

Population-Economic Growth Nexus in Nigeria and Poland: Does Quality or Quantity Matter?

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Abstract: *In this study, we examined the influence of population growth on the growth of two distinct economies – Nigeria and Poland. These two economies were selected due to their differences in investment in human capital development, and being at different population spectrums. While Poland with a declining population has been proactive in investing in human capital development, investment by Nigeria has been meagre despite its huge population endowment. Such has a negative consequence on the population as portrayed in her low life expectancy, literacy rate, and human capital index compared to Poland. In carrying out our empirical analysis, time series data ranging from 1991 to 2020 which were obtained from the World Bank were being put to use. The analysis follows the autoregressive distributed lag approach where we realized that there exists a long-run relationship between population growth and economic growth. Further empirical results indicated that population growth wielded a negative and significant influence on Poland's economic growth both in the short-run and in the long-run. In the case of Nigeria, population growth wielded a negative and significant short-run effect on economic growth though such effect became positive but insignificant in the long run. The policy lesson that can be derived from this is that although the two countries are at different population spectrums, the need to control population is of immense importance.*

Keywords: Fertility, Mortality, Active Population, Dependent Population, Economic Growth.

JEL Classification: E24, F43, O47, Q56, R23.

1 Introduction

The quest for economic growth is desirable by every economy and such has been opined to be driven by quality human resources. Reliance on the quantity of a population as a driver of growth could be misleading since the ability of the population to drive growth is also dependent on the quality of the human resources it possesses. Consistent with Solow (1956), capital alone cannot explain unrelenting economic growth, so Mankiw (2010) proposed expanding the 'Solow model' to include the other two sources of economic growth – population growth and technological progress – to explain the sustained economic growth observed in most parts of the world. One of the most notable population growth theories is that of Malthus, who claims that population expansion reduces per capita income and lowers the human development index (Malthus, 1798).

Despite the fact that technological advancement has rendered Malthus' theory of population growth almost obsolete, many countries continue to implement birth control policies, such as family planning and contraception, and the World Bank and the International Monetary Fund are putting pressure (via the structural adjustment program and the HIPC initiative) on developing countries to control birth rate (Sibe, Chiatchoua and Megne, 2016).

While Malthus regarded population expansion as a threat to growing living standards, economist Michael Kremer has claimed that global population growth is a crucial driver of advancing economic success (Sibe *et al.*, 2016). Kremer contends that if there are more people, there will be more scientists, inventors, and engineers to contribute to innovation and technical advancement. As evidence for this argument, Kremer notes that global growth rates have grown in tandem with global population over the course of human history. This finding supports the premise that having more people leads to more technical advancement (Mankiw, 2010).

In this study, we only look at the influence of population expansion on economic growth, using Poland and Nigeria as a rallying point. Poland's population constitutes a greater number of aged population, and the aging pattern is at a faster pace (Devictor, 2012). The implication of this aging pattern in the population is that the total population will be declining. As statistic reveals, the country's population declined from 38.6 million in 1995 to 38.2 million in 2000. This was followed by a subsequent decline to 38.04 million in 2010 before reaching 37.9 million as at 2020, with an estimated population of 32 million by 2050 (World Bank, 2021). An aging and shrinking population indicates an aging and shrinking labour force.

Consistent with European Commission analysts, Poland's potential GDP per capita growth – that is, long-term development patterns beyond the ups and downs of the economic cycle – would drop from 4.7 percent of GDP to 3 percent of GDP after 2021, due to population aging (Devictor, 2012). What is at risk is Poland's capacity to maintain its strong growth rate and raise living standards to Western European levels in the foreseeable future. Nigeria on the contrary is characterised by a rising population growing at an average of 2.5% per annum. This is evidenced in the rising trend of the total population from 107.9 million in 1995 to 122.3 million

in 2000 before reaching about 158.5 million in 2010. This upsurge continued to approximately 181.1 million in 2015 before reaching 206.1 million in 2020 (World Bank, 2021).

In relating the above population dynamics to the economy, can Poland and Nigeria put up with its robust economic feat under these circumstances? Understanding in other nations proposes a three-faced tactic: “get people to work longer hours; get more people to work within the working-age population; and encourage those who work to work better, to produce more” (Devictor, 2012). “One have to work in a prolonged manner if they live longer.” The proportion of the population of Poland over the age of 65 is anticipated to be nearly twice the current value by 2030. With today's retirement age, the active population would be down in excess of 15% by 2035 (Devictor, 2012). When fewer individuals work, little is produced than when many are involved. This is why increasing the retirement age is so vital. At the same time, more individuals must enter the labour force. Labour force participation (those of active population who have a job or are actively seeking for one) in Poland is low, particularly among the young, women, and those in excess of 55 years.

Finally, if fewer people work, is it possible to help them create more? Economic growth is determined not just by the quantity of people who work, but also by how efficiently they work. Increasing worker productivity appears to be a complicated, multifaceted endeavour, based on past experience. It entails efforts in areas such as education quality (basic education, professional training, higher education, life-long learning, and so on); the business environment, to support job creation and innovation; labour regulations, to help jobs shift to more productive and growing firms; economic revolution in sectors where productivity remains low, such as agriculture; and so on (Devictor, 2012). This is an agenda that must be pursued regardless of demographic changes, but is made much more imperative by the aging of society.

Poland is characterized by huge investments in human capital development given her greater allocation to the education and health sector (education expenditure being 11.28% of total expenditure and health being 11.02%). This has been the inputs to the high human capital index of 0.75 experienced in the country given her high adult literacy rate of about 99% and her life expectancy of about 77 years. On the contrary, Nigeria's investment in education and health is petite (education expenditure being 5.68% of total expenditure and health being 3.83%). The outcome is the meagre 0.36 human capital index resulting from poor education and health outcomes (55 years' life expectancy and 62.02% adult literacy rate). Other attendant issues related to this high population in Nigeria, in particular and Africa in general, is the high poverty incidence. Given the poverty line at Purchasing Power Parity (PPP) of \$1.90 a day in 2020, about 43.4% to 45.7% of the population of Sub-Saharan Africa were below the poverty line (Piwowarski *et al.*, 2022).

Given these dynamics on the quantity and quality of the population of the two countries, could it be that the population-economic growth nexus could exhibit a different pattern in the two countries? It is in this regards that this paper seeks to establish the influence of population growth on economic growth of Nigeria and Poland from 1991 to 2020.

2 Literature Review

Demographers and development economists are both interested in the link between population expansion and economic growth. The economic literature that has emerged around this problem includes three schools of thought, each with its own set of arguments and results concerning this relationship: The Malthusian school (negative impacts), the revisionist school (positive effects), and the Transition Theory (transient effects). However, there is currently no agreement on which of these theory is right (Garza-Rodriguez *et al.*, 2016). Consistent with the conventional (or Malthusian) view, fast population expansion leads to poor economic growth and poverty. The Revisionist school of thought holds that higher population growth improves the pool of human capital, leading to economic growth. Finally, the Transition hypothesis is of the view that population increase is caused in part by changes in income; that is, populated nations are populous because they are economically impoverished (Darrat and Al-Yousif, 1999).

This three major views have spurred empirical studies in different countries to validate or refute them as the case may be. Empirical outcomes on studies surrounding the influence of population expansion on economic growth are varied. While a momentous number of studies recorded a positive effect (Simon, 1981; Fox and Dyson, 2008; Adewole, 2012; Ali *et al.*, 2013; Shaari *et al.*, 2013; Thuku, *et al.*, 2013; and Tartiyus *et al.*, 2015; Garza-Rodriguez *et al.*, 2016), the negative implications of rising population for economic growth are widely acknowledged (Headey, 2009; Afzal, 2009; Bloom and Canning, 2001; Shah *et al.*, 2015; Guga *et al.*, 2015; Fox *et al.*, 2019). Meanwhile, other studies contend that population expansion has no sway on economic growth (Dao, 2012; Okwori *et al.*, 2015).

Afzal (2009) used multivariate approach to evaluate the link between population increase and economic development in Pakistan from 1950 to 2001. He discovered a pronounced inverse link concerning economic growth and economic development. Atanda *et al.* (2012) examined the comparative trend of population growth factors in developing countries (*Bangladesh, Ethiopia, Indonesia, Mexico, and Nigeria*) and developed countries (*Germany and the United States*). The key reasons of population expansion, according to the study, include high fertility rates, low crude death rates, low birth and mortality rates, and a high juvenile dependence ratio.

Adewole (2012) used the OLS technique on time series data from 1981 to 2007 to investigate the influence of population on Nigerian economic development. The findings indicated that population expansion had a beneficial impact on economic growth.

Ali *et al.* (2013) used the ARDL Model to inspect the link stuck between economic growth and population increase in Pakistan from 1975 to 2008. The outcome demonstrates a desirable rapport concerning them. Thuku *et al.* (2013) examined the link amid population increase and Kenya's economic growth from 1963 through 2009 using the VAR framework. The study's findings confirmed the 'revisionist school' of thought that "population expansion has a beneficial sway on economic growth and encourages economic development".

Nwosu (2014) investigated the waves of population increase on growth in Nigeria deploying a linear model on yearly data from 1960 through 2008. For analysis, the ADF stationarity test was utilized, along with the Granger Causality and Co-integration tests. The findings showed that population surge influences growth, and that there is a long-run link flanked by the two. Olabiyi (2014) analyzed the link concerning population and growth in Nigeria using data from 1980 to 2010, concentrating on the impacts of fertility and infant mortality rates on growth. VAR econometric approach was used for estimation. The findings revealed that lowering the fertility rate steadily raised growth rates from 3.3 percent to 7.9 percent along a 12-year era in the economy. In addition, an escalation in infant mortality boosted the pace of growth from 0.6 percent to 15.9 percent during the same time period.

Guga *et al.* (2015) were concerned with detecting how Albania's declining population growth affects her economic growth from 1990 through 2014. With the multiple regression analysis, total population posed a positive and substantial weight on Albania's growth; while urban population growth wielded a deleterious and substantial effect. They recommend the need for government's actions in emerging economies towards population controls by putting up restrictions or family planning programs.

In the similar pattern, Shah *et al.* (2015) used a 'multiple linear regression model' to analyze the influence of population increase on economic growth in Bangladesh from 1980 to 2005. The findings imply that economic growth and population growth are adversely connected, and that an increase in population would have a detrimental influence on Bangladesh's economic growth. To mitigate the negative implications of fast expanding population, the government can prioritize family planning initiatives.

From 1981 through 2015, Ogunleye, Owolabi, and Mubarak (2016) evaluated the influence of population growth on Nigerian economic development. Data was examined deploying 'ordinary least squares' regression. Consistent with the study's conclusions, "population expansion has a favourable and considerable impact on Nigeria's economic growth". The research recommends, among other things, that the Nigerian government move the country's rising population into aspects of the economy for their full utilization in achieving astronomical degrees of economic growth.

Garza-Rodriguez *et al.* (2016) used a structural break cointegration analysis to examine the dynamic link amid population increase and economic growth in Mexico from 1960 to 2014. The 'Gregory-Hansen cointegration test' proved the presence of a long run equilibrium link amid Mexican population and economic growth. Consistent with the outcomes of this test, 1985 was chosen as the year in which the structural break transpires in the cointegrating equation, and a dummy variable for this year was inserted in the VECM. In the short-term, economic expansion has been shown to have a detrimental influence on population increase. In the long-term, it was discovered that population has a positive influence on per capita GDP and that per capita GDP has a positive effect on population. The Granger causality test revealed bidirectional connection amid population increase and Mexico's economic growth.

Fox, Klusener, and Myrskylä (2019) started by addressing key factors that might encourage the advent of a positive fertility–development rapport traversing parts of vastly developed nations. Changes in family rules, changes in economic spatial organization, and selective international and domestic migration patterns are examples of these. The paper analysed data from 20 European nations divided into 256 sections between 1990 and 2012 to determine possible reversal patterns. The results demonstrate a reduction in the negative link concerning fertility and economic growth in many countries, plus the appearance of a positive rapport in a few. These outcomes do not appear to be solely the result of delay effects. However, the fertility and economic development levels at which such reversal tendencies are observed vary significantly.

Okijie and Effiong (2021) attempted to detect the variables that trigger population growth; and to establish a threshold level for population growth that could sustain development. Using data from 1970 to 2017 and deploying the OLS and threshold regression, it was uncovered that the variables that spur Nigeria's population growth were crude birth rate and infant mortality rate; with birth rate putting forth a positive and significant effect, and mortality rate posing a negative and significant effect. A population growth threshold of 2.5 percent was detected to be sustainable for growth. The paper recommended the need maintain an optimal population that will support the available resources if development is to be achieved.

In a recent study by Qosim *et al.* (2022), the 'VAR Granger Causality/Block Exogeneity Wald Tests' was deployed to ascertain the direction of causality amid population variables and economic growth in Nigeria for the timeframe of 1986 to 2020. As the result revealed, a feedback effect exists among economic growth, birth rate, death rate, and secondary school enrolments; and that there is

an independency between population growth and the growth in per capita income. Nigeria's average population growth was not productive as it did not in any way culminate to growth in the economy, the study concluded.

