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Population dynamics and human development in Nigeria

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Abstract

Population dynamics has been noted to have diverse effects on human development. This study examined these effects using autoregressive distributed lag (ARDL) with annual time series data spanning from 1990-2023 which were sourced from Central Bank of Nigeria Statistical Bulletin, World Development Index and National bureau of statistics. The results show that there is a long run relationship among the study variables. The findings of the study show that domestic capital formation has negative and significant impact on gross national income per capita. Both government expenditure on health and government expenditure on education have positive and significant impact. Labour force has positive insignificant effect while population growth rate has a negative insignificant impact. Furthermore, domestic capital formation, government expenditure on education and population growth rate have positive and significant impact on mean year of schooling while government expenditure on health and labor force has insignificant effect on mean year of schooling with negative and positive impact respectively. Also, domestic capital formation and government expenditure on education have positive and significant impact on life expectancy at birth while government expenditure on health and labour force have negative insignificant impact. Population growth rate also has an indirect significant effect on life expectancy at birth. In conclusion, population dynamics influence mean year of schooling and life expectancy at birth while government expenditure on education and domestic capital formation influence all human development variables. The study therefore recommends that population dynamic variables be improved in order to achieve more rapid and sustainable human development.

Keywords: Human development; Life expectancy; Adult literacy; mean year of schooling; Population dynamics

1. Introduction

1.1. Background to the Study

Human development is a broad concept that encompasses the expansion of people's freedoms and capabilities to lead lives they value. It goes beyond economic growth, focusing on improving the well-being of individuals through better health, education, and living standards. The United Nations Development Programme (UNDP, 2020) defines human development as "the process of enlarging people's choices," where the most critical aspects include the ability to lead a long and healthy life, acquire knowledge, and have access to the resources necessary for a decent standard of living. Sen (1999) postulated that human development is a capsule that consists of health, education, and standard of living which are mostly measured or proxied as human development index. Population dynamics refer to the patterns and processes that affect the size, structure, and distribution of human populations over time (Cochrane, 2016). These dynamics are influenced by factors such as birth rates, death rates, migration, and aging. Rapid population growth, particularly in developing countries, can strain resources, leading to challenges such as food insecurity, environmental degradation, and inadequate access to education and healthcare. Conversely, declining populations, often seen in developed countries, can lead to labor shortages and economic stagnation (UNFPA, 2018). The age structure of a population, which

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refers to the distribution of people across different age groups, has significant implications for development. (Bloom, Canning, & Sevilla, 2003).

Urbanization, a key component of population dynamics, often leads to better access to education due to the concentration of schools and educational resources in urban areas. However, rapid urbanization can also lead to disparities in education access between urban and rural areas, as rural schools may be under-resourced and less accessible (UN-Habitat, 2020; IOM, 2020; Todaro & Smith, 2020).

1.2. Statement of the Problem

Nigeria's population is one of the fastest-growing in the world, with an annual growth rate of approximately 2.6%. The country's fertility rate, at around 5.3 children per woman, significantly contributes to this growth (UN Department of Economic and Social Affairs, Population Division, 2019). The United Nations projected that Nigeria's population could surpass 400 million by 2050, making it the third most populous country globally. As noted by Uche and Adelaja (2020), rapid population growth distorts and overshoot public spending in social welfare packages, education and health benefit.

Nigeria has implemented various policies and actions aimed at improving human development, addressing education, health, employment and overall well-being. For instance, the Universal Basic Education (UBE) Programme aims at providing free and compulsory basic education for children up to the junior secondary level as well as promoting functional and qualitative education to meet the needs of individuals and society. Despite those policies, initiatives and international support, human development in Nigeria still faces several pressing challenges that hinder progress in education, health, employment and overall well-being.The country still struggles with systemic issues exacerbated by economic instability, insecurity and rapid population growth. Nigeria has one of the highest numbers of out-of-school children globally, estimated at over 10 million, mainly in northern regions due to insecurity, poverty, and cultural barriers (Afolayan, Ikwuyatum and Abejide, 2008). Frequent industrial actions by the Academic Staff Union of Universities (ASUU) disrupt tertiary education. Insufficient funding for education (below the UNESCO-recommended 15-20% of the national budget) hampers development. Nigeria allocates only a small percentage of its GDP to healthcare, leading to inadequate facilities, outdated equipment and shortages of medical personnel. Nigeria accounts for a significant proportion of global maternal deaths, with poor access to antenatal care and skilled birth attendants. Diseases such as cholera, malaria, Lassa fever, and vaccine-preventable diseases continue to plague the country due to low vaccination rates and weak healthcare delivery systems. The National Health Insurance Scheme (NHIS) has limited coverage, leaving a large portion of the population with out-of-pocket expenses for healthcare (WHO, 2021).

Nigeria’s policies towards human development reflect a commitment to addressing poverty, education, health, and employment challenges. While these initiatives have yielded some positive outcomes, issues like inadequate funding, corruption, and uneven implementation hinder their full potential. All these support the need to still interrogate the effect of population dynamics on the various human development components.

Objectives of the Study

- To examine the effect of population dynamics on education (mean year of schooling) in Nigeria
- To investigate the impact of population dynamics on health (life expectancy at birth) in Nigeria
- To analyse the effect population dynamics has on standard of living (gross national income per capita) in Nigeria.

1.3. Research Hypotheses

The research hypotheses are stated both in null and alternative forms and they are in alignment with research objectives:

- H0: Population dynamics has no impact on mean year of schooling in Nigeria
- HI: Population dynamics has impact on mean year of schooling in Nigeria
- H0: Population dynamics has no effect on life expectancy at birth in Nigeria
- HI: Population dynamics has effect on life expectancy at birth in Nigeria
- H0: Population dynamics does not influence GNI per capita in Nigeria
- HI: Population dynamics influences GNI per capita in Nigeria

2. Review of Related Literature

The relationship between population dynamics and human development has witnessed divergent opinions regarding the advantages and disadvantages of over- population and under- population on economic development. The debates have occasioned and prompted several theories, empirical studies and concepts to reflect on the impact of population dynamics and human development.

2.1. Conceptual Literature

a) Human Development: Human development is a multidimensional process that enhances individual well-being and expands people's capabilities. It focuses not only on economic growth but also on improving social and cultural conditions, ensuring that every person has the opportunity to live a fulfilling life. Human development is defined by the United Nations Development Programme (UNDP) as the process of enlarging people's freedoms and opportunities and improving their well-being. The Human Development Index (HDI) is commonly used to measure development, taking into account indicators such as life expectancy, education level, and income per capita (UNDP, 2021).

b) Population Dynamics: It refers to the patterns and processes that influence changes in population size, composition, and distribution over time. It is a multidisciplinary field that examines the factors driving population growth, decline and demographic shifts, including births, deaths, migration and aging. Influenced by fertility rates, mortality rates, and migration, it measures the rate at which a population increases or decreases over time.

