02	0.79	2.33
1972	0.79	0.80	0.52	-0.36	2.03	0.82	1.05	0.81	2.37
1973	0.62	0.65	0.11	-0.28	2.19	0.69	1.06	0.76	2.45
1974	0.45	0.50	-0.27	-0.21	2.39	0.56	1.07	0.66	2.57
1975	0.32	0.38	-0.59	-0.15	2.61	0.45	1.07	0.55	2.72
1976	0.98	0.99	0.69	-0.45	2.47	1.01	1.06	0.43	2.89
1977	0.61	0.63	0.23	-0.28	2.76	0.66	1.04	0.33	3.01
1978	0.37	0.40	-0.10	-0.17	2.92	0.43	1.00	0.22	3.05
1979	0.24	0.28	-0.32	-0.11	2.92	0.32	0.93	0.13	2.99
1980	0.15	0.19	-0.45	-0.07	2.83	0.23	0.82	0.03	2.86
1981	1.35	1.34	1.57	-0.63	2.11	1.32	0.67	-0.06	2.72
1982	1.10	1.10	1.21	-0.52	2.11	1.09	0.50	-0.18	2.61
1983	0.86	0.86	0.88	-0.41	2.16	0.86	0.34	-0.27	2.54
1984	0.59	0.59	0.56	-0.28	2.28	0.59	0.18	-0.34	2.53
1985	0.31	0.31	0.26	-0.15	2.45	0.31	0.05	-0.42	2.57
1986	0.64	0.62	0.98	-0.31	2.33	0.60	-0.06	-0.51	2.61
1987	0.24	0.23	0.51	-0.12	2.54	0.21	-0.12	-0.59	2.63
1988	-0.10	-0.11	0.11	0.05	2.72	-0.13	-0.13	-0.65	2.64
1989	-0.38	-0.39	-0.24	0.18	2.84	-0.39	-0.12	-0.68	2.62
1990	-0.62	-0.62	-0.55	0.30	2.92	-0.62	-0.09	-0.72	2.58
1991	-0.11	-0.14	0.42	0.05	2.64	-0.18	-0.05	-0.72	2.55
1992	-0.40	-0.43	-0.03	0.19	2.75	-0.45	-0.03	-0.74	2.52
1993	-0.65	-0.67	-0.41	0.31	2.86	-0.68	0.00	-0.73	2.51
1994	-0.84	-0.85	-0.72	0.40	2.94	-0.86	0.03	-0.71	2.50
1995	-0.98	-0.98	-0.98	0.47	3.00	-0.98	0.06	-0.65	2.50
1996	-0.27	-0.29	0.00	0.13	2.66	-0.31	0.10	-0.61	2.50
1997	-0.49	-0.49	-0.43	0.23	2.76	-0.50	0.14	-0.55	2.50
1998	-0.63	-0.62	-0.76	0.30	2.84	-0.61	0.20	-0.50	2.50
1999	-0.69	-0.67	-0.99	0.32	2.87	-0.65	0.27	-0.45	2.51
2000	-0.68	-0.65	-1.14	0.32	2.87	-0.62	0.39	-0.41	2.51
2001	0.17	0.17	0.11	-0.08	2.47	0.18	0.55	-0.38	2.52
2002	0.05	0.07	-0.27	-0.02	2.54	0.09	0.72	-0.38	2.53
2003	-0.03	0.00	-0.59	0.02	2.60	0.04	0.89	-0.40	2.55
2004	-0.08	-0.04	-0.82	0.04	2.64	0.02	1.02	-0.41	2.57
2005	-0.11	-0.05	-1.00	0.05	2.68	0.01	1.12	-0.43	2.60
2006	0.57	0.56	0.80	-0.26	2.38	0.54	1.17	-0.45	2.62
2007	0.39	0.38	0.45	-0.18	2.49	0.38	1.16	-0.47	2.64
2008	0.25	0.26	0.12	-0.12	2.57	0.26	1.10	-0.47	2.66
2009	0.15	0.17	-0.19	-0.07	2.64	0.19	1.01	-0.49	2.67
2010	0.07	0.10	-0.46	-0.03	2.69	0.14	0.91	-0.56	2.68
2011	0.41	0.39	0.80	-0.19	2.53	0.36	0.80	-0.65	2.69
2012	0.28	0.27	0.41	-0.13	2.60	0.26	0.71	-0.76	2.69
2013	0.10	0.11	0.04	-0.05	2.67	0.11	0.65	-0.89	2.68
2014	-0.13	-0.12	-0.33	0.06	2.76	-0.10	-0.66	0.85	2.66

Source: CBN and WDI (2015) and computed by author

Where GDR is growth rate of DR, GCDR is growth rate of CDR, GADR is growth rate of ADR, GEAR is growth rate of EAR, GLF is growth rate of LF, Gbilleter is growth rate of Billeter index, GLEXP is growth rate of LEXP, and GFR is growth rate of FR in Nigeria.