By redirecting our study based on the recorded mixed findings, our concern is therefore to elucidate how population growth could affect economic growth from 1991 to 2020. We will consider two distinct economies – Poland (with declining population) where more investment is made in human capital development, and Nigeria (with rising population) where less investments is made. It is within this basis that we will detect whether a declining or rising population and quality or quantity matters for the population-growth nexus.

3 Research Methodology

3.1 The Model

In specifying our model to capture the sway of population growth in influencing economic growth in Nigeria and Poland, this study adapt the model of Ogunleye *et al.* (2018) where they modelled real GDP (economic growth) to be depending on population growth rate, fertility rate, crude death rate, and exchange rate. In our model, we incorporate key variables that has relevance to human capital development to capture the fact that it is not only the quantity of the population that matters, but the quality of such population and the utilization of such population for productivity counts to a greater extent. In that regards, population growth, life expectancy at birth, employment to population ratio, and unemployment rate were included in the model and controlled with key macroeconomic variables like financial sector development, gross fixed capital formation, inflation rate, and trade openness. The model is specified thus;

$$GRTH_{it} = f(BMSS_{it}, EPRT_{it}, GFCF_{it}, INFR_{it}, LEXB_{it}, POPG_{it}, TRDN_{it}, UNMP_{it}) \quad 3.1$$

As described in Equation 3.1, the variables are defined as follows:

GRTH = economic growth

BMSS = financial sector development

EPRT = employment to population ratio

GFCF = gross fixed capital formation

INFR = inflation

LEXB = life expectancy

POPG = population growth

TRADN = trade openness

UNMP = unemployment

Meanwhile, t captures time and i captures the country (here, Nigeria and Poland). Equation 3.1 can be transformed into an econometric form as follows:

$$GRTH_{it} = \vartheta_0 + \vartheta_1 BMSS_{it} + \vartheta_2 EPRT_{it} + \vartheta_3 GFCF_{it} + \vartheta_4 INFR_{it} + \vartheta_5 LEXB_{it} + \vartheta_6 POPG_{it} + \vartheta_7 TRDN_{it} + \vartheta_8 UNMP_{it} + \mu_t \quad 3.2$$

As specified in Equation 3.2, ϑ_0 is the constant of the regression model; ϑ_1 to ϑ_8 are the parameters of the respective variables to be estimated; and μ_t is the random error term.

3.2 Measurement of Variables and a priori Expectation

Consistent with our model, economic growth on the left-hand side of the model is the dependent variable while all other variables on the right-hand side are the independent variables that explains the variation in economic growth. GRTH is measured in percentages as the growth rate of gross domestic product (GDP); BMSS (financial sector development) is measured in percentages as the ratio of broad money supply to GDP; employment to population ratio is measured in percentages; GFCF is captured in percentages as a ratio of GDP; INFR is measured in percentages as the consumer price index; LEXB is measured in years; POPG is measured in percentages as annual growth in the total population; TRDN is measured in percentages as the ratio of total trade to GDP; and UNMP is measured in percentages to capture the proportion of the working population that are actually not employed.

It is expected that $\vartheta_0 \neq 0$ since we are not utilizing 'regression through the origin'; $\vartheta_1 > 0$ to portray the significance of financial development in driving growth; $\vartheta_2 > 0$ or < 0 in the depending on the country; $\vartheta_3 > 0$ portraying the importance of capital in fostering growth; $\vartheta_4 > 0$ or < 0 depending on whether it is demand-pull or cost-push; $\vartheta_5 > 0$ or < 0 depending on the country; $\vartheta_6 > 0$ or < 0 to reflect on the quality of the population; $\vartheta_7 > 0$ or < 0 depending on whether the country benefits from trade openness or not; and $\vartheta_8 < 0$ since unemployment entails underutilization of human capital that could foster growth.

3.3 Nature and Sources of Data

Since our study is expo-facto in nature, we used data that are time series in nature to check whether they had exerted any influence on growth; and to use such information to make generalizations about the behaviour of the independent variables on growth over the study period. For that reason, we consider a large sample size from 1991 to 2020 (30 years). The choice of the period is based on availability of data for the two countries, and the duration is long enough to capture different dynamics in population and growth in the two countries. For all the data utilized, the World Bank (2021) under the 'World Development Indicators' served as the source of data for the two countries. This source is reliable because it is recognized as an official database for the various variables utilized.

3.4 Technique of Analysis

The method of analysis in this study stems from the unit root test, test for cointegration, and error correction model. The unit root test is based on the constant and trend assumption under the Augmented Dickey-Fuller (ADF) framework. The cointegration test follows the autoregressive distributed lag (ARDL) approach of Bounds test; while the error correction model also follows the utilization of the ARDL framework.

3.5 Rationale for the Choice of the Two Countries

Poland and Nigeria are being selected for this study due to the disparity in their population and human capital development. Poland has a lower population of about 38 billion while Nigeria has about 200 million. Meanwhile, Poland invest magnanimously on the development of her population by voting a greater proportion of her total expenditure and GDP to education and health; while Nigeria pays very little attention to the sectors. The result of this has been portrayed in the low literacy rate and low life expectancy in Nigeria compared to Poland. This points out to the greater difference in their human capital index (HCI) which of recent, Nigeria has 0.36 while Poland has 0.75. The choice of these two distinct countries is to measure if quality rather than quantity of a country's population surely counts as a catalyst for growth.

4 Results

In this segment of the paper, we capture critical facts on the population dynamics, quality of the population, economic performance of the economy, and empirical evidence to portray the influence of population growth on the growth of the economy of Nigeria and Poland.

4.1.1 Birth Rate, Death Rate, Fertility Rate, Mortality Rate, and Population Dynamics

Poland, being a developed economy is characterised by lower birth rates as compared to Nigeria which is a developing economy. Meanwhile, the similar characteristics of the two countries is that they are both experiencing a declining birth rates over the years. Figure 1 reflects this trend for the two countries for selected years.

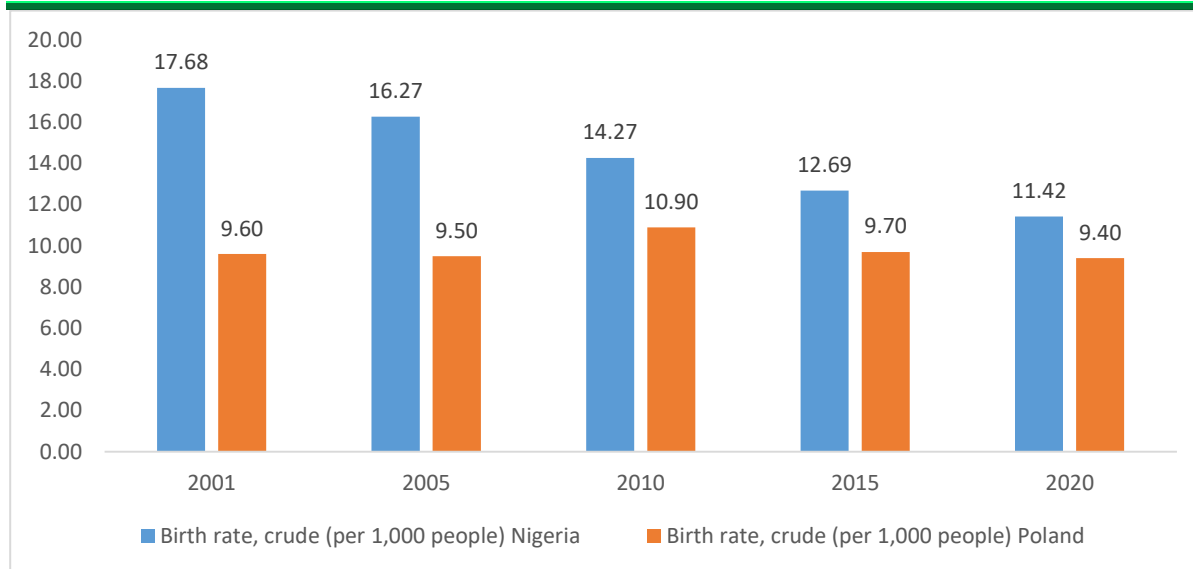


Figure 1: Birth rates in Nigeria and Poland for selected years

In 2001, Nigeria’s birth rate was put at 18 persons (per 1,000 people) which declined to 16 persons in 2005 with a subsequent decline to 14 persons in 2010. Still, the downward trend continued till 2015 through 2020 with a birth rate of 13 persons and 11 persons per 1,000 people respectively. Poland on the contrary exhibited lower birth rate with 10 persons per 1,000 persons in 2001 with the number of 10 persons per 1,000 people in 2005. In 2010, there was an increase to the tune of 11 persons per 1,000 people; but the trend maintained a downward trend to approximately 10 persons per 1,000 people and 9 persons per 1,000 people for 2015 and 2020 respectively.

The same scenario is exhibited by death rates in the two countries. Poland maintained a lower death rate over the years, while the death rate in Nigeria has been very high. The contrasting argument here is that though the death rate in Poland is low, it is maintaining an upward trend. Conversely, the death rate in Nigeria is exhibiting a downward trend over the years. Figure 2 portrays this attribute for some selected years.

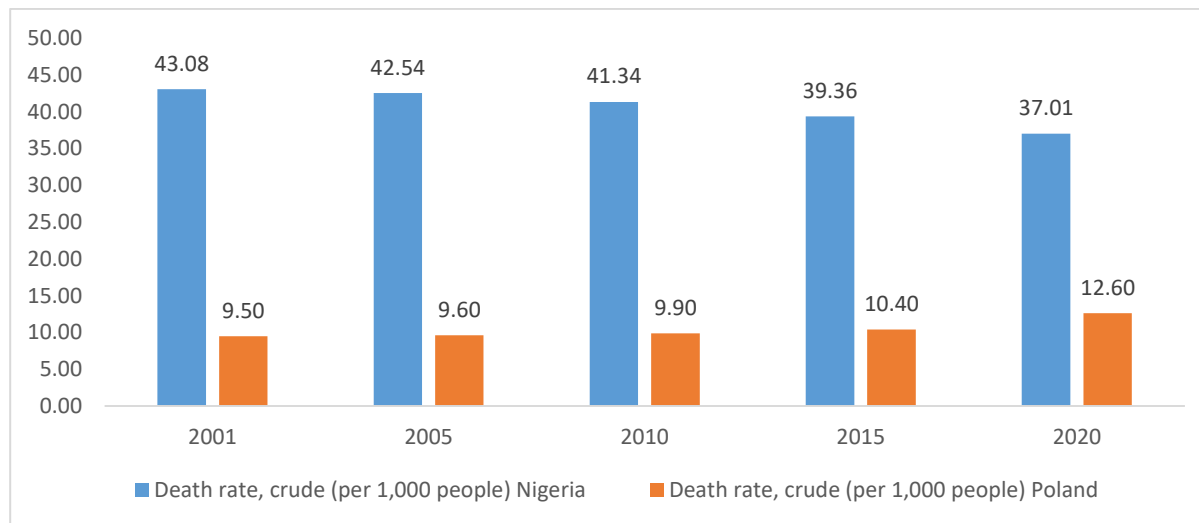


Figure 2: Death rates in Nigeria and Poland for selected years

The death rate in Nigeria was approximately as high as 43 persons (per 1,000 people) in 2001 and 2005 but declined slightly to 41 persons and 39 persons for 2010 and 2015, with a further plunge to 37 persons as at 2020. Poland on the other had had a lower death rate (per 1,000 people) amounting to approximately 10 persons in 2001 till 2015, but rose to an all-time high of 13 persons in 2020.

Fertility rates in the two countries has been at variant between the two countries as Figure 3 clearly depicts.