2.1.1. Basic Theories

Human Capital Theory

The human capital theory is traced to Adam Smith (1776) 'The Wealth of Nations' (1776) and Alfred Marshall (1890), 'Principles of Economics'. It states that individuals can increase their productivity and earning potential through investments in education, training and skills which are considered forms of human capital. Some of its basic assumptions include: education, training, and skill development are considered investments in human capital, similar to investments in physical capital like machinery. The theory highlights that by improving the knowledge, skills, and well-being of individuals, society can achieve higher economic output and sustainable growth. Critics of this theory argue that it oversimplifies complex social and economic phenomena and ignores broader structural and social factors; it places excessive focus on formal education and skills acquisition as the primary determinants of productivity and economic success, neglecting other factors such as social networks, institutional quality, and natural talents. While human capital theory emphasizes the importance of education and health, critics also argue that it may overlook other factors that influence development, such as institutional quality, social inequalities and access to resources. The Human Development Index (HDI) indirectly reflects human capital theory by incorporating educational attainment and life expectancy as key components of development, recognizing that human capital is central to economic and social progress- this makes it appropriate for this study despite its criticisms.

Capability Approach

The capability approach, developed by economist Amartya Sen (1985), focuses on assessing individual well-being and development by emphasizing people's capabilities and freedoms rather than just their economic resources. This approach shifts the focus from traditional measures of development, such as GDP to what individuals can actually achieve in their lives.

The capability approach has been widely praised for its emphasis on human well-being and freedom but it has also faced criticisms from scholars and practitioners.The approach does not provide a specific or standardized list of capabilities, leaving it open-ended and difficult to operationalize. The approach's focus on individual capabilities may underplay the role of collective or communal well-being and structural inequalities. The emphasis on freedom as a central value assumes that freedom is universally desirable, potentially neglecting other important aspects of well-being like security or stability.

Amartya Sen's capability approach provides a comprehensive framework for understanding human development, focusing on enhancing individuals' freedoms and capabilities. By shifting the focus from economic resources to human potential, it encourages policies that promote social justice, equity, and sustainable development.

2.2. Empirical Review

Zhang and Zhao (2023) explored the relationship between population aging and life expectancy across various countries from 2000 to 2021 using a panel data analysis. The authors find that an increase in the elderly population is positively correlated with life expectancy. The relationship between population aging and life expectancy is not uniform across all countries. The findings highlight the importance of implementing policies that promote healthy aging. Governments should focus on creating age-friendly environments, enhancing healthcare access for older adults and encouraging active lifestyles among the elderly.

Cuaresma (2023) delve into the complex relationship between population growth and human capital accumulation, specifically focusing on mean years of schooling as a key indicator of educational attainment in low-income countries (1985-2021). The study found that as populations grow rapidly, especially among youth, governments face increased pressure to expand educational services. Cuaresma concluded that proactive policies that prioritize educational investment during periods of demographic transition are essential for maximizing human capital accumulation.

Kotschy (2022) present a comprehensive analysis of the role human capital plays in maximizing the economic benefits of demographic transitions, particularly in emerging economies between 2000 and 2020. Their study focuses on how changes in population dynamics—especially declining fertility rates and a growing working-age population—can lead to accelerated economic growth, as measured by GNI per capita. The researcher finds that countries experiencing these transitions tend to see faster GNI per capita growth, but only if they effectively invest in human capital. The increase in the proportion of working-age individuals can lead to higher productivity, greater economic output, and thus higher income per capita, provided that these individuals are equipped with the necessary education and skills to participate fully in the labor market.

Nguyen (2021) conducted a comprehensive study examining the relationship between population growth, demographic transitions, and GNI per capita in developing countries, utilizing cross-country data spanning from 1995 to 2018. Their investigation centers on how demographic shifts—such as declining fertility and mortality rates—interact with economic growth, with particular attention to how these transitions impact GNI per capita. The authors find that countries undergoing a demographic transition—characterized by a shift from high fertility and mortality rates to lower rates—tend to experience faster growth in GNI per capita leading to increased labor supply and potential for greater economic output. The study recommends that to fully capitalize on the demographic transition and boost GNI per capita, developing countries must adopt comprehensive policies that focus on both population control and human capital development.

The study by Anyanwu and Erhijakpor (2020) highlights the crucial role that population dynamics play in shaping the economic futures of sub-Saharan African countries from 2000 to 2018. The findings suggest that countries with high fertility rates and large youth populations face significant challenges to achieving higher GNI per capita. However, those experiencing a demographic transition, characterized by declining fertility and dependency ratios, are better positioned to capitalize on the demographic dividend and achieve faster economic growth. The study underscores the importance of investing in human capital and implementing policies that support population control and economic diversification to improve GNI per capita and overall

Most of the study reviewed focused either on mean year of schooling or life expectancy or gross national income per capita but this study takes a holistic view of the three main human development index at a glance. This makes it possible to compare and contrast the impact of population dynamics on those human development indexes at a time.

3. Method of Study

The basic aim of this section is to lay down the procedure for research design, data collection and analysis. It will guide the researcher to follow the specific pattern for scientific analysis and evaluation of cause and effect on the relationship between population dynamics and human development in Nigeria.

3.1. Theoretical Framework

Based on the objectives of this study, the human capital theory was adopted to guide this study as the theory captured the necessary variables that are essential in transforming human beings for better life and human development. Those essential variables are human capital investment such as education and skills, health care which in turn influence income.

3.2. Model Specification

3.2.1. Model for Objective One

The specific model is captured as the mean year of schooling model driven by population dynamics. The mean year of schooling (MYS) stands as the dependent variable to be estimated while the population dynamics variables; population growth rate (PGR), labour force (LF), domestic capital formation (DCF), government expenditure on health (GEH) and government expenditure on education (GEE) are the explanatory variables. The model is a modification of Barro and Ursúa (2021) on population dynamics on mean year of schooling which emphasized the influence of fertility rate, migration and public health on mean year of schooling. The inclusion of population growth rate, labour force and domestic capital formation justifies our model. The model estimates are as follows

MYS = F(PGR, LF, DCF, GEH, GEE) ………………………………………………3.1

Transforming equations 3.1 into mathematical and econometric models

MYS = a0 + a1PGR + a2 LF + a3DCF + a4GEH+ a5GEE + ……………………………3.2

Logging equations 3.2 for linearity

MYS = a0 + a1PGR + a2LF + a3llogDCF + a4logGEH + a5logGEE + e ………………3.3

al < 0 a2, a3, a4 and a5 >0

3.2.2. Model for Objective Two

The specific model is captured as the life expectancy at birth model driven by population dynamics. The life expectancy at birth (LEB) stands as the dependent variable to be estimated while the population dynamics variables; population growth rate (PGR) labour force (LF), domestic capital formation (DCF) government expenditure on health (GEH) and government expenditure on education (GEE) are the explanatory variables. The model is a modification of Bruckner and Oksuzyan's (2022) on population dynamics on mean year of schooling. The model emphasized the influence of fertility rate, migration, public health and population transition on life expectancy at birth. The inclusion of labour force, domestic capital formation, government expenditure on health and education justifies our model. The model estimates are as follows