A comparative analysis of J Billeter index (productive economy population) and EDR (economically dependent population) in a linear graph (figure 3.1) shows that for each EDR, the J Billeter index is higher over the study period. In economics terms, the J Billeter index shows that a positive ratio indicates pre-productive generation instead of aging generation and it is better than an aging economy as in India (Bloom, 2011).

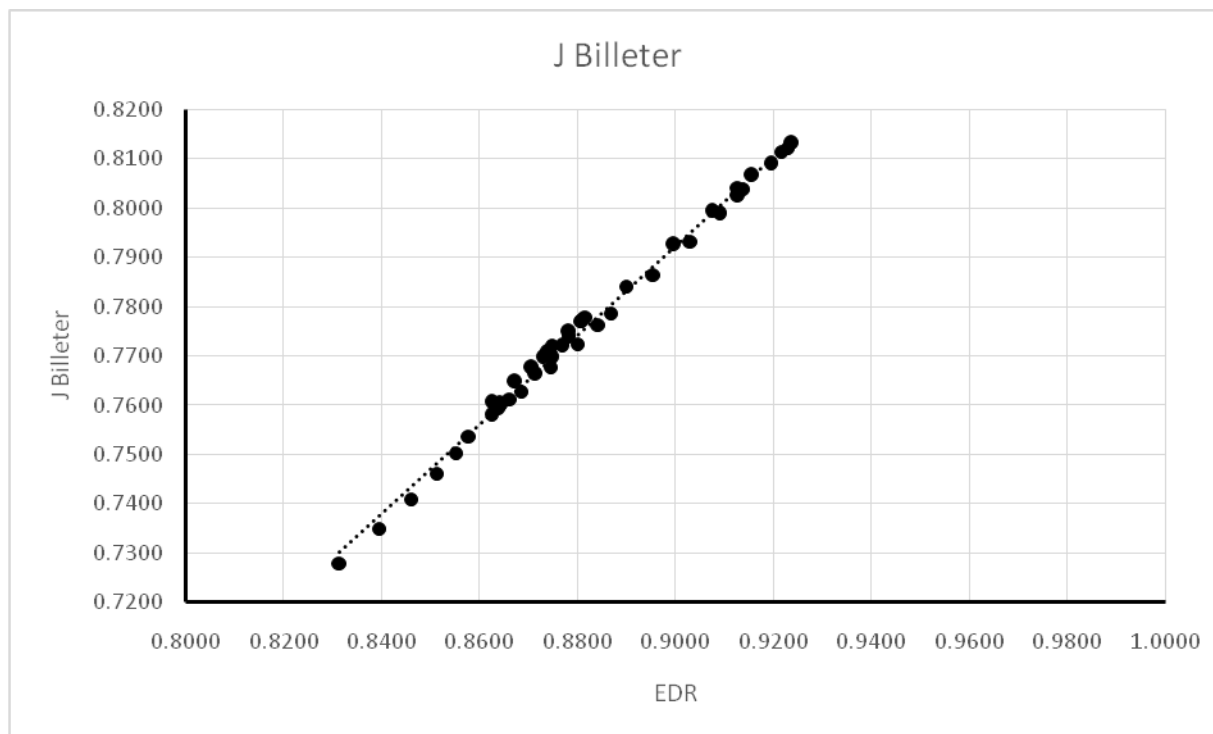


Figure 3.1: **Comparative Trend of J Billeter (Promising Population) and Economically Dependent Population (1970-2014)**

Source: WDI, 2015 and Computed by Author

However, the working-age population (WP) bracket aged between 15 and 64, which mostly include the labour-force (LF), is the most productive and crucial population structure for long-run economic growth. This group of population structure constitutes the economically active population involved in the production process (Weber, 2010). An economy with more of this group of population equipped with education exercises more influences on economic growth (Bloom *et al*, 2003 and Bloom, 2011).

From figure 3.2, the working-age population has always been above 50 per cent of the Nigerian population structure. The highest per cent is in 1970 (54.5%), while the lowest is in 1987 (52.5%). The drop in the working-age population in 1987 might have been because of the civil war that reduced the working-age population in the Nigerian economy. However, the

working-age population is still on the high side as it increased from 53.14% in 2013 to 53.17% in 2014. This clearly shows that more than half of the Nigerian population is made up of the able working-age population ready for productivity in the Nigerian economy if equipped with the requisite skills to do so.

The working-age population is also called the Economically Active Ratio (EAR), which is the ratio of working-age population to the total population of an economy. This bracket of population age is mostly what constitutes the Labour-Force (LF) of a country. It pays an economy to have an increasing EAR. In the Nigerian economy, the EAR (Table 4.1) over the study period was highest in 1970 (55%) and lowest in 1987 (52%). However, the EAR increased to 54 per cent in 2000 and stands at 53 per cent as at 2014. This shows that more than 50 per cent of the Nigerian population is economically active and thus significant to long-run economic growth.

The structure of the Nigerian population shows that the population is youthful and promising for long-run economic growth. It is further pertinent to examine how much the population is growing. Figure 3.2 illustrates that the Nigerian population from 1970 to 2014 peaks at 3.05% growth rate in 1978 and records a low rate of 2.29% in 1970. The Nigerian population has been on a steady increase and in 2014 has 2.66% as its growth rate. This calls for more government investment in human capital to prepare the population for the labour market to ensure an enduring economic growth and not economic disaster.