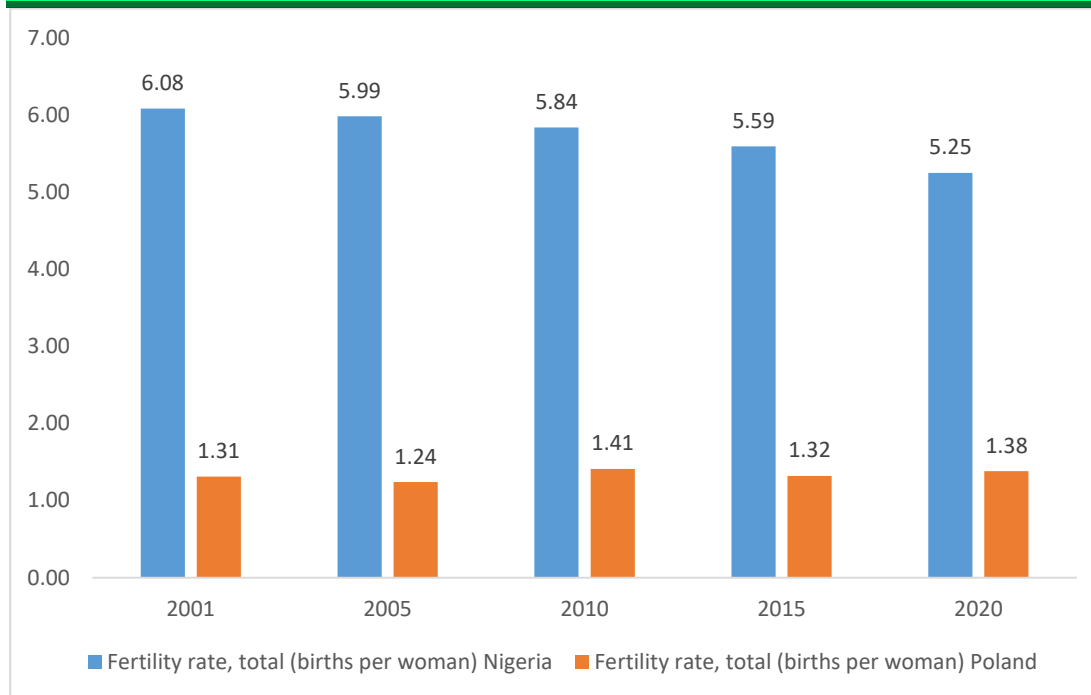


Figure 3: Fertility rates in Nigeria and Poland for selected years

The total fertility rate (births per women) is approximately 6 per woman in Nigeria compared to an average of 1 per woman in Poland. This gives rise to the high birth rate in Nigeria and the low birth rate experienced in Poland. A Polish woman has 1.3 children on average; replacing generations would need 2.1. Demography also thrives in waves. It has been reported that over 3.2 million women in the ages bracket of 25 to 35 in Poland are in their most fertile years. However, because fertility decreased in the 1990s, merely 1.8 million girls in the age bracket of 5 to 15 exist, who may be the following generation's mothers: regardless of having 2.1 children, such will be insufficient to halt the demographic drop (Devictor, 2012).

Irrespective of the high fertility rate in Nigeria, the country is characterised by high infant mortality. Meanwhile, Poland is characterised by a very low infant mortality rate. Figure 4 reflects this behaviour for the two countries at given time.

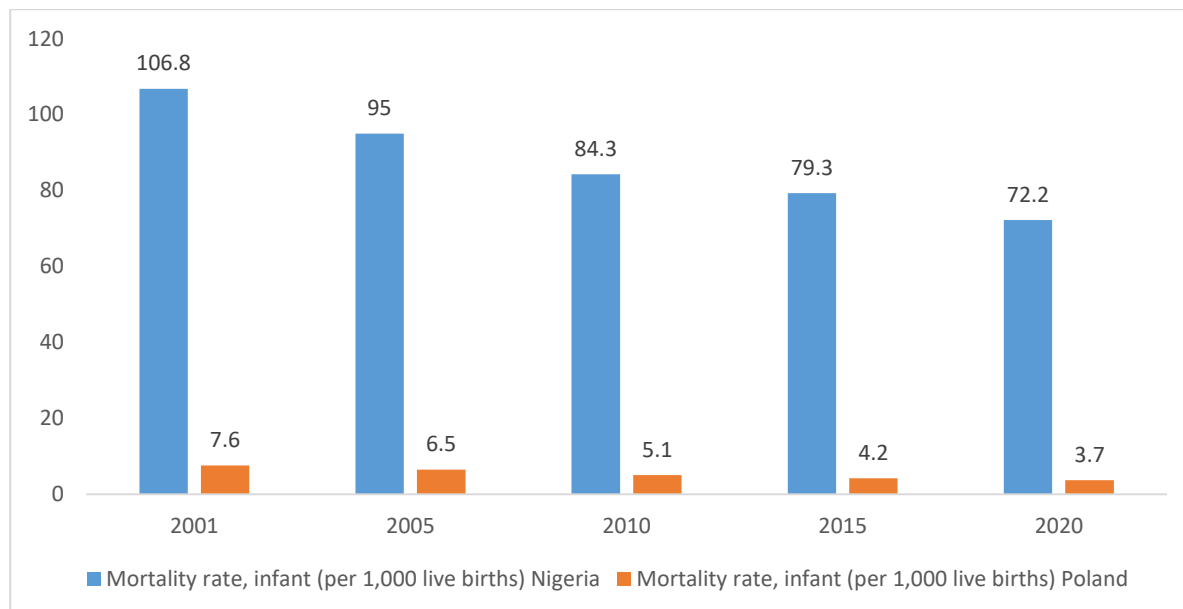


Figure 4: Infant mortality rates in Nigeria and Poland for selected years

Out of a total of 1,000 live births, Nigeria recorded an infant mortality rate to the tune of approximately 107 infants in 2001. This declined to 95 infants in 2005 with a further plunge to 84 and 79 infants in 2010 and 2015 respectively. Poland on the other hand recorded an infant mortality rate of approximately 8 and 7 infants for 2001 and 2005 respectively; which further declined to 5 and 4 infants in 2010 and 2015. While the infant mortality rate for Nigeria stood at approximately 72 infants in 2020, that of Poland was just approximately 4 infants per 1,000 live births. This also explains the high death rate in Nigeria compared to Poland.

One similarity that can be drawn about the population of Nigeria and Poland is that the greatest chunk of their population lies within the active/working population (15 – 64 years). Figure 5 and Figure 6 captures this for the two countries.

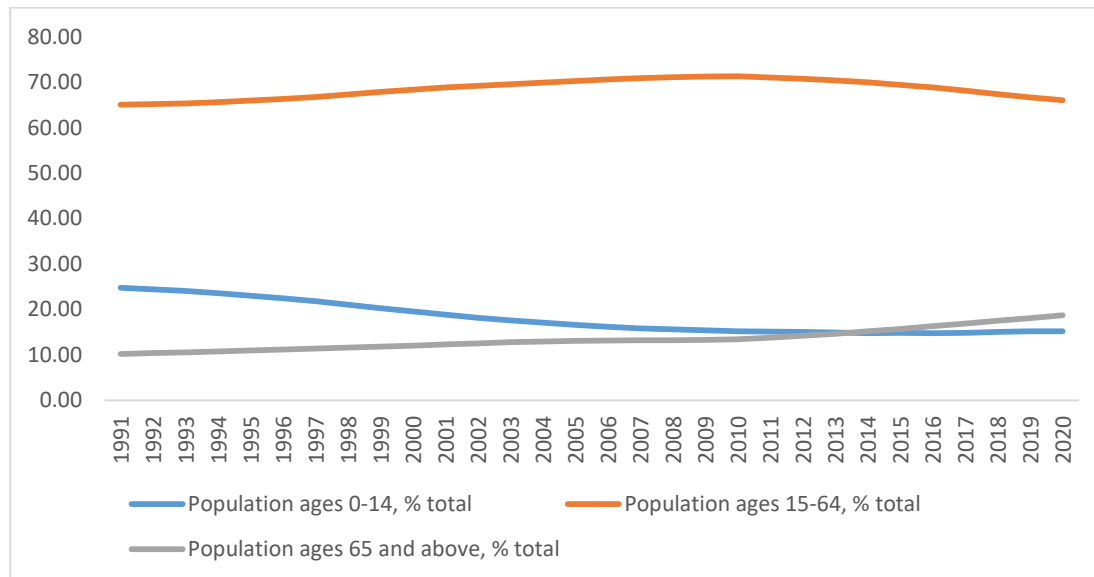


Figure 5: Population dynamics in Poland, 1991 – 2020

The active population alone in Poland constitutes about 70% of the total population, while we also notice an overthrow of the population of children by the aged in recent times. Nigeria also has about 60% of her population being part of the active population category. This is reflected in Figure 6.

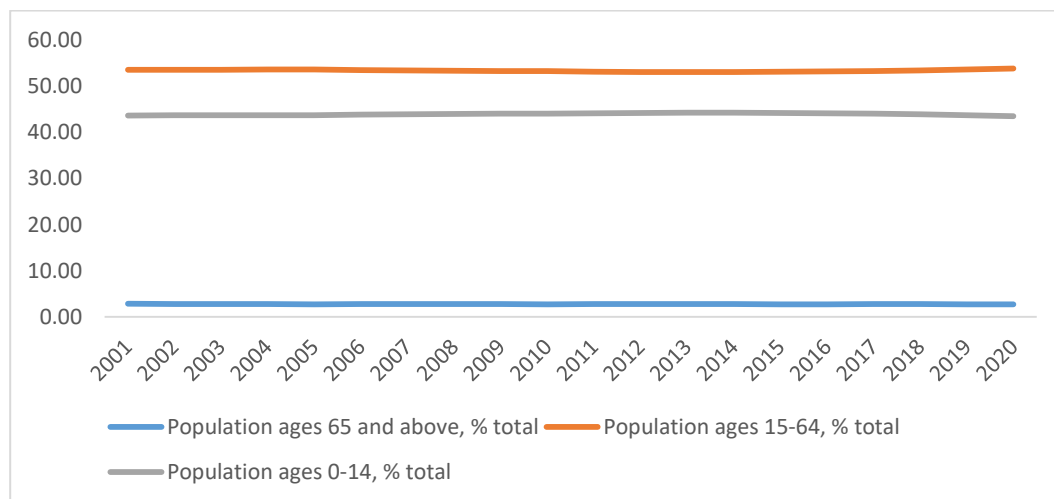


Figure 6: Population dynamics in Nigeria, 1991 – 2020

However, while Poland is characterised by an aged population being greater than the population of the children, the aged population is about 3% of the total population in Nigeria. This implies that there is a greater number of youthful population in Nigeria compared to Poland. Also, the lower aged population in Nigeria can be attributed to the low life expectancy rate of approximately 50 years compared to the 70 years in Poland.

The dynamics, in birth rate, death rate, infant mortality rate, and fertility rate explains the variation in the population growth of the two countries. Nigeria with high birth rate and fertility rate is characterised by high population growth compared to Poland with low birth rate and low fertility rate. Figure 7 reflects on this variation between the two countries.

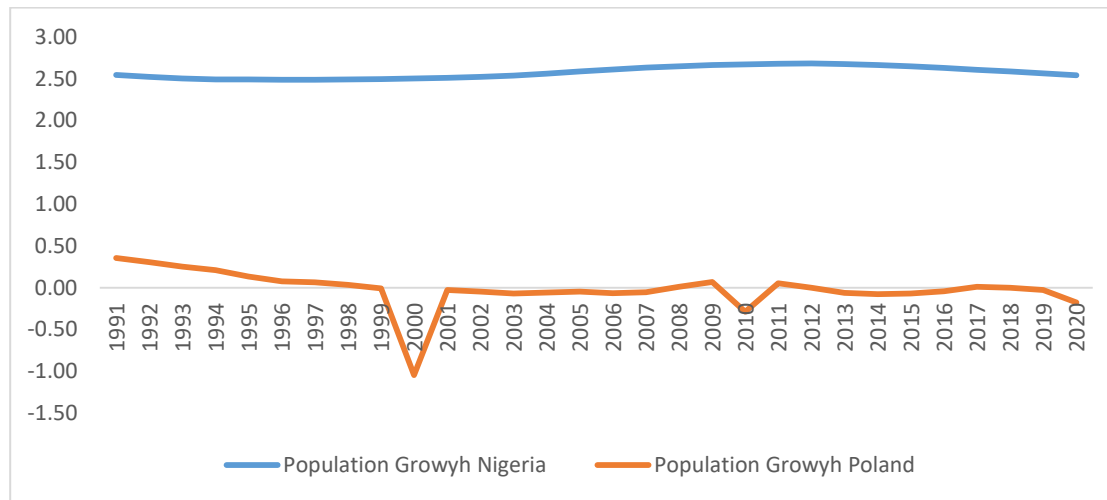


Figure 7: Annual population growth in Nigeria and Poland, 1991 – 2020

While Nigeria records an average annual population growth of 2.5%, Poland has been characterised by periods of negative population growth. In some years where the growth rate of the population was positive, such growth rate were not up to 0.5% over the period of analysis. The highest growth rate of population in Poland between 1991 and 2020 was 0.35% in 1991, and this was followed by periods of negative and minute positive population growth. This is because of the inherent low birth rate of an average of 9 persons per 1,000 accompanied with low fertility rate of 1 per woman on the average.

Given these dynamics, it is clear that Nigeria as a developing country is likely to have higher population compared to Poland. Evidence from data is plotted in Figure 8 validates this claim.