LEB = F(PGR, LF, DCF, GEH, GEE) ………………………………………………3.4

Transforming equations 3.4 into mathematical and econometric models

LEB = a0 + a1PGR + a2 LF + a3DCF + a4GEH+ a5GEE + ……………………………3.5

Logging equations 3.5 for linearity

logLEB = a0 + a1PGR + a2LF + a3llogDCF + a4logGEH + a5logGEE + e ………………3.6

al, a2, a3, a4 and a5 >0

3.2.3. Model for Objective Three

The specific model is captured as the mean year of schooling model driven by population dynamics. The gross national income per capita (GNI) stands as the dependent variable to be estimated while the population dynamics variables; population growth rate (PGR) labour force (LF), domestic capital formation (DCF) government expenditure on health (GEH) and government expenditure on education (GEE) are the explanatory variables. The model is a modification of Chen (2021) on population dynamics on mean year of schooling. Chen (2021) model captured the influence of population growth rate fertility rate, government expenditure on education and health. The inclusion of labour force, domestic capital formation justifies our model. The model estimates are as follows

GNI= F(PGR, LF, DCF, GEH, GEE) ………………………………………………3.7

Transforming equations 3.7 into mathematical and econometric models

GNI = a0 + a1PGR + a2 LF + a3DCF + a4GEH+ a5GEE + ………….……………3.8

Logging equations 3.8 for linearity

logGNI = a0 + a1PGR + a2LF + a3llogDCF + a4logGEH + a5logGEE + e …………….3.9

al < 0 a2, a3, a4 and a5 >0

Where

MYS = mean year of schooling; LEB = life expectancy at birth; GNI = gross national income per capita; PGR = population growth rate; LF = labour force ; DCF = domestic capital formation; GEH = government expenditure on health; GEE = government expenditure on education

3.3. Estimation Techniques and Procedures

The estimation of time series data follows a definite logical pattern, which begins from the examination of the level of integration of the series. This is a very important aspect of time series analysis as it serves as a pointer towards the most suitable technique for analyses. The Autoregressive Distributed Lag (ARDL) model is a statistical technique used to analyze the relationship between variables in both the short and long term. It is particularly useful for examining time series data and understanding how changes in one variable (such as population dynamics) affect other variables (human development index) over time.

ARDL models are especially useful for distinguishing between short-run and long-run relationships between variables. While short-run effects capture immediate reactions to changes, long-run effects show how variables are related over time as they adjust to equilibrium. ARDL models can be applied to variables that are of different orders of integration. Specifically, they can handle variables that are I(0) (stationary) or I(1) (non-stationary), making it more flexible than traditional methods like co-integration that require all variables to be integrated of the same order.

3.4. Data Sources and Nature

The study employed secondary data and the annual time series data covered the period of 1990 to 2023. They were sourced from recognized publications from reputable organizations such as the Central Bank of Nigeria (CBN) Statistical Bulletin, World Development Index (WDI) and National Bureau of Statistics.

4. Result

This section focuses on data presentation, analysis and discussion of findings.

4.1. Descriptive Test

The descriptive statistics focus on the mean, median, skewness, and Kurtosis and Jaque Bera statistics. The descriptive test is done to determine the behavior and direction of the individual variable.

Table 1 Descriptive Statistics

	MYS	LEB	GNI	DCF	GEH	GEE	PGR	LF
Mean	7.150000	47.42528	1509.139	4.352410	272.9754	726.2559	2.577489	54144979
Median	7.350000	46.10098	1259.766	4.490910	193.7749	479.4214	2.570885	50742324
Skewness	-0.756227	1.153886	0.903323	0.172497	0.482235	0.656292	0.229231	1.058709
Kurtosis	3.267293	2.812060	2.413915	1.717845	1.466432	1.738593	1.712449	3.646894
Jarque-Bera	3.341861	7.594937	5.110580	2.497501	4.649549	4.694864	2.646296	6.944407
Probability	0.188072	0.022427	0.077670	0.286863	0.097806	0.095614	0.266296	0.031049
Observations	34	34	34	34	34	34	34	34

*Source:*Researchers' computation using E-View 12

Table 4.1 presents the descriptive statistics which explained that Nigeria mean year of schooling (MYS) averaged 7.15 years, life expectancy at birth (LEB) averaged 47.42 years, gross national income per capita (GNI) averaged $1509.139 while domestic capital formation (DCF) mean values $4.35 billion, the mean value of government expenditure on health (GEH) stood at $272.97 million and the averaged mean of government expenditure on education stood at $726.2559 billion. The population growth rate (PGR) averaged 2.577 per year while labour force averaged 54144979 workers per year. The closeness between the mean and median indicated that the variables have less outlier and thus the variables are fit for economic generalization for Nigeria forecast.

The skewness test unveils the direction of the each of the variables' distribution to the mean. Positive skewness indicated that the variable is rightly skewed while negative skewness implies that the variable is left skewed. Positive skweness means that the variable is not symmetric around the mean value and its implication is that the variable deviate from the normality assumption and will be less precision in decision making. Left skewed variables showed that the variables' distribution revolves around the mean and decisions on them are more accurate than the rightly skewed variables. From the above explanation, all the series in the equation except mean year of schooling (MYS) has a positive (rightly) skewness this means that there should be caution while forecasting with the variables so as to maintain an accurate economic decision.

The Kurtosis analysis illustrates the peakness or flatness of the variables. The test is classified into platykurtic and leptokurtic. The platykurtic means that kurtosis variables are less than three and the distribution is flat regarding the expectation of normal observations while leptokurtic implies that the value of the kurtosis is more than three which revealed that the distribution is peak in relation to assumption of normality distribution. From the analysis of table 4.1, LEB, GNI, DCF, GEH, GEE, PGR fall under the group of platykurtic while other variables (MYS and LF) fall in the category of leptokurtic.

The Jarque-Bera estimate is employed to validate the expected observations of the series of the classical ordinary least square analysis. The prob. figure of the Jarque-Bera is used to indicate the normal distribution or otherwise. The null hypothesis explains that the distribution is normality distributed with the prob. Figure higher than 5 percent while the other hypothesis implies that the distribution is not distributed normally with the prob. Value less than 5 percent. From the Jarque-Bera probability value in table 4.1, MYS, GNI, DCF, GEH, GEE and PGR are normally distributed while other variables (LEB and LF) did not fit with the expected observation as the P- value is less than 5%.