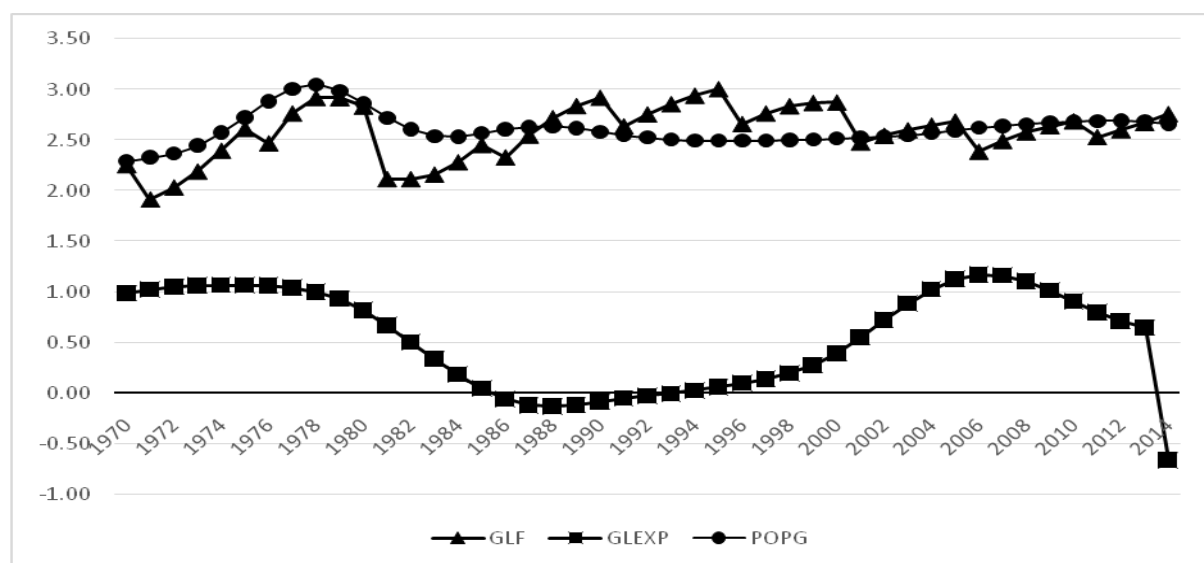


Figure 3.2: Trend Analysis of Population Growth, Working-Age Population, and Life Expectancy at Birth (1970-2014)

Source: WDI, 2015 and Computed by Author

4.0. Summary of the study

The descriptive study took critical look into the debate of population and economic growth in the most populous black nation in the world and the most populated nation in Africa. Studies have found mix results how population influence economic growth in both developed and developing countries. Even among economists and demographers, population and economic growth is contentious. However, looking at population from its growth alone without paying crucial attention to the age structure of the population is observed to distort some economic thoughts about population and economic growth with respect to planning and policy.

Population structure, which shows the different groupings or dynamics of population in the Nigerian economy such as EDR, CDR, ADR, EAR, and J Billeter, are examined from economic perspective. EDR also called DR possesses the highest rate, which shows how many persons depend on a worker in the Nigerian economy. The DR of less than one (1) indicate that less than one person depends on a worker in Nigeria. The second highest rate is the CDR, which describes the pre-productive generation in the Nigerian economy. CDR indicates that the Nigerian economy population has a promising (pre-productive) future according to Billeter (1954). Evidently, the CDR is followed by a positive J Billeter index, which connotes a promising and growing population. The youthful nature of the Nigerian population further confirmed a consistent above 50 per cent working-age population over the study period. This shows that even though the depending population shows high rate, the Nigerian economy has never suffered a situation of scarce labour-force for production process.

Hence, population dominated with baby boom has serious stress with future benefits on economic growth. Population with dominating working-age population is sensitive to economic growth in that if equip with the requisite skills would cause demographic dividend. However, if such dominating working-age population is not equip with requisite skill and engaged in the production process as augmented in the endogenous growth model (Ekperiware, 2016), such population would lead to a demographic disaster through increasing restive youths and increasing unemployment in such economy. In addition, increasing aged population structure has also produced mixed effect on economic growth through saving, investment, and consumption behaviours. However, in the Nigerian context, aged population is not dominating, rather the nation is made-up of youthful economically active population. This requires huge investment in

human capital formation with economic policies to engage such dominating working-age population to contribute positively to economic growth in the country.

5.0. Conclusion of the Study

The descriptive study observed that there is more into the age composition of population (population structure) than looking at population generally (population growth). a population structure with dominating working-age population as in the case of Nigeria where more than 50 per cent of the population are in the age bracket of 15-64 pose huge potential for a demographic dividend if such working-age population is equip with requisite skills and engaged in the production process of the economy through appropriate economic policies. However, such huge working-age population pose a time bomb of youth restiveness and unemployment, which would lead to a demographic disaster.

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