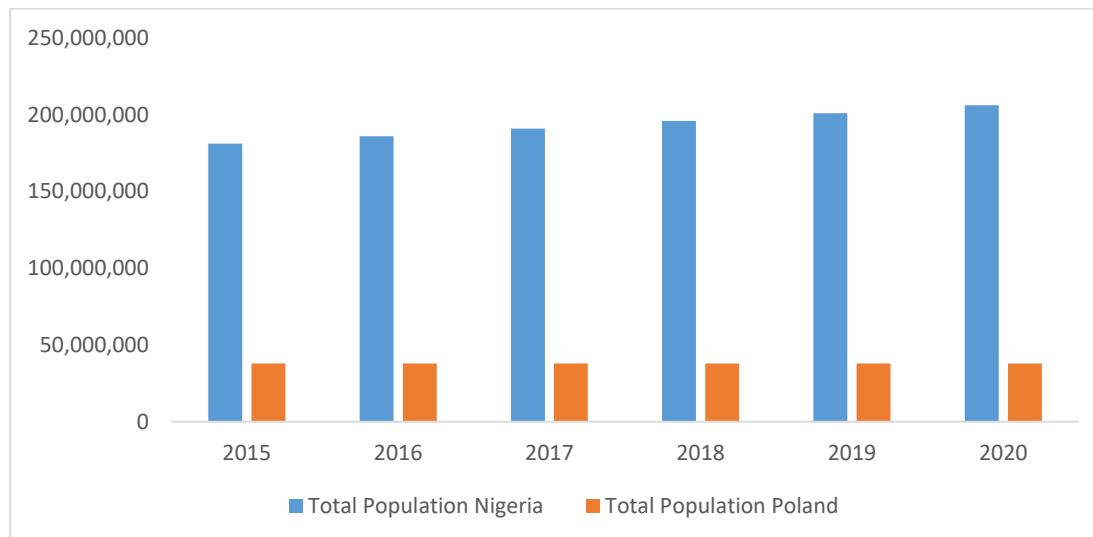


Figure 8: Total population in Nigeria and Poland, 2015 – 2020

It is evident that Nigeria’s population is more than five times the population of Poland over the years. Nigeria’s population was 181,137,454 in 2015 which increased by an average of 2.5% yearly to 185,960,244 and 190,873,247 in 2016 and 2017 respectively. The rising trend continued to a respective record of 195,874,685 and 200,963,603 in 2018 and 2019. The total population in Nigeria in 2020 was put at 206,139,587 compared to 37,899,070 in Poland which was a decline from 37,965,475 in 2019 (World Bank, 2021).

This rising trend in the population of Nigeria compared to that of Poland calls for concern on whether Nigerians are concerned about the quantity of the population than the quality. Our evidence will be gathered from the investment in human capital with respect to education and health in the two countries.

4.1.2 Health and Education Expenditure

It is worth to note that for the society to build a strong, vibrant, and quality population, investment in education and health (popularly known as human capital development) is of chief importance. The reason behind this is that it is only when a society has educated individuals with adequate skills plus a healthy workforce that the required innovation, technology, and entrepreneurship can thrive. As such, the issue of investment in education has made the United Nations to recommend that countries should set aside 26% of their budget to finance education; while an average of 8% to 10% should be directed to the health sector. The rationale behind this is to develop human resources that can drive the desired growth in the modern economy. The commitment of Poland and Nigeria to stirring education and health sectors are presented in Figures 9 to 12.

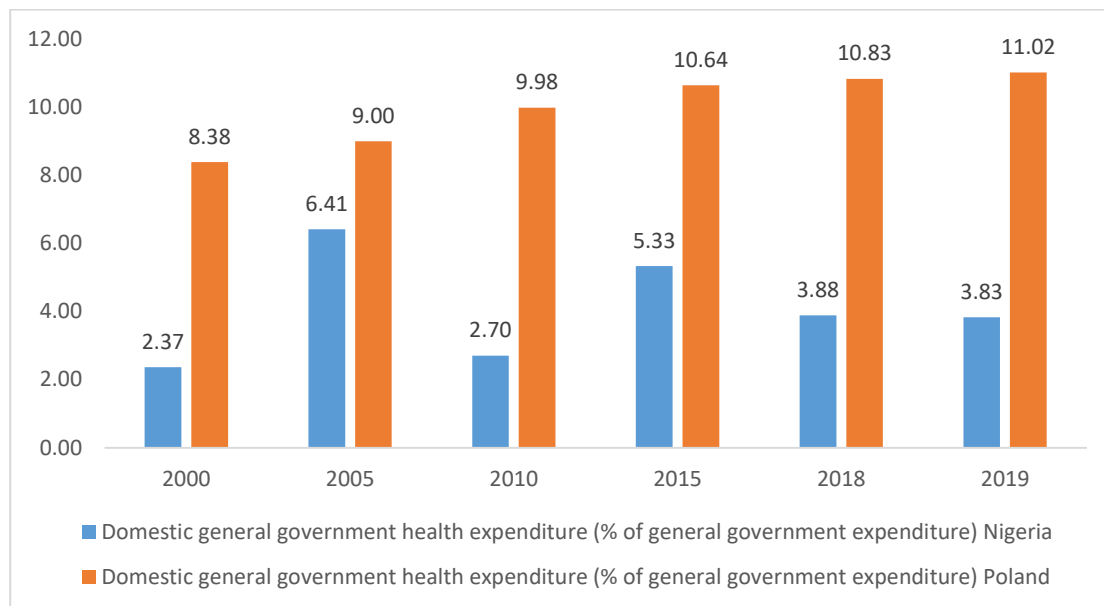


Figure 9: Domestic general government health expenditure in Nigeria and Poland

In regards to domestic general government expenditure on health, it is evidence form Figure 9 that Poland has been apportioning a greater portion of her budget to the educational sector compared to Nigeria, and the trend has been on the rise. Nigeria’s investment on the health sector has been characterised by swings in different periods. As at 2019, Poland’s domestic general health expenditure was 11.02% of her overall general expenditure, while that of Nigeria was a meagre 3.83%. It therefore signifies that while Poland has already keyed into the 8% to 10% health expenditure recommendation by the UN, Nigeria is far from reaching the benchmark. This has serious implications on the health outcomes of the country as will be disclosed later.

Comparing the health expenditure with the aggregate output, Figure 10 captures the trend where Poland also apportion greater percentage of her GDP to the health sector compared to Nigeria.

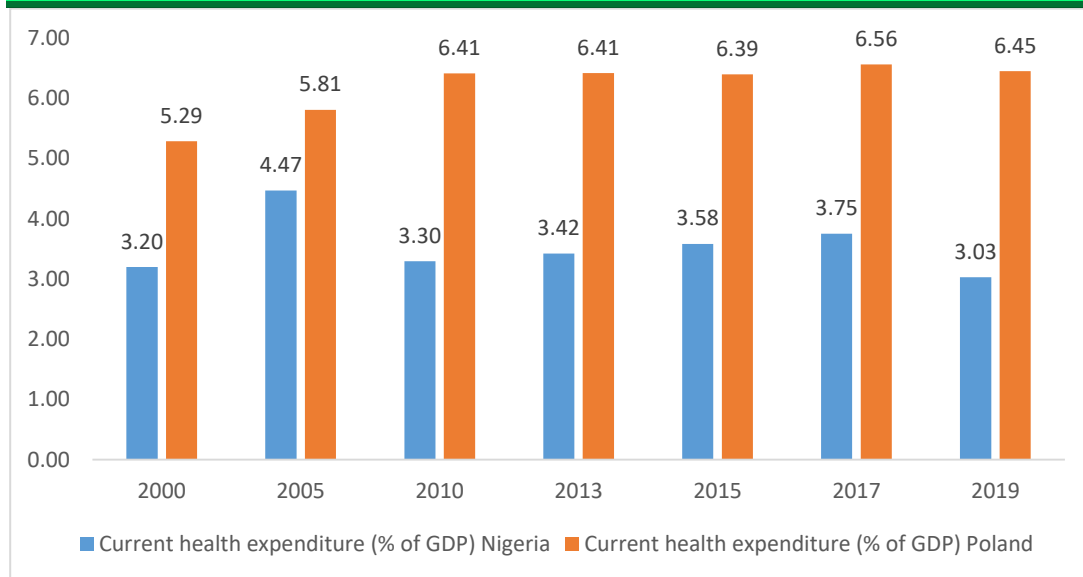


Figure 10: Current health expenditure in Nigeria and Poland (% of GDP)

As clearly displayed in Figure 10, Poland has continued to apportion an average of 6% of her GDP to her health sector while Nigeria only apportion an average of 3%. It is also worth noting that this percentage has been on the rise for Poland while that of Nigeria has been exhibiting some volatility over the years.

Going to the education sector, the total government expenditure for the two countries has also been in variant over the years, with Poland still showcasing greater commitment to the education sector, though our data is limited to 2016, than for Nigeria. A common attribute for the two countries is that they have not met the 26% recommended by the United Nations.

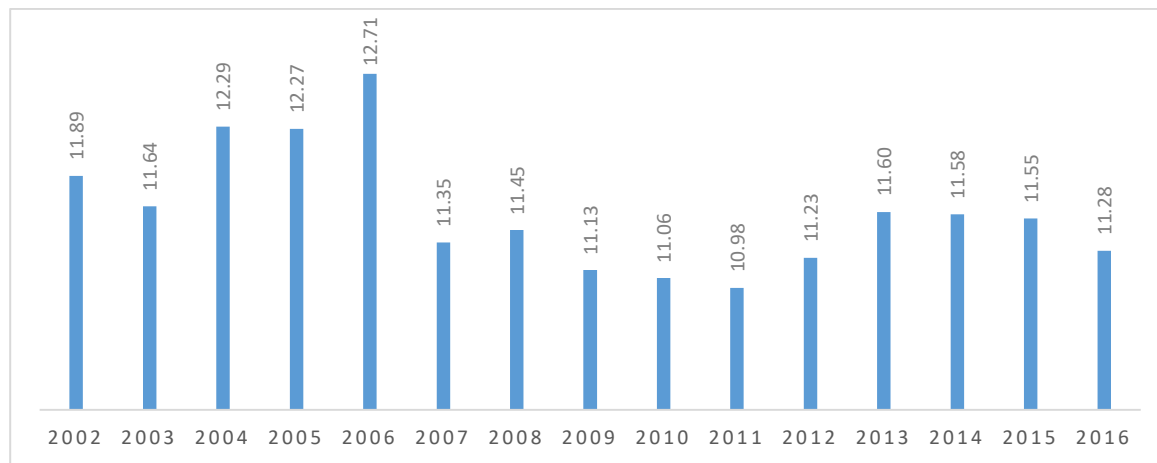


Figure 11: Total government expenditure on education in Poland (% of total expenditure)

As indicated in Figure 11, Poland's aggregate education expenditure was 11.89% in 2002 but declined to 11.64% in 2003 which later maintained a rising trend till 2006, reaching 12.71% of the total expenditure. Subsequently, the rate declined over the years to a tune of 10.98% in 2010 before rising slightly to 11.60% in 2013. This was followed by a continuous plunge to approximately 11.28% as at 2016.

The Nigeria's scenario is depicted in Figure 12 where we observed that aggregate education expenditure (% of total expenditure) has been declining over the years.

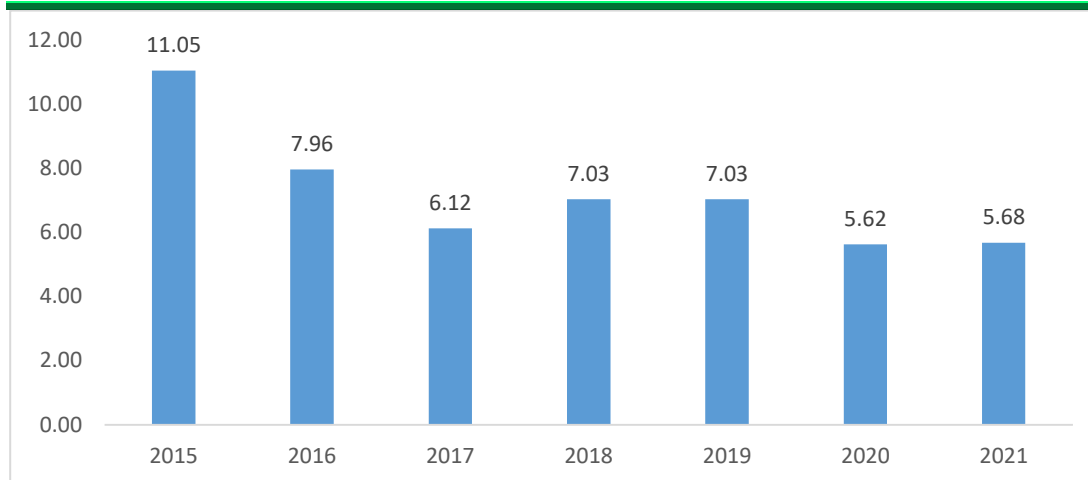


Figure 12: Total government expenditure on education in Nigeria (% of total expenditure)

In 2015, Nigeria’s total government education expenditure was 11.05% of the total government expenditure but this has declined drastically to 6.12% in 2017, but later rose to 7.03% in 2018 and 2019 before declining further to 5.62% in 2020 with an infinitesimal increase to 5.68% in 2021. This little commitment to the educational sector has been one of the issues that causes academic disruptions coupled in incessant strikes in the public universities in Nigeria with a deleterious influence on the educational outcomes in the country.

4.1.3 Educational and Health Measures

Here, key educational measures include school enrolments, school completion rates, pupil-teacher ratio, and literacy rate; while that of the health is majorly life expectancy. These measures are finally merged to capture the human capital index (HCI) of the two countries.

Starting with school enrolment, Figure 13 reflects the enrolments by categories for Poland.