4.2. Correlation Matrix

Table 2 Correlation Matrix

	DCF	GEE	GEH	GNI	LEB	LF	MYS	PGR
DCF	1.000000	0.600398	0.648865	0.319627	0.446889	0.611458	0.561159	0.035133
GEE	0.600398	1.000000	0.984246	0.857979	0.928863	0.865546	0.422163	0.567503
GEH	0.648865	0.984246	1.000000	0.829780	0.916326	0.902056	0.413053	0.516313
GNI	0.319627	0.857979	0.829780	1.000000	0.945626	0.799217	0.199934	0.758428
LEB	0.446889	0.928863	0.916326	0.945626	1.000000	0.918601	0.308032	0.673197
LF	0.611458	0.865546	0.902056	0.799217	0.918601	1.000000	0.403407	0.429076
MYS	0.561159	0.422163	0.413053	0.199934	0.308032	0.403407	1.000000	-0.255446
PGR	0.035133	0.567503	0.516313	0.758428	0.673197	0.429076	-0.255446	1.000000

*Source:*Researchers' computation using E-View 12

Table 4.2 shows the correlation matrix of the series in the analysis. The co-efficient correlation measures the direction and strength of linear relationship between the variables. The range of correlation matrix is from -1 to 1. -1 indicates an inverse perfect relationship while 1 implies a positive perfect association between the series. 0 implies no correlation at all. A variables correlated with itself will always have a correlation of 1. From the correlation matrix table, it is observed that all variables except mean year of schooling and population growth rate have positive correlation with each other. Due to the issues of multicollinearity (high level of correlation), we log the variables so as to have a good and well analysed model.

4.3. Lag Selection Criterion

Table 3 Result of the Optimum Lag for Gross National Income Per Capita

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-189.2746	NA	17421.01	12.59836	12.87591	12.68884
1	-178.0919	17.31519*	9058.479*	-11.94141*	-12.26522*	-12.04697*
2	-177.4198	0.997277	9289.423	11.96257	12.33263	12.08320
3	-177.4011	0.026662	9948.622	12.02587	12.44219	12.16158

*Source:*Researchers' computation using E-View 12

Table 4 Result of the Optimum Lag for Mean Year of Schooling

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-23.55770	NA	0.396142	1.906948	2.184494	1.997421
1	-23.31916	0.369349	0.417328	-1.956075*	-2.279878*	2.061627
2	-20.31718	4.454541*	0.368239	1.826915	2.196976	1.947546
3	-18.41525	2.699517	0.349253*	1.768726	2.185045	1.904436*

*Source:*Researchers' computation using E-View 12

Table 5 Result of the Optimum Lag for Life Expectancy at Birth

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-5.578586	NA	0.124192	0.747006	1.024551	0.837479
1	68.85839	115.2572	0.001091	-3.990864	-3.667060*	-3.885312
2	97.33186	42.25096	0.000186	-5.763346*	-5.393285	-5.642715
3	105.3161	11.33243*	0.000119*	-6.213940	-5.797621	-6.078230*

*Source:*Researchers' computation using E-View 12

The model is best fit with the criterion with highest absolute value indicated with arteries (*). From the table 4.3a, b and c, the Schwarz Information Criterion will be used throughout the study. In the mean year of schooling model, the highest lag length is first lag, in life expectancy at birth model; the model can only be lagged once while in the gross national income per capita model there is room to lag the model once also.

4.3.1. Test of Unit Root

Table 6 ADF-Fisher Unit Root Test

Variable	ADF	ADF	First Lag	Order of
	Unit root Value 5%	Critical Value 5%		Integration
DCFti	-4.446745**	-3.557759		1(0)
GEHti	-5.883111**	-3.557759		1(0)
GNIti	-1.367181	-3.557759	-6.951714**	1(1)
GEEti	-3.941373**	-3.557759		1(0)
LFti	-0.503270	-3.557759	-4.475813**	1(1)

PGRti	-3.916494**	-3.557759		1(0)
LEBti	-5.165994**	-3.557759		1(0)
MYSti	-3.963356**	-3.557759		1(0)

*Source:*Researchers' computation using E-View 12

The ADF test shows the null hypothesis of non-stationairty of the variables; if the P. value is higher than the 0.05 at 5 percent significance level we accept the null hypothesis that the variable in question is not stationary. From table 4.3, DCF, GEH, GEE, PGR, LEB and MYS are stationary at level while other variables (GNI and LF) became stable at 1st difference. This implies that the integration order in the model is mix of order 1 of 0 and 1 of 1. The mix order of integration in the model calls for bound test to ascertain the level of long run association of the observations.

4.3.2. Co-integration Analysis

This analysis is paramount in evaluating the long run link in the model. Regarding on the mix of order of integration of the unit root estimate, the Bound test of co-integration is adequate to check for the dynamic association of the series in the model. The bound estimate ascertains the possibility of long run association. Table 4.5 captured the Bound test analysis.

Table 7 Bound Test

Critical Values			**Models Critical Values**		
Significance	**I(0) Bound**	**I(1) Bound**	**MYS Model**	**GNI Model**	**LEB Model**
10%.	1.81	2.93	K=5	K=5	K=5
5%.	2.14	3.34	F-val.= 7.723845	F-val.=13.31767	F-val. = 19.64281
2.5%.	2.44	3.71			
1%.	2.82	4.21			

*Source:*Researchers' computation using E-View 12

The proponent of the Bound test analysis Pesaran, Smith and Shin (2001) resolved that the series combination of the different integration order are co-integrated if the F-Statistics. value is higher than the upper value of the critical bound test at a specified significance rate (5% in this study). The result is termed inconclusive if the F-Statistics is within the values of the upper and lower critical value of the Bound test and no co-integration exist in the case of the F-Statistics values being less than the lower critical value of the Bound test.

Looking at table 4.5, the F-Statistics values (7.723), (13.3117), and (19.642) of the MYS model, GNI model and LEB model respectively at five percent significance level is higher than the important critical value (3.34) of the bound test. Therefore, we concluded that long run association exists in the presented models. The observed trends of the series in the model were of different order of integration which makes it relevant to introduce the Bound test analysis of co-integration approach to understand the possible level of association of the model and the ARDL was used to ascertain the dynamic and static effect of the series on the estimated models. The outputs of the models are presented in static and dynamic forms.

4.4. Data Analysis

The variables were logged in order to have a unit measurement of analysis.