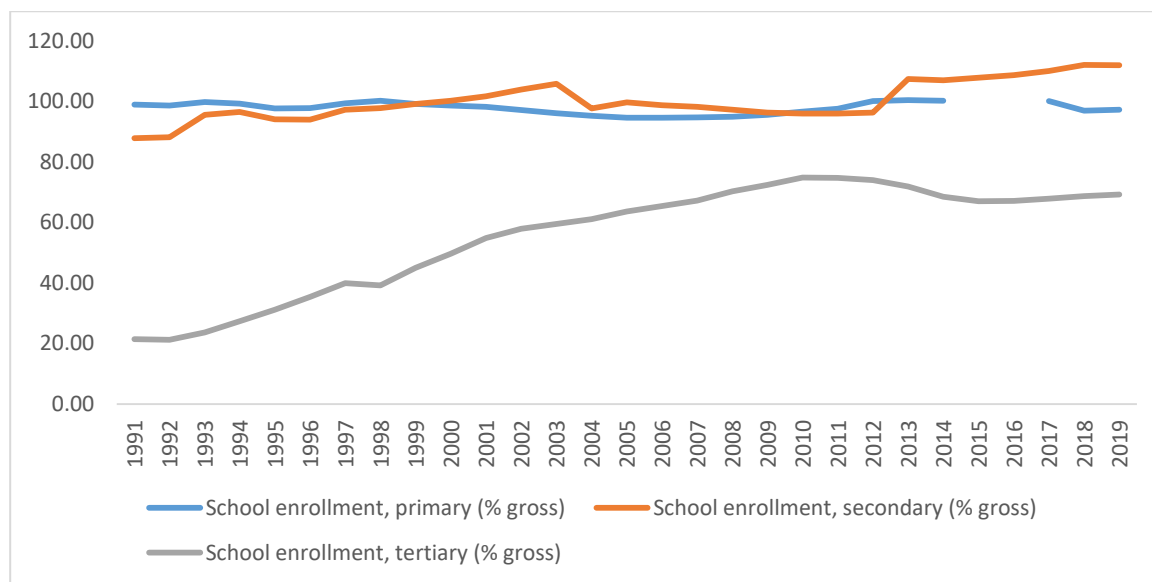


Figure 13: Secondary enrolment rate by categories (% of gross)

It is evidenced that the enrolment (% gross) maintained an upward trend, with the secondary school enrolment exhibiting the highest level followed by the primary school enrolment. Meanwhile, the pace of growth in tertiary enrolment has been on the fastest pace over the years. This signifies the rising demand in tertiary education in the country over the years. Table 1 reflects the detained statistic of such enrolments over the years.

Table 1: School enrolment by categories (% of gross) in Poland

Year	School enrolment, primary (% gross)	School enrolment, secondary (% gross)	School enrolment, tertiary (% gross)
1991	98.85	87.80	21.47
1995	97.62	93.98	31.18
1998	100.09	97.67	39.20
2000	98.56	100.10	49.67
2003	96.01	105.70	59.48
2005	94.53	99.58	63.59
2008	94.80	97.15	70.23
2010	96.53	95.94	74.76
2013	100.33	107.35	71.86
2015	NA	107.74	66.95
2017	100.02	109.93	67.83
2018	96.89	111.97	68.62
2019	97.17	111.80	69.18

Source: World Bank (2021)

As clearly reflected in table 1, primary school enrolments, secondary school enrolments, and tertiary education enrolment was put at 97.17%, 111.80%, and 69% respectively. This signifies that Poland still has a lot to do in improving tertiary education enrolment in the concerned age group.

In the case of Nigeria, data available for some periods indicates that primary school enrolment has been the highest compared to other educational level. Table 2 reveals this scenario.

Table 2: School enrolment rate by categories (% gross) in Nigeria

Year	School enrolment, primary (% gross)	School enrolment, secondary (% gross)	School enrolment, tertiary (% gross)
2009	85.39	39.23	NA
2010	85.12	44.22	NA
2011	90.67	45.56	NA
2012	92.09	47.18	9.57
2013	94.12	56.21	10.17
2014	90.10	45.62	NA
2015	NA	46.78	NA
2016	84.73	42.00	NA
2017	NA	NA	NA
2018	87.45	43.51	NA

Source: World Bank (2021)

Though data were not available (NA) for some years, school enrolment in the primary level stood at 85.39% and rose substantially to 94.12% in 2013 before exhibiting a downward trend to 87.45% in 2018. The secondary school enrolment was 39.23% in 2009 but rose steadily, reaching a peak of 56.21% in 2013; which was followed by a dramatic decline to 43.51% in 2018. The data for tertiary education enrolment has not been made available for some years but in 2012 and 2013, tertiary education enrolment was 9.57% and 10.17% respectively.

At the school completion rate, Figure 14 reflects evidence for the two countries. One key thing to note is that the two countries have been recording a significant school completion rate above 90%, which is a crucial foundation for basic education in any country. However, the completion rate of Poland has often been higher than that of Nigeria for the period under survey. Due to the high number of out-of-school children in Nigeria, the government has been putting up policies such as the free and compulsory education to boost enrolment and completion over the years.

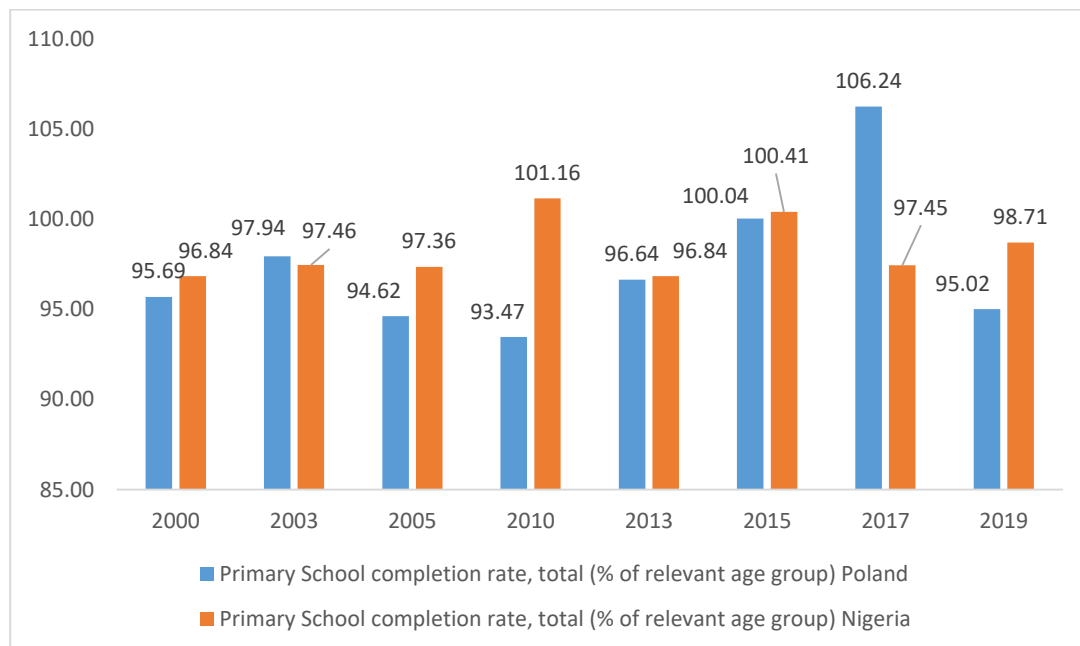


Figure 14: Gross primary school completion rate (% of relevant age group)

As observed in Figure 14, the primary school completion rate (% of relevant age group) in Nigeria stood at 95.02% in Nigeria while that of Poland was 98.71% in 2019.

It is also important to look into the pupil-teacher ratio at various categories in the two countries. Table 3 captures this situation.

Table 3: Pupil-teacher ratio by category in Nigeria

Year	Primary	Lower Secondary	Upper Secondary	Tertiary
1999	41.44	29.80	NA	13.35
2000	42.90	30.89	NA	NA
2001	39.01	32.72	NA	NA
2002	40.28	31.44	NA	NA
2003	34.88	NA	NA	NA
2004	35.81	40.62	38.61	34.83
2005	36.91	40.16	44.36	NA
2006	40.42	31.85	30.37	NA
2007	46.09	28.44	26.35	NA
2008	NA	22.34	18.95	NA
2009	NA	NA	NA	NA
2010	37.55	23.20	17.63	24.62
2011	NA	NA	NA	22.60

Source: World Bank (2021)

As Table 3 clearly indicates, the pupil-teacher ratio in 1999 was as high as 41 pupils per teacher in the primary school level, 30 students per teacher in the lower secondary school level, and 13 students per lecturer in the tertiary education level. This trend has been improving in the primary and secondary school levels where we recorded 38 pupils per teacher in primary, 23 students per teacher in lower secondary, and 18 pupils per teacher in the upper secondary school as at 2010. At the tertiary education level, the case has been worse as it increased from 13 students per lecturer in 1999 to 35 students per lecturer in 2004. This is as a result of the increasing demand for tertiary education in the country. As at 2011, the ratio stood at 23 students per lecturer in tertiary institutions.

The case of Poland has been interesting over the years as there has been significant improvements. Table 4 captures this scenario from 2001 to 2017 due to data availability.

Table 4: Pupil-teacher ratio by categories in Poland

Year	Lower secondary	Primary	Secondary	Tertiary	Upper secondary
2001	10.60	11.14	13.20	19.88	14.76
2003	13.28	12.65	14.11	19.68	14.86
2005	12.56	11.54	11.64	22.26	10.90
2008	12.35	9.94	11.04	21.55	10.08
2010	11.89	9.32	10.39	20.94	9.36
2013	9.07	10.23	9.53	18.50	9.92
2015	8.79	NA	9.32	17.10	9.78
2017	8.64	10.18	9.10	NA	9.51

Source: World Bank (2021)

At the primary school level, the pupil-teacher ratio declined from 11 pupils in 2001 to 10 pupils per teacher in 2017; that of secondary school declined from 13 students to 9 students per teacher; while that of the tertiary institutions declined from 20 students in 2001 to 17 students in 2015. Such decline indicates an increase in the number of instructors within the educational system.

Given these inputs into the educational and health systems in the two countries, it is evident that Poland has been putting more attention to the education and health sectors compared to Nigeria. This is reflected in the literacy rate, life expectancy, and human capital index of the countries. Figure 15 and Figure 16 reflects the adult literacy rate for Nigeria and Poland respectively.

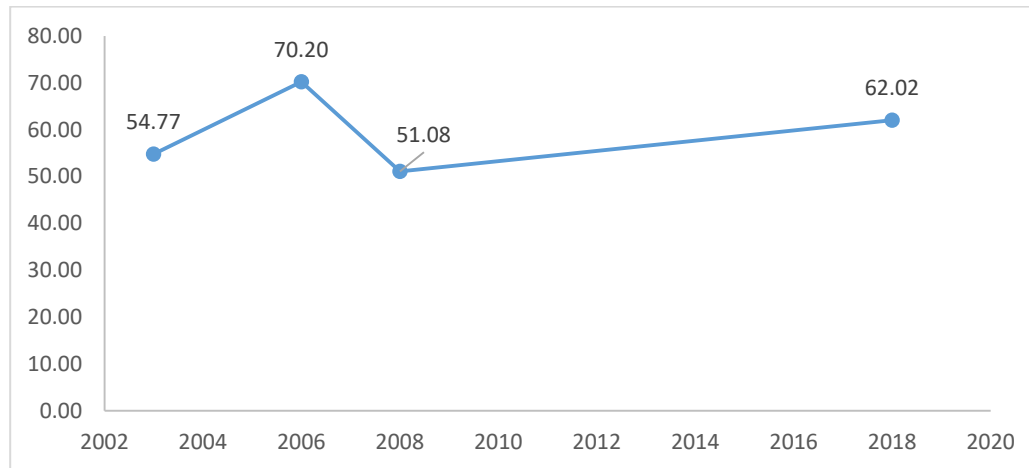


Figure 15: Adult literacy rate in Nigeria (% of people ages 15 and above)

In the case of Nigeria, adult literacy rate surged from 54.77% in 2003 to 70.20% in 2006 and then plunged to 51.08% in 2008. The rate improved to a tune of 62.02% of the populated within the age bracket of 15 and above. This points to the fact that about 37.98% of the population in the relevant age group are illiterates, and this reflects a greater proportion of the population. This scenario is an outcome of the petite investment in the educational sector as our data has earlier revealed.

The case of Poland is an interesting one with the society characterized by greater proportion of the population in the relevant age group being literate. Figure 16 captures this case.

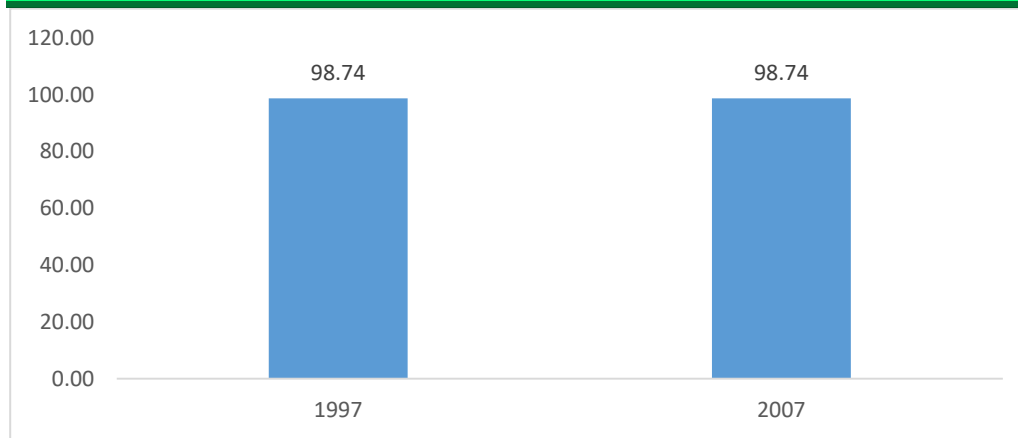


Figure 16: Adult literacy rate in Poland (% of people ages 15 and above)

Data available for 1997 and 2007 indicates that the literacy rate in Poland was as high as 98.74% in the two periods, implying that only 1.26% of the population were illiterate as at then compared to a 37.98% in the case of Nigeria. Again, this variant is attributable to the difference in the investment in education by the two countries.

Going to the health sector, it has been established earlier that Poland apportioned significant amount of her total expenditure and GDP to the health sector compared to Nigeria. The outcome of such investment is captured in figure 17 in respect to life expectancy at birth.

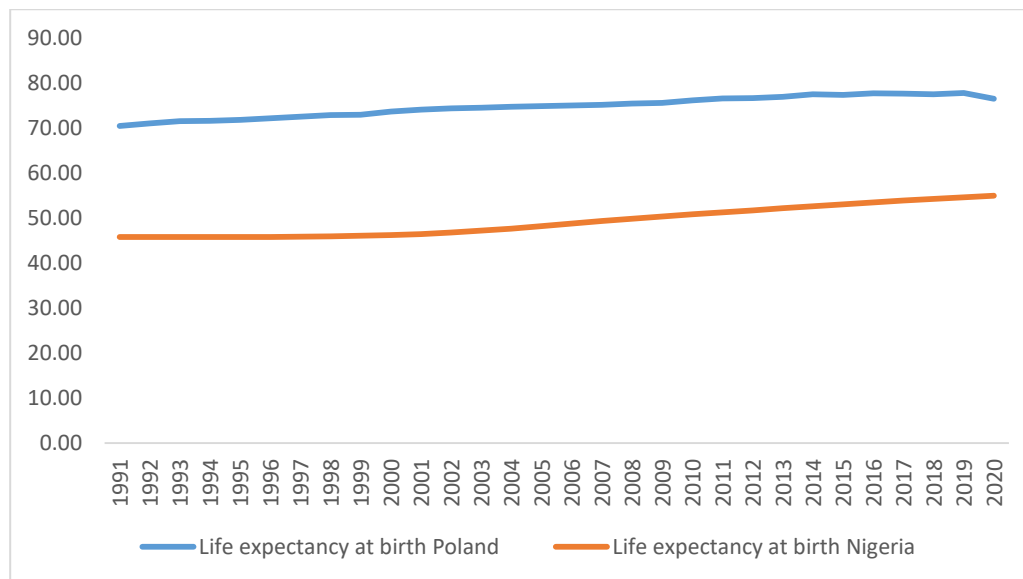


Figure 17: Life expectancy at birth (in years)

Figure 17 portrays that there is a huge gap between the life expectancy at birth in Nigeria and that of Poland. While life expectancy at birth in Nigeria was an average of 55 years in 2020, that of Poland was as high as 76 years, indicating a difference of 21 years between the two countries.

It is worthy to note that the HCI of the two countries will be at a greater variant given the variants in their educational and health outcomes. Figure 18 and Figure 19 captures the case of Nigeria and Poland respectively.

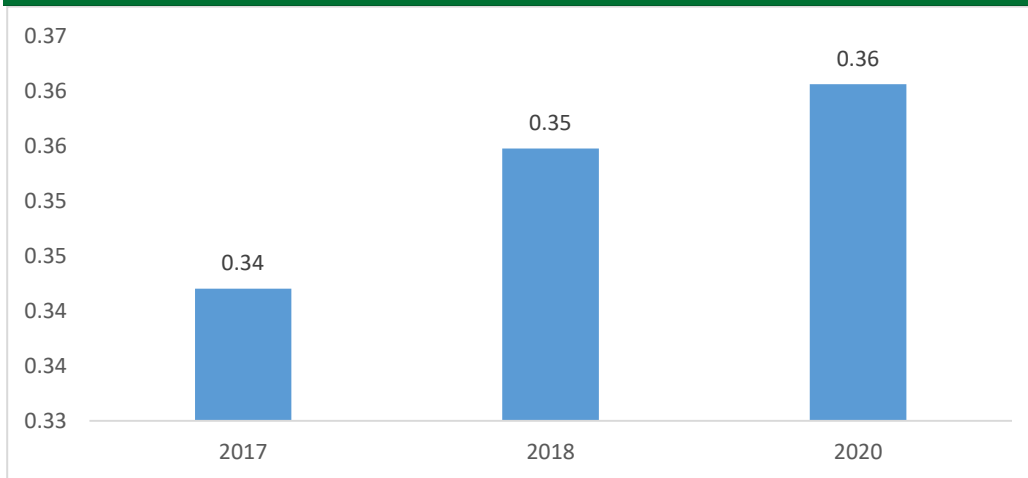


Figure 18: Human capital index (HCI) in Nigeria (scale 0 – 1)

The HCI in Nigeria was been very low over the years. With a scale of 0 to 1, the HCI of Nigeria was just 0.34 in 2017 and rose by a 0.01 point to 0.35 and 0.36 in 2018 and 2020 respectively. This points out that Nigeria is characterized by low HCI which is not even up to 0.5, which is an average.

This reverse is the case of Poland with high HCI, which Figure 19 captures.

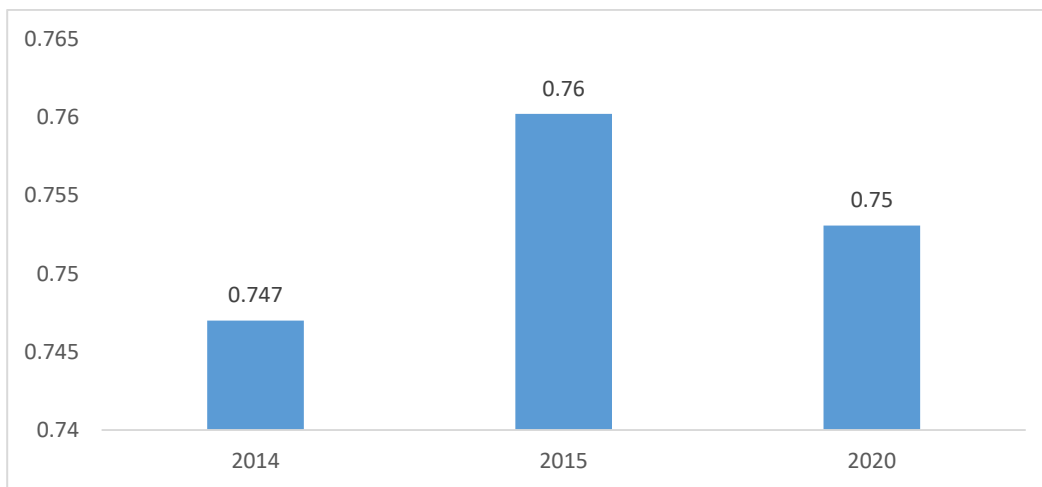


Figure 19: Human capital index (HCI) in Poland (scale 0 – 1)

For Poland, the HCI is above average standing at 0.75 in 2014; 0.76 in 2015; but declined slightly to 0.75 again in 2020. This is quite high and it portrays the high quality of human capital that exist in Poland.

4.1.4 Unemployment Situation

The utilization of human capital is a crucial issue in reaping from the benefits such can offer. Such is captured by the number of trained human capital that has been absorbed by the diverse sectors of the economy. Figure 20 and Figure 21 respectively showcases the unemployment situation in Nigeria and Poland at different levels of educational attainment.

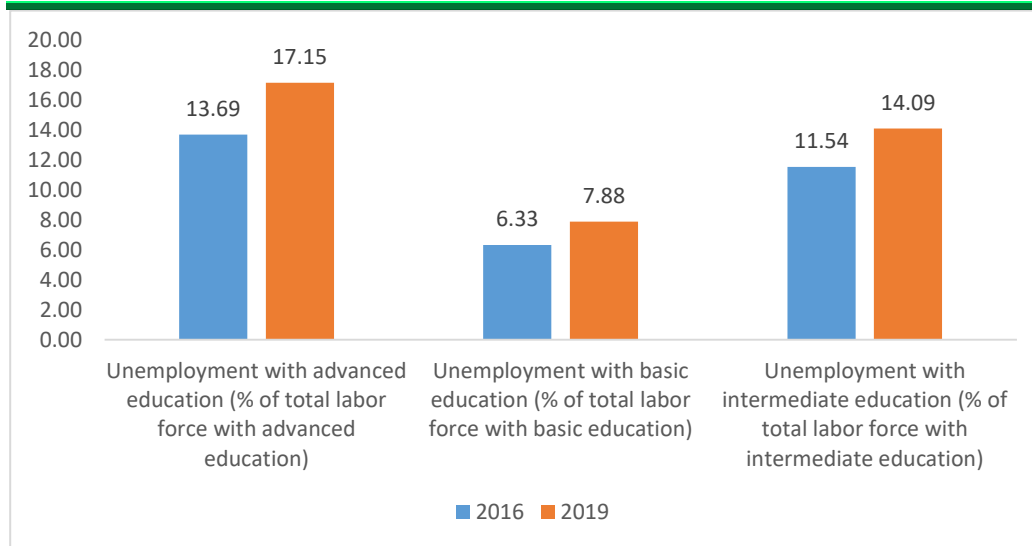


Figure 20: Categorization of unemployment on education basis in Nigeria

In the Nigeria, Figure 20 indicates that unemployment with advanced education was about 13.69% in 2016 but rose to 17.15% in 2019. At the basic education level, the unemployment rate in the category rose from 6.33% in 2016 to 7.88% in 2019; while at the intermediate education, unemployment rose from 11.54% in 2016 to 14.09% in 2019. This clearly points out that even at the advanced level of education, unemployment remains still high showing that majority of the trained human capital has not been absorbed. This is reflected in the high graduate unemployment in the country which is a big call for worry on the future of the country. The most worrisome aspect is that unemployment in all the categories has been exhibiting a rising trend.

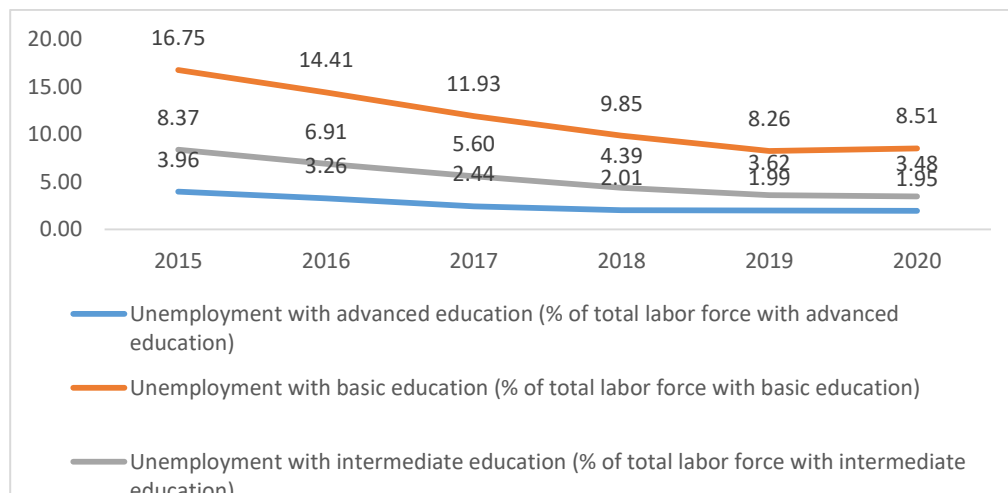


Figure 21: Categorization of unemployment on education basis in Poland

The reverse is the case of Poland where all the categories of unemployment on education basis has been declining substantially. Meanwhile, the attribute that Poland exhibit similar to Nigeria is that unemployment at the advanced education has been the highest compared to others. The rate was as high as 16.75% in 2015 but declined substantially to 11.93% and 8.51% in 2017 and 2020 respectively.

At the aggregate level, Poland has been characterized by a declining unemployment while Nigeria is characterized by a rising unemployment trend. Figure 22 replicate the situation.