4.4.1. The GNI Model

Table 8 GNI Model of Population dynamics –Static model

Panel A	Static Model			
Variables	**Coefficient**	**Std. Error**	**T. Statistics**	**Prob.**
C	345.5010	1076.782	0.320864	0.7509
LDCF	-2.78E-09	1.04E-09	-2.674166	0.0128
LGEE	0.164461	0.226227	3.726976	0.0037
LGEH	0.551384	0.795028	3.693540	0.0041
LLF	2.03E-06	2.59E-06	0.783474	0.4404
PGR	-70.08733	438.7818	-0.159732	0.8743

*Source:*Researchers' computation using E-View 12

Table 9 GNI Model of Population dynamics **–**Dynamic model

Panel B	Dynamic Model			
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
LDCF	-1.18E-08	2.59E-09	-4.554001	0.0104
LDCF(-1)	-1.26E-08	3.49E-09	-3.601570	0.0227
LGEE	-2.075805	0.799910	-2.895048	0.0404
LGEE(-1)	-1.839896	0.671348	-2.940601	0.0319
LGEH	-2.233861	1.003933	-2.925110	0.0401
LGEH(-1)	2.338979	2.047395	1.142417	0.3170
LLF	-5.87E-08	7.42E-06	-0.007914	0.9941
LLF(-1)	8.94E-05	1.49E-05	6.013694	0.0039
PGR	14930.85	3551.583	4.203999	0.0137
PGR(-1)	-32362.60	6112.480	-5.294512	0.0061
CointEq(-1)*	-0.821446	0.061263	13.40853	0.0002
R-Square = 0.673720	Adj R. Squ. 0.669764	F.stat.= 133.7183	Prob. (F. Stat.) = 0.000000	DW. Stat. = 2.270733

*Source:*Researchers' computation using E-View 12

From table 8, the constant term of 345.5 implies that GNI per capita has a natural tendency to grow all things being equal. DCF has an opposite impact on GNI and also significant to GNI growth. This implies that a unit alteration in DCF will makes GNI to change by -2.7 percent. Government expenditure on education (GEE) was positive and significant to GNI. This posits that a one percent rise in GEE will make GNI to rise by 0.16% in the static model GEH is significant to changes in GNI with a positive coefficient. It revealed that a unit or one percent rise in government expenditure on health will cause to 0.055 percent increase to GNI. Labour force (LF) has a positive effect on GNI but import has insignificant impact on GNI. Population growth rate has a negative interaction with GNI and insignificant to GNI.

In the model selection criteria, the GNI model can only be lagged once in Panel B of table 9 but in the model, DCF has a negative but significant link with GNI per capita at level and first lagged period. Both at level and first lagged period, government expenditure on education was negative but significant to GNI per capita. Government expenditure on health (GEH) at level was negatively related to GNI but with significant effect. At first lagged period, GNI became insignificant but has positive interaction with GNI. Both level and first lagged periods, population growth rate (PGR) was significant to GNI changes. At level PGR exhibit a positive interaction while at first lagged period PGR showed a negative relationship. Labour force also indicated an insignificant effect on GNI with negative sign in level period and positive coefficient in the first lagged period significant effect to GNI.

The negative value of the co-integration coefficient validated a long run link of the estimated equation and this shows that in the event of shock in the GNI per capita model, it will take an average speed of 82 percent for the model to restore to equilibrium. The R-square value indicated that the independent variables cause about 67 percent changes in gross national income per capita model while the remaining 33 percent are accounted by the stochastic variables. The F-statistics value and its probability show that the GNI per capita equation possesses a good fit. The DW value implies that the series are not correlated.

4.4.2. The MYS Model

Table 10 Mean Year of Schooling Model of Population Dynamics – Static model

Panel A	**Static Model**			
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	5.965	26430.32	6.776176	0.0000
LDCF	2.37E-11	7.60E-12	3.125255	0.0045
LGEE	0.001135	0.001445	2.785728	0.0394
LGEH	-0.005367	0.005536	-0.969461	0.3416
LLF	6.15E-09	1.59E-08	0.387568	0.7016
PGR	1.770607	0.464770	3.809638	0.0008

*Source:*Researchers' computation using E-View 12

Table 11 Mean Year of Schooling Model of Population Dynamics – Dynamic model

Panel B	**Dynamic Model**			
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
LDCF	8.73E-11	2.38E-11	3.664786	0.0471
LDCF(-1)	-5.97E-11	5.44E-11	-1.096264	0.3873
LGEE	0.006279	0.007411	0.847260	0.4861
LGEE(-1)	0.003513	0.008332	0.421653	0.7143
LGEH	-0.019100	0.014876	-1.283957	0.3278
LGEH(-1)	0.042660	0.020225	2.109268	0.1694
LLF	-3.08E-07	1.43E-07	-2.947567	0.0148
LLF(-1)	4.23E-07	2.75E-07	1.539555	0.2636
PGR	-5.892382	29.08229	-3.202611	0.0482
PGR(-1)	100.9091	61.26990	1.646961	0.2413
CointEq(-1)*	-0.651804	0.153253	-12.73581	0.0061
R. Square = 0.538802	Adj. R. Squ. =0.538114	F. Stat. = 29.90029	Prob. (F. Stat.) = 0.000001	DW. = 2.106622

*Source:*Researchers' computation using E-View 12

In table 10 panel A, the positive and significant value of the constant term means that mean year of schooling irrespectively of the outcome of the selected (independent) series in the estimated equation there will be a minimum people schooling. DCF as well as GEE and PGR have positive and significant influence on MYS. This indicated that a one percent increase on DCF, GEE and PGR will cause the MYS to increase by 2.3 percent, 0.001 percent and 1.77 percent respectively. Interest rate has positive insignificant impact on PCIGEH and LF has insignificant effect on GNI with GEH being negative and LF being positive.

In panel B of table 11, the modern selected criteria suggested that the variables in the model can be lagged at least once. Domestic capital formation has direct influence with MYS at level while in the first lagged period DCF became negative and insignificant to MYS. At both level and first lagged period, government expenditure on education (GEE) was positive but insignificant to MYS. Government expenditure on health (GEH) was insignificant in both level and first lagged period although GEH was negative in the level period but became positive in the first lagged period. Labour force (LF) was negative but significant at level but in the first lagged period, LF became positive but insignificant. Population growth rate (PGR) was significant at level but with a negative sign. In the first lagged period, PGR was insignificant but positive.

The negative value of the co-integration coefficient validated a long run interaction of the equation and the implication is that in the event of shock in the MYS model, it will take an average speed of 65 percent for the model to restore to equilibrium. The R-square value indicated that the independent variables cause about 53 percent changes in real gross domestic product while the remaining 47 percent are accounted by the stochastic variables. The F-statistics value and its probability show that the per capita income equation a good fit or fit perfectly. The DW value implies that the series are not correlated.

4.4.3. The Life Expectancy at Birth Model

Table 12 LEB Model of Population Dynamics – Static model

Panel A	**Static Model**			
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	3.850271	0.638706	6.028236	0.0000
LDCF	1.02E-13	5.53E-14	2.849670	0.0385
LGEE	2.70E-05	1.78E-05	3.514579	0.0048
LGEH	-4.71E-05	0.000123	-0.381912	0.7064
LLF	-4.68E-10	3.41E-10	-1.372713	0.1843
PGR	-0.066297	0.037017	-2.790991	0.0477

*Source:*Researchers' computation using E-View 12

Table 13 LEB Model of Population Dynamics- Dynamic model

Panel B	**Dynamic Model**			
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
LDCF	-2.81E-13	1.62E-13	-1.738949	0.2242
LDCF(-1)	1.21E-12	2.95E-13	4.099375	0.0447
LGEE	-0.000215	6.14E-05	-3.493406	0.0731
LGEE(-1)	-0.000270	5.72E-05	-4.726626	0.0420
LGEH	0.000375	0.000181	3.070471	0.0042
LGEH(-1)	-0.000290	0.000209	-3.384337	0.0005
LLF	3.56E-09	8.08E-10	4.406799	0.0478
LLF(-1)	-4.17E-09	1.45E-09	-2.877670	0.1025
PGR	0.381268	0.367068	1.038685	0.4080
PGR(-1)	-1.277894	0.555880	-2.298868	0.1483
CointEq(-1)*	-0.939044	0.125590	-7.477042	0.0000
R.Square = 0.614950	Adj. R. Squ. = 0.612805	F. Stat. = 121.6631	Prob. (F. Stat.) = 0.000000	DW. Stat. = 2.145362

*Source:*Researchers' computation using E-View 12

From table 12 of the static model or panel A of life expectancy at birth model of population dynamics, the positive coefficient of the constant term and its prob. Values implies life expectancy at birth is a natural phenomenon. Domestic capital formation has a positive and vital effect on life expectancy at birth. The implication is that a one percent rise in DCF will cause LEB to increase by 1.02 percent all things being equal. Government expenditure on education has direct and significant impact on LEB. This showed that a one percent increase in GEE will cause LEB to increase by 2.7 percent. Government expenditure on health and labour force have negative and insignificant impact on LEB. Population growth rate (PGR) has an indirect and significant effect on LEB. The coefficient of PGR revealed that a percentage rise in PGR will cause LEB to decrease by 0.066 percent.

In table 13 of the dynamic model of life expectancy at birth, domestic capital formation (DCF) coefficient is negative and DCF also has significant effect on LEB in the level period, but at first difference, DCF became positive but insignificant. In the level form and first lagged period, government expenditure on education was negative but significant to LEB. At level, government expenditure on health was positively related to LEB with a significant impact but at first difference, GEH became negative but significant to LEB. Labour force has a positive interaction with LEB at level but at first period it became negative. At both level and first lagged periods, LF was significant to LEB. Population growth rate (PGR) has a positive but insignificant impact on LEB both at level and first difference.

The negative value of the co-integration coefficient validated a long run association of the equation and this reveals that in the event of shock in the LEB model, it will take an average speed of 93 percent for the model to restore to equilibrium. The R-square value indicated that the independent variables cause about 61 percent changes in real gross domestic product while the remaining 39 percent are accounted by the stochastic variables. The F-statistics value and its probability show that the real gross domestic product model has a good fit. The DW value implies that the series are not correlated.

4.5. Post Test Analysis

4.3.1 Residual Test : The post test result was conducted in order to ascertain and validate the primary assumptions of the classical linear regression. The test and assumptions are analyzed based on no serial correlation using Breusch Godfrey (BG) test, homoscedasticity applying the Breusch-Pagan-Godfrey test, residual normally distributed using Jacque Bera (JB) and no specification error with the test of Ramsey Reset test. The Ho is accepted if the probability value is greater than 5% and will rejected if the probability value is less than 5%. The post-test estimate is presented in table 4.9.

Table 14 Diagnostic Analysis Result

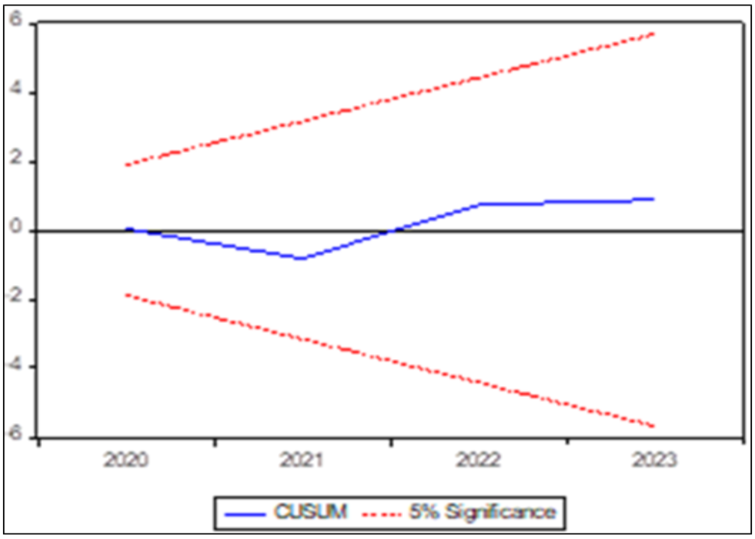
GNI Model as a Function of Population Dynamics				
Hypothesis	**Test statistic**	**Cal-Stats**	**Prob.**	**Remark**
Residual normally distributed	Jacque Bera (JB)	3.122956	0.2098	Accepted
No Serial correlation	Breusch Godfrey (BG)	2.366074	0.1641	Accepted
Homoscedasticity	Breusch-Pagan-Godfrey	1.349389	0.3448	Accepted
No specification error	Ramsey RESET	0.106830	0.7522	Accepted
MYS Model as a Function of Population Dynamics				
Residual normally distributed	Jacque Bera (JB)	2.712834	0.2575	Accepted
No Serial correlation	BreuschGodfrey (BG)	0.229976	0.8003	Accepted
Homoscedasticity	Breusch-Pagan-Godfrey	1.845336	0.1848	Accepted
No specification error	Ramsey RESET	0.268027	0.6187	Accepted
LEB Model as a Function of Population Dynamics				
Residual normally distributed	Jacque Bera (JB)	2.804515	0.2460	Accepted
No Serial correlation	BreuschGodfrey (BG)	0.940465	0.4197	Accepted
Homoscedasticity	Breusch-Pagan-Godfrey	0.750927	0.7301	Accepted

No specification error	Ramsey RESET	3.126026	0.1024	Accepted

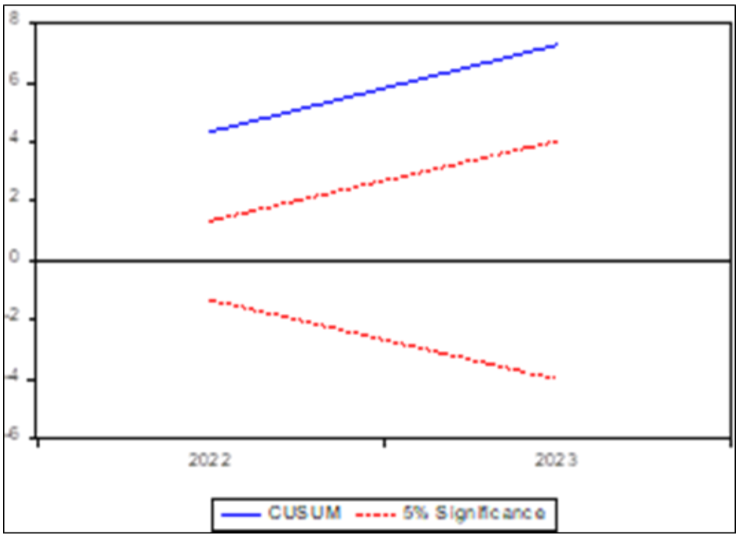
*Source:*Researchers' computation using E-View 12