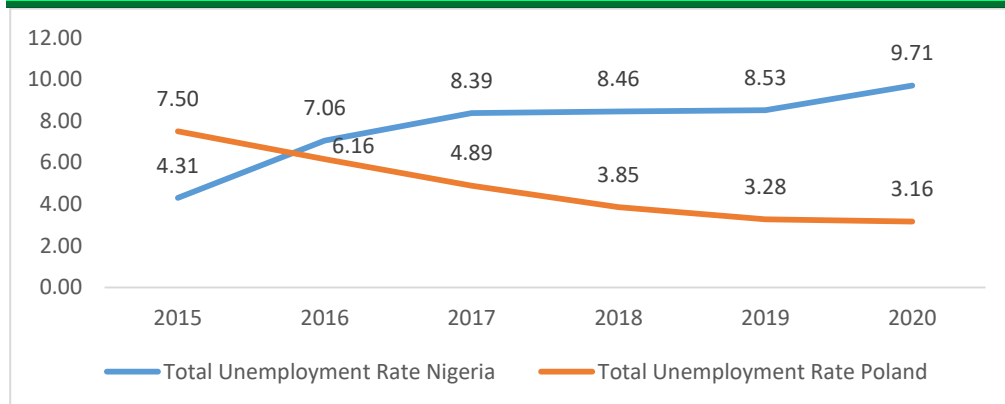


Figure 22: Total unemployment rate in Nigeria and Poland for selected years

In some of the periods till 2015, total unemployment rate in Poland was greater than that of Nigeria with a rate of 7.50% while that of Nigeria was 4.31%. Subsequently, a divergence sets in with Nigeria exhibiting rising unemployment while that of Poland kept declining. In 2017, unemployment in Nigeria was put at 8.39% against 7.06% in 2016 while that of Poland was 4.89% in 2017 against 6.16% in 2016. The trend continued till 2020 where the Nigeria unemployment rate reached 9.71% from 8.53% in 2018; while that of Poland reached a record low of 3.16% in 2020 against 3.28% in 2019.

4.1.5 Economic Performance

The two economic performance indices under consideration are output growth and per capita income. Figure 23 captures the pattern of output growth for the two countries.

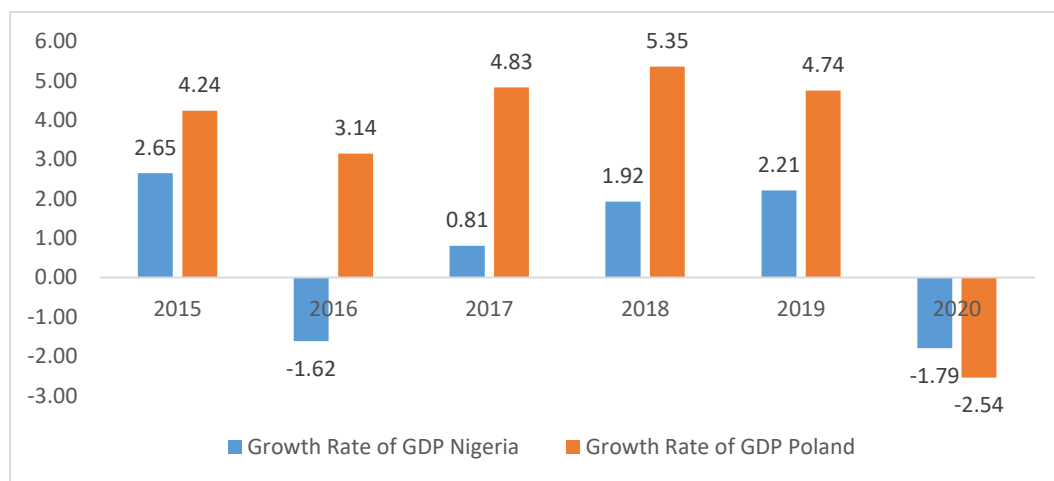


Figure 23: Output growth in Nigeria and Poland, 2015 – 2020

The growth in GDP for the two countries seems to exhibit similar movements over the years. This is because global economic factors do affect both countries since they are both open economies. Meanwhile, the two countries enjoyed positive GDP growth in 2015, 2017, and 2019; while a negative growth rate was recorded in 2020 by the two countries due to the effect of the Covid-19 pandemic. In periods of positive growth rate, it is evident that Poland recorded higher growth rate than Nigeria. Instances can be drawn from the growth rate of 2.65 and 4.24 in 2015 for Nigeria and Poland respectively; 0.81% and 4.83% for in 2017 for the two countries respectively; 1.92% and 5.35% in 2018 for the two countries respectively; and 2.21% and 4.74% in 2019 for the two countries respectively. Within the period, Nigeria recorded two periods of negative growth rate (-1.62% in 2016 and -1.79% in 2020); while Poland only recorded a negative growth rate of -2.54% in 2020. Whether these growth rates transform to better living standards will be captured in the per capita income of the populace.

The per capita income of Nigeria and Poland is characterized by a very wide variation, given that Poland enjoys a higher per capita income compared to Nigeria. This transforms to a better living standard of the citizens of Poland while a majority of Nigerians are still wallowing in abject poverty perpetrated by corrupt leaders with no long term policy drive to reduce the pronounced inequality in the country. Figure 24 gives evidence of this scenario on the income per head for the two countries from 2015 to 2020.

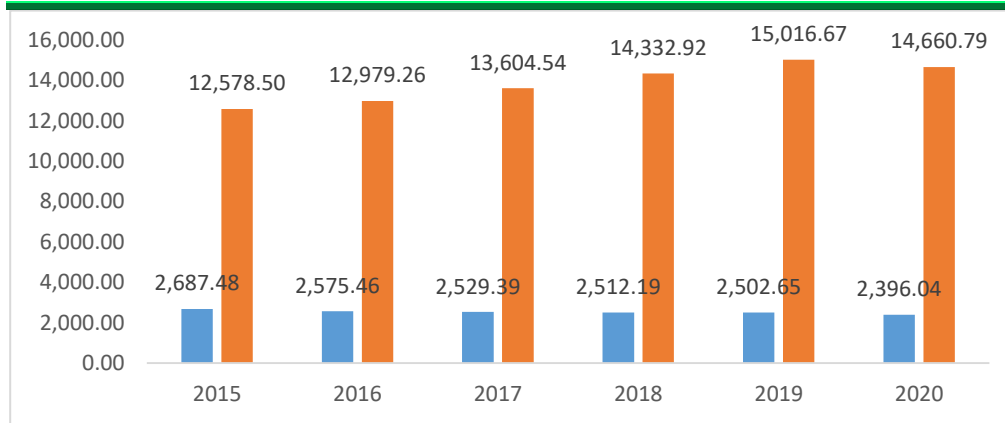


Figure 24: GDP per capita for Nigeria and Poland, 2016 – 2020 (constant 2015 US\$)

It is evident that for the period under observation, the income per head of Nigerians was an average of US\$2,500 compared to Poland with an average of US\$14,000. This points to a clear gap in the standard of living between the two countries.

Nigeria is characterised with high population with low per capita income (standard of living) while Poland enjoys high per capita income with low population. Whether this population difference yields significant sway on economic growth of the two countries will be determined via empirical analysis which is captured in subsequent segment of this paper.

4.2 Empirical Findings

4.2.1 Correlation Analysis

To detect the pattern of the association amid population growth and economic growth for Nigeria and Poland, Table 5 captures the correlation matrix for the two countries.

Table 5: Correlation Result

Nigeria		Poland	
	Economic Growth		Economic Growth
Economic Growth	1.0000	Economic Growth	1.0000
Population Growth	0.2896	Population Growth	-0.1521

Source: Researchers' Computation (2022)

As Table 5 portrays, the correlation coefficient amid population growth and economic growth is positive while that of Poland is negative. For the two countries, the correlation coefficient is weak – 0.2896 for Nigeria and -0.1521 for Poland. It follows that population growth and economic growth in Nigeria moves in the same direction – economic growth increases as population growth increases and vice versa; while they move in the opposite direction in Poland – economic growth increases as population decreases and vice versa.

4.2.2 Unit Root Test

For the fact that the pattern of our data is time series, testing their properties in that regards is of utmost importance. To achieve this, the ADF test is conducted to determine the order of integration of the variables and Table 6 and 7 presents the result for Nigeria and Poland accordingly.

Table 6: Stationarity test result for Nigeria

Variables	Levels	Probability	First Difference	Probability	Order of Integration
GRTH	-2.3399 (-3.5742)	0.4009	-5.9839 (-3.5950)	0.0002**	I(1)
BMSS	-3.1516 (-3.5806)	0.1145	-4.2267 (-3.5806)	0.0125**	I(1)
EPRT	-0.8456 (-3.5742)	0.9491	-4.1635 (-3.5806)	0.0144**	I(1)
GFCF	2.4749	1.0000	-4.2452	0.0120**	I(1)

	(-3.6032)		(-3.5806)		
INFR	-2.6493 (-3.5742)	0.2631	-4.9293 (-3.6121)	0.0031**	I(1)
LEXB	-4.0511 (-3.6220)	0.0213**			I(0)
POPG	-3.9634 (-3.5950)	0.0234**			I(0)
TRDN	-3.1584 (-3.5742)	0.1124	-6.1479 (-3.5806)	0.0001**	I(1)
UNMP	1.4262 (-3.6121)	0.9999	-5.6865 (-3.6121)	0.0006**	I(1)

Source: Researchers' Computation (2022)

For the variables pertaining to Nigeria, the result indicates that life expectancy at birth and population growth rate are do not contain a unit root. This is because they are stationary at levels, I(0). Every other variables contains unit root and they have to be differenced once. Upon differencing, they became stationary at first difference, I(1). As our variables are mixed with I(0) and I(1), it will be pertinent to use the autoregressive distributed lag (ARDL) to ascertain the long run relationship status in the mode using Bounds test.

For Poland, the test for unit root is presented in Table 7 where we also observed that our variables' stationarity are in I(0) and I(1).

Table 7: Stationarity test result for Poland

Variables	Levels	Probability	First Difference	Probability	Order of Integration
GRTH	-4.6283 (-3.6121)	0.0060**			I(0)
BMSS	-1.6902 (-3.5742)	0.7297	-5.2555 (-3.5806)	0.0011	I(1)
EPRT	-2.5110 (-3.5806)	0.3207	-4.4299 (-3.5875)	0.0082	I(1)
GFCF	-3.9435 (-3.6328)	0.0274**			I(0)
INFR	-8.3698 (-3.5742)	0.0000**			I(0)
LEXB	1.4275 (-3.5806)	0.9999	-4.4802 (-3.5806)	0.0070**	I(1)
POPG	-4.4862 (-3.5742)	0.0066**			I(0)
TRDN	-4.0567 (-3.6121)	0.0204**			I(0)
UNMP	-3.5162 (-3.5806)	0.0569	-3.6577 (-3.5875)	0.0434**	I(1)

Source: Researchers' Computation (2022)

As it has been stated, GFCF, INFR, POPG, and TRDN exhibit stationarity at levels, I(0); while other variables are only stationary after first differencing, I(1). This same order of integration similar to the variables in the Nigeria data calls for the test for long run relationship under the ARDL bounds test.

4.2.3 Cointegration Test

Conditional upon the reported order of integration of our variables in both Nigeria and Poland data, we proceed to the ARDL bounds test. The null hypothesis for the test follows that "there is no levels relationship". For cointegration to exist, it is of utmost importance that the F-statistic is greater than the I(0) and I(1) bounds value at the 5% level of significance. The result of the test for Nigeria and Poland are respectively captured in Table 8 and Table 9.

Table 8: Bounds test for cointegration (Nigeria)

Test Statistic	Value	Significance	I(0)	I(1)
----------------	-------	--------------	------	------

F-statistic	19.5823	10%	1.85	2.85
k	8	5%	2.11	3.15
		1%	2.62	3.77

Source: Researchers' Computation (2022)

In the case of Nigeria, the F-statistic (19.5823) is outside the 5% critical value at the lower bound (2.11) and upper bound (3.15), therefore calling for the rejection of the null hypothesis. The existence of cointegration will then usher in the estimation of both the short run and long run estimates of the model.

The test for cointegration for the variables in Poland is also conducted and Table 9 captures the result.

Table 9: Bounds test for cointegration (Poland)

Test Statistic	Value	Significance	I(0)	I(1)
F-statistic	9.2338	10%	1.85	2.85
k	8	5%	2.11	3.15
		1%	2.62	3.77

Source: Researchers' Computation (2022)

In the same case, the F-statistic of 9.2338 is greater than the lower (2.11) and upper (3.15) bound values at the 5% level. So, cointegration exist among the variables. In a likely manner, the estimation of the short run and long run estimates will be carried out.

4.2.4 Short Run ARDL Error Correction Model

Conditional upon the reported result of the existence of cointegration, Table 10 presents the result of the short run error correction model in regards to Nigeria.