4.5.1. Stability Test

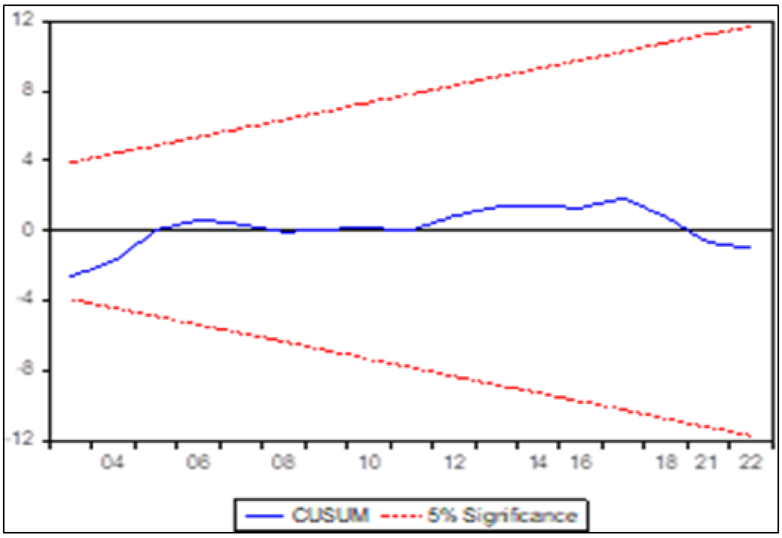
Stability of the short run model was tested using CUSUM test. The idea behind this test is to reject the hypothesis of model stability if the blue line lies outside the dotted red lines otherwise, the model is said to be stable. The result of this test is presented in Figure 4.1



For GNI Model



For MYS Model



For LEB Model

Figure 1 CUSUM test

The result of the CUSUM test shows that the blue lines lie inside the dotted red line which indicates that the model is dynamically stable in all the models.

4.6. Test of Hypotheses

4.6.1. Test of Hypothesis One

- Ho: population dynamics has no significant impact on mean year of schooling in Nigeria.
    - Decision Rule: Reject Ho if the *P value* of t-statistic < 0.05, otherwise do not reject Ho.

Conclusion: The conclusion from Table 4.7 regarding the coefficient for population growth rate (PGR) is that population growth rate has a statistically significant impact on mean year of schooling in the static model, as indicated by the probability value (P(t) = 0.0008), which is less than the 5% significance level. This means that in the static term, changes in PGR significantly influence MYS. However, in the dynamics model, the effect of PGR on MYS is also statistically significant, as shown by the probability value (P(t) = 0.0482), which is less than the 5% threshold. Thus population dynamics proxied as population growth rate (PGR) significantly affects mean year of schooling in both static and dynamic model.

4.6.2. Test of Hypothesis Two

- Ho: There is no causality relationship between population growth rate (PGR) and life expectancy at birth in Nigeria.
    - Decision Rule: Reject Ho if the *P value* of t-statistic < 0.05, otherwise do not reject Ho.

Conclusion: The conclusion from Table 4.8 regarding the coefficient for population growth rate (PGR) is that population growth rate has a statistically significant impact on life expectancy at birth in the static model, as indicated by the probability value (P(t) = 0.0477), which is less than the 5% significance level. This means that in the static term, changes in PGR significantly influence LEB. However, in the dynamics model, the effect of PGR on LED is also statistically insignificant, as shown by the probability value (P(t) = 0.4080), which is more than the 5% threshold. Thus, while population dynamics proxied as population growth rate (PGR) significantly in the static model, its dynamic model influence is not conclusive

4.6.3. Test of Hypothesis Three

- Ho: population dynamics proxied as population growth rate (PGR) does not influence GNI per capita in Nigeria.
    - Decision Rule: Reject Ho if the *P value* of t-statistic < 0.05, otherwise do not reject Ho.

Conclusion: The conclusion from Table 4.6 regarding the coefficient for population growth rate (PGR) is that population growth rate has a statistically insignificant impact on gross national income per capita in the static model, as indicated by the probability value (P(t) = 0.8743), which is greater than the 5% significance level. This means that in the static term, changes in PGR does not significantly influence GNI per capita. However, in the dynamics model, the effect of PGR on GNI per capita is statistically significant, as shown by the probability value (P(t) = 0.0137), which is less than the 5% threshold. Thus, while population dynamics proxied as population growth rate (PGR) insignificantly in the static model; its dynamic model influence is significant.

5. Discussion of Findings and Summary

In the data analysis of this work, the major findings will be strictly based static and dynamic models. In the GNI per capita model it was confirmed that domestic capital formation (DCF), government expenditure on education (GEE) and government expenditure on health (GEH) were significant to GNI per capita while labour force (LF) and population growth rate (PGR) were insignificant in the static model of RGDP. In the dynamic model, DCF, GEE, GEH and PGR are significant at first difference while LF is insignificant. The R-square revealed that about 67 percent of the variation in the GNI per capita equation is explained by the independents variables while the remaining 23 percent is being accounted by the error term. The Durbin-Watson test value means that the series in the equation is not serially correlated. The adjusted speed is averaged 82 percent in the event of shock.

In the static period of the mean year of schooling model, DCF, GEE and PGR are significant to GNI per capita while LF and GEH are insignificant. In the dynamic model, DCF, LF and PGR are significant at level while GEE and GEH are insignificant at level. The R-square revealed that about 53 percent of the changes in the mean year of schooling model is explained by the independents variables while the remaining 47 percent is being accounted by the error term. The Durbin-Watson test value revealed that the series in the estimated equation is not serially correlated. The recovering speed of the equation in the event of disequilibrium is 65 percent

In the static model of life expectancy at birth, only DCF, GEE and PGR are significant to life expectancy at birth while GEH and LF were insignificant to GNI per capita. In the dynamic model DCF, GEE and PGR were insignificant at levels. LF and GEH are significant in the dynamic model at level. The R-square revealed that about 61 percent of the alteration in the per capita income is explained by the independents variables while the remaining 39 percent is being accounted by the error term. The Durbin-Watson test value revealed that the observations in the equation is not serially correlated. In the event of shock, the adjustment speed of the model is about 93 percent.

5.1. Summary

This work primarily focused on the influence of population dynamics on human development in Nigeria. The findings of the work were obtained through ADF- unit root, Bound co-integration test and ARDL to address the study objectives. Regarding the specific objectives, the listed findings are outlined;

- From the MYS model based on the static model, government expenditure on health has negative impact to MYS while domestic capital formation, government expenditure on education, labour force and population growth rate have positive effect on GNI per capita. Domestic capital formation, government expenditure on education, and population growth rate are significant to GNI per capita. This implies that population dynamics has a positive interaction with mean year of schooling in Nigeria.
- In the life expectancy at birth model, government expenditure on health, labour force, and population growth rate have a negative co-efficient meaning that an increase in those variables will reduce life expectancy at birth. Domestic capital formation and government expenditure on education have positive association with life expectancy at birth, this accounts that increase in DCF and GEE will lead to increase in LEB. From the LEB model, DCF, GEE and PGR were statistically significantly to LEB. Other variables (GEH and LF) are not significant.
- In the GNI per capita model, domestic capital formation and population growth rate were negative while government expenditure on education, government expenditure on health, and labour force were positive and significant. DCF, GEE and GEH are significant to GNI per capita while LF and PGR are insignificant to GNI per capita in Nigeria.

6. Conclusion

From the analysis, population dynamics proxied as population growth rate influenced the mean year of schooling, life expectancy at birth but insignificant to GNI per capita. Government expenditure on education and domestic capital formation affect all the index of human development variables (mean year of schooling, life expectancy at birth and GNI per capita). Labour force is insignificant to mean year of schooling and life expectancy at birth but significant to GNI per capita.

Recommendations

From the basic results and conclusion of the work, the underlined policies are put forth for internal and external applications;

- Population dynamics variables (government expenditure on education, population growth rate, and domestic capital formation) need to be improved upon as they spur mean year of schooling while government expenditure on health and labour force need to be revisited as they have insignificant impact on mean year of schooling
- The level of labour force and government expenditure on health need to be checked as they have no meaningful impact on life expectancy at birth while government expenditure on education, population growth rate, and domestic capital formation need to be encouraged by creating a workable policy that encouraged life expectancy at birth.
- Population growth rate and labor force have an insignificant impact to GNI per capita also calls for serious concern. This is because a worsening population growth rate and labour force will jeopardize the entire economy by reducing the money income per capita; therefore, prioritizing on the improvement of population growth rate and labor force are paramount as it will encourage per capita income.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] Afolayan, A. A., Ikwuyatum, G. O., & Abejide, O. (2008). Dynamics of international migration in Nigeria (A review of literature). Research review of the global commission on international migration link. Bloom, D. E., Canning, D. & Sevilla, J. (2003) The demographic dividend: A new perspective on the economic consequences of population change. RAND corporation.

[2] Anyanwu, J. C., & Erhijakpor, A. E. O. (2020). The Impact of population dynamics on economic growth in Africa. African development review, 32(3), 331-343.

[3] Barro, R. J. & Ursúa, J. F. (2021). "Demographic transitions and educational expansion: An empirical study of global schooling trends." Economic inquiry, 59(2), 945-969.

[4] Bloom, D., Canning, D., & Sevilla, J. (2003). The demographic dividend: A new perspective on the economic consequences of population change. Rand Corporation.

[5] Bongaarts, J. (2010). The causes of educational differences in fertility in Sub-Saharan Africa. population studies, 64(2), 103-120.

[6] Bruckner, T. A., & Oksuzyan, A. (2022). The role of population dynamics in determining life expectancy: Evidence from European Countries. Population Studies, 76(2), 263-279.

[7] Chen, X., Wang, Y., & Lee, K. (2021). Population growth and economic development in developing countries. Economic Development and Cultural Change, 69(4), 1127-1153.

[8] Cochrane, S. H. (2016). Fertility and education: What do we really know? Johns Hopkins University Press.

[9] Cuaresma, J. C., et al. (2023). "Population growth, demographic transitions, and the dynamics of human capital accumulation." World Development, 156, 105290Friedman, M. (2020). The role of gni per capita in development economics. Journal of Economic Perspectives, 34(3), 45-58.

[10] Gujarati, D. (2011). Econometrics by example

[11] Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration—with appucations to the demand for money. Oxford Bulletin of Economics and statistics, 52(2), 169-210.

[12] Kotschy, R., Sunde, U., & Vischer, T. (2022). Demographic Transition and Economic Growth: The Role of Human Capital Accumulation. Journal of Population Economics, 35(2), 567-595.

[13] Lee, R. & Mason, A. (2011). Population Aging and the generational economy: A global perspective. Edward Elgar Publishing.

[14] Lutz, W., Butz, W. P., & KC, S. (2014). "World population and human capital in the twenty-first century." Oxford University Press.

[15] Nguyen, P., Vo, T., & Pham, T. (2021). Population growth, demographic transition, and economic growth in developing countries. Journal of Development Economics, 52(1), 45-62.

[16] Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. Journal of applied econometrics, 16(3), 289-326.

[17] Schultz, T. W. (1993). "The economic value of education." Journal of Political Economy, 101(6), 1428-1464.

[18] Sen, A. (1999). Development as Freedom. Oxford University Press. This book discusses the concept of development as an expansion of human freedoms, focusing on the importance of health, education, and income in improving human well-being.

[19] Sen, A. (1985). "Commodities and capabilities." Oxford University Press.

[20] UNESCO. (2015). "Education for All 2000-2015: Achievements and challenges." UNESCO Publishing.

[21] UNESCO. (2020). "Global education monitoring report 2020: Inclusion and education." UNESCO Publishing.

[22] Organisation for Economic Co-operation and Development (OECD). (2020). GNI and GDP: Measuring Income and Wealth. OECD Publishing OECD. (2019). "The Future of Education and Skills: Education 2030." OECD Publishing.

[23] OECD. (2020). "International Migration Outlook 2020." OECD Publishing.

[24] Todaro, M. P., & Smith, S. C. (2020). Economic development (13th ed.). Pearson.

[25] United Nations Population Fund (UNFPA). (2018). The State of World Population 2018: The Power of Choice. United Nations Population Fund.

[26] United Nations Department of Economic and Social Affairs, Population Division (2019). World Population Prospects 2019: Highlights. United Nations. Link

[27] United Nations Development Programme (UNDP). (2020). Human Development Report 2020: The next frontier - human development and the anthropocene. UNDP. Retrieved from UNDP.

[28] UNFPA. (2018). The State of world population 2018: The power of choice. United Nations population fund.

[29] UN-Habitat. (2020). World Cities Report 2020: The value of sustainable urbanization. United Nations Human Settlements Programme.

[30] UNESCO. (2021). Global education monitoring report 2021/2: Non-State actors in education: Who chooses? Who loses? United Nations Educational, Scientific and Cultural Organization.

[31] World Health Organization (WHO) (2021). Nigeria health system review. Geneva: World Health Organization. Link

[32] World Bank. (2018). World Development Report 2018: learning to realize education’s promise. The World Bank.

[33] Zhang, L., & Zhao, Z. (2023). the impact of population aging on life expectancy: Evidence from panel data. Demographic Research, 48, 1-28. Link