Table 10: Error correction model result (Nigeria)

Dependent Variable: D(GRTH)
Selected Model: ARDL(1, 2, 2, 2, 2, 2, 2, 2)

Variable	Coefficient	Standard Error	t-Statistic	Probability
D(BMSS)	-1.1003	0.0365	-30.1283	0.0011**
D(BMSS(-1))	-2.2722	0.0961	-23.6386	0.0018**
D(EPRT)	-6.5090	0.2358	-27.6008	0.0013**
D(EPRT(-1))	0.7357	0.1212	6.0694	0.0261**
D(GFCF)	-0.3879	0.0282	-13.7719	0.0052**
D(GFCF(-1))	-1.1097	0.0510	-21.7407	0.0021**
D(INFR)	-0.2801	0.0087	-32.0760	0.0010**
D(INFR(-1))	-0.0911	0.0081	-11.2581	0.0078**
D(LEXB)	-299.1129	10.2312	-29.2355	0.0012**
D(LEXB(-1))	451.0506	14.7936	30.4895	0.0011**
D(POPG)	-417.8036	24.4432	-17.0929	0.0034**
D(POPG(-1))	201.5131	22.3599	9.0123	0.0121**
D(TRDN)	-0.0124	0.0110	-1.1228	0.3782
D(TRDN(-1))	-0.0628	0.0111	-5.6677	0.0297**
D(UNMP)	3.1538	0.1842	17.1170	0.0034**
D(UNMP(-1))	-1.7138	0.1578	-10.8620	0.0084**
ECT_{t-1}	-1.4371	0.0438	-32.8181	0.0009**
R-squared	0.9961		S.E. of regression	0.3403
Adjusted R-squared	0.9904		Akaike info criterion	0.9618

Note: ** signifies significance at the 5% level

Source: Researchers' Computation (2022)

It is clear from the result that changes in broad money supply and its one-period lag wielded a negative and significant sway of GRTH. A 1% increase in BMSS reduced GRTH by 1.10% on the average; while the one-period lag of BMSS reduced GRTH by 2.27% on the average. It therefore implies that financial development (broad money supply as a percentage of GDP) had not been favourable in driving growth in Nigeria.

The changes in employment to population ratio (EPRT) is noted to wield a negative and significant short run impact on GRTH at the 5% level however, its one-period lag wielded a positive and significant weight on GRTH. A 1% increase in EPRT reduced GRTH by 6.51% on the average; while its one-period lag increased GRTH by 0.74% on the average. The implication is that the last year's EPRT was potent in driving the growth of the Nigerian economy.

The GFCF in company with its one-period lag both wielded a negative and significant short run weight on GRTH at the 5% level. a 1% rise in GFCF wielded a 0.39% decline in GRTH; while the past value of GFCF reduced GRTH by 1.11% on the average. The implication here is that the weak capital base coupled with abandoned capital projects in Nigeria has been a bottleneck to the growth of the economy.

Changes in inflation (INFR) with its one-period lag put forth a negative and significant short-run influence on GRTH at the 5% level. As INFR increases, GRTH reduces and vice versa. Inferring from the coefficient, a 1% increase in INFR will on the average culminate to a 0.28% decrease in GRTH; while the last year's value of INFR reduced GRTH by 0.09% on the average. This points out that INFR has been putting forth a deleterious influence on the growth of the Nigerian economy within the period of review.

It is also noted that LEXB put forth a negative and momentous influence on GRTH, while its one-period lag wielded a positive and substantial influence. It portrays that a 1% increase in LEXB reduced GRTH by 229.11% on the average; while the last year's LEXB increased GRTH by an average of 451.05%. This points out the importance of life expectancy in driving short-run growth. The negative wave of life expectancy on growth can be linked to the low life expectancy attributed to Nigeria.

In regards to population which is a core area of concern, the variable wielded a negative and significant influence on GRTH while its one-period lag wielded a positive and significant effect. As the coefficient depict, a 1% increase in POPG reduced GRTH by 299.11% on the average; while the last year's POPG increased GRTH by an average of 451.05%. This implies that last year's population growth level was sustainable in driving the growth in the Nigerian economy compared to the present rate. It also follows that persistent population growth is not desirable for economic growth in Nigeria.

Changes in the degree of trade openness (TRDN) and its one-period lag put forth a negative influence on GRTH. While changes in TRDN wielded an insignificant weight, its one-period lag put forth a significant effect. consequent upon that, the last year's degree of openness reduced GRTH by 0.06% on the average. The implication here is that Nigeria has not been gaining significantly from the proceeds of trade openness which is signified in the negative trade balance that the country reported recently. Also, Nigeria basically export primary products but imports goods of greater value which dwindles the external reserves and put unnecessary pressure on the value of the local currency.

Changes in unemployment in company with its one-period lag respectively wielded a positive and negative significant impact on GRTH. By the coefficient so estimated, a unit percent increase in UNMP increased GRTH by 3.15% on the average; while the last year's value of UNMP reduced unemployment by 1.71% on the average. It therefore implies that the current rate of unemployment is sustainable for the growth of the Nigerian economy. This could be linked to the equilibrium level of unemployment or the 'non-accelerating inflation rate of unemployment'.

To check on the capacity of the short-run model to establish long-run equilibrium relationship, the error correction term (ECT_{t-1}) is considered. As normally expected, the ECT_{t-1} must be negative plus being statistically significant before it can correct the short-run discrepancies to drive home a long-run relationship. By inspection, the coefficient of ECT_{t-1} (-1.4371) satisfies these two conditions. It follows that 143.71% of the short-run discrepancies is corrected annually for long run equilibrium to be achieved. That is, it takes less than a year for the model's long-run equilibrium to be fully restored. The R-squared is an indication that the overall model explains 99.61% of the changes in economic growth in Nigeria.

In the case of Poland, the result of the short-run error correction model is given in Table 11.

Table 11: Error correction model result (Poland)

Dependent Variable: D(GRTH)
Selected Model: ARDL(1, 0, 1, 1, 1, 1, 1, 0, 1)

Variable	Coefficient	Standard Error	t-Statistic	Probability
D(EPRT)	-1.9772	0.3197	-6.1851	0.0002**
D(GFCF)	0.2798	0.1138	2.4597	0.0362**
D(INFR)	-0.1981	0.0702	-2.8215	0.0200**
D(LEXB)	2.0312	0.2941	6.9061	0.0001**
D(POPG)	-5.6747	0.6556	-8.6553	0.0000**
D(UNMP)	-1.7336	0.1913	-9.0605	0.0000**
ECT_{t-1}	-0.6860	0.0505	-13.5896	0.0000**
R-squared	0.9497		S.E. of regression	0.5635
Adjusted R-squared	0.9330		Akaike info criterion	1.9224

Note: ** signifies significance at the 5% level

Source: Researchers' Computation (2022)

In the short-run result, employment to population ratio (EPRT) wielded a negative and significant sway on GRTH at the 5% level. consequently, a 1% increase in the EPRT reduces GRTH by an average of 1.98%. It follows that the current EPRT in Poland is not sustainable in driving growth in the economy. The GFCF wielded a favourable and significant waves on GRTH. As GFCF rises, GRTH also changes in the same direction. Evidence from the coefficient reflect that if GFCF increase by 1%, GRTH will increase by 0.28% on the average in the short-run. Inflation (INFR) however wielded a negative and substantial sway on the growth of the economy of Poland. It follows that the rate of inflation within the has not been desirable to drive the needed growth rather, it worked against the growth since such inflation might have been cost-push.

Life expectancy wielded a positive and significant waves on GRTH at 5% level against that of Nigeria where we recorded a negative influence. Consequent upon this, as life expectancy increases, economic growth also increases since it portrays a healthy population. It follows from the coefficient that if LEXB increases by 1%, GRTH will likely increase by 2.03% on the average. This points to the importance of life expectancy of the population in driving growth, since accumulated skills and trainings can be used to drive the economy for a longer lifespan.

In regards to population growth, our result made clear that POPG put forth a negative and substantial waves on the growth of the economy of Poland. As captured form the coefficient, a 1% increase in population growth will cause GRTH to decline by an average of 5.67%. As the population grows, economic growth will be hampered given the underutilization of such additional population and the attendant vices that may ensue. In another angle, we can say that the population is not sufficient enough to drive the needed growth since the growth rate has been infinitesimal and even negative in some periods.

As expected, unemployment wielded a negative and significant effect to portray the negative effect of the underutilization of human resources in the economy. As unemployment increases, the human capital which are supposed to increase productivity are idle and this will have a detrimental effect on the overall effect of the economy. As the coefficient reflects, a unit percent increase in UNMP will cause GRTH to decline by 1.73% on the average.

The coefficient of the ECT which is -0.6860 is negative and statistically significant at the 5% level. It portrays that 68.60% of the short-run distortions in GRTH is adjusted every year so that the model can attain a long-run equilibrium. The R-squared reflects that 94.97% of the overall changes in GRTH is as a result of the changes in the explanatory variables in the model.

4.2.5 Long Run Result

The long-run estimates of our model is illustrated in Table 12 for Nigeria, and Table 13 for Poland.

Table 12: Long run estimates (Nigeria)

Variable	Coefficient	Standard Error	t-Statistic	Probability
BMSS	1.8622	0.7995	2.3293	0.1452
EPRT	-7.3461	3.3154	-2.2157	0.1571
GFCF	0.5481	0.3428	1.5988	0.2510
INFR	-0.3049	0.1369	-2.2274	0.1558

LEXB	-16.6326	7.1580	-2.3236	0.1458
POPG	17.8214	57.9505	0.3075	0.7875
TRDN	0.2908	0.1245	2.3350	0.1446
UNMP	2.3195	2.2656	1.0238	0.4136
C	1091.7170	379.3587	2.8778	0.1025

Source: Researchers' Computation (2022)

From the long-run estimates, it is observed that none of the variables wielded a significant influence on economic growth. Going by the signs, financial development (ratio of broad money supply to GDP) wielded a positive long-run effect on GRTH while employment-population ration wielded a negative long-run effect. Gross fixed capital formation and trade openness put forth a positive effect on GRTH, while INFR, and LEXB all put forth a negative long-run effect. It is also observed that population growth and unemployment wielded a positive long-run impact on economic growth of Nigeria.

For Poland, Table 13 captures the long-run estimates where it is observed that only financial development, population growth, and unemployment put forth a significant influence on economic growth.

Table 13: Long run estimates (Poland)

Dependent Variable: GRTH				
Variable	Coefficient	Standard Error	t-Statistic	Probability
BMSS	-0.8515	0.3080	-2.7645	0.0220**
EPRT	0.1998	0.5985	0.3338	0.7462
GFCF	-1.3909	0.6515	-2.1349	0.0615
INFR	-0.6639	0.3648	-1.8199	0.1021
LEXB	4.6145	2.5724	1.7938	0.1064
POPG	-15.8208	6.4403	-2.4565	0.0364**
TRDN	-0.3814	0.2644	-1.4427	0.1830
UNMP	-1.4534	0.6376	-2.2796	0.0486**
C	-234.2350	154.9228	-1.5119	0.1648

Note: ** signifies significance at the 10% and 5% level.

Source: Researchers' Computation (2022)

As Table 13 clearly indicates, BMSS wielded a negative and significant long-run influence on GRTH at the 5% level. A 1% increase in BMSS reduced GRTH by 0.85% on the average. Such negative influence of financial development on growth could be as a result of widespread financial globalization which could pose a detrimental effect on the domestic economy. The EPRT and LEXB both wielded a positive but insignificant long-run sway on GRTH. Meanwhile, GFCF, INFR, and TRDN all wielded a negative but insignificant weight on GRTH.

Population growth is observed to put forth a negative and significant long-run impact on the economic growth of Poland. This implies that over time, the population will not be sustainable in driving the needed growth. a survey of the coefficient indicates that if population increases by 1%, the long-run economic growth will reduce by 15.82% on the average. This calls for a managed population growth that will not trigger such negative growth effect tin the long-run. Unemployment still put forth a negative and significant influence on GRTH in the long-run. Rising unemployment will be followed with a declining growth due to the underutilization of human capital that can drive growth. if unemployment increases by 1%, it is likely that the growth of the economy of Poland will drop by an average of 1.45% in the long-run.

4.3 Major Findings

From the foregoing, key findings of the study are as follows:

- i. Poland has a lower population compared to Nigeria, but the quality of the Population in Poland is quite higher than that of Nigeria given their recent Human Capital Index (HCI) of 0.36 and 0.75 respectively. This index is an evidence of the low

- investment in education and health in Nigeria versus the high investment in education and health in Poland. This is because investment in these sectors has greater influence on literacy rate, life expectancy, and mortality rates.
- ii. Life expectancy in Nigeria put forth a negative and significant influence on economic growth of Nigeria in the short-run but such effect becomes positive and insignificant in the long-run. Meanwhile, life expectancy in Poland wielded a positive and significant short-run effect on growth though its effect in the long-run becomes insignificant.
 - iii. Population growth is observed to put forth a negative and significant short-run influence on the economic growth of Nigeria in the short-run but its effect becomes positive but insignificant in the long-run. For Poland, both the short-run and the long-run influence of population growth on economic growth has been negative and significant. This points to the fact that the current population growth level of Poland is not sustainable for growth, pointing out the need to balance the population in the long-run. The negative effect of population growth as observed in this study aligns with the findings of Headey (2009), Afzal (2009), Bloom and Canning (2001) Shah *et al.* (2015), Guga *et al.* (2015), and Fox *et al.* (2019), which are against the revisionist school of thoughts but supports the orthodox (Malthusian) underpinnings.
 - iv. The effect of unemployment on the growth of Poland's economy has been negative and substantial both in the short-run and the long-run, pointing out the undesirable effect that unemployment can pose to an economy. For the Nigerian economy, the short-run effect has been positive and significant while the long-run effect was positive but insignificant. The difference in the two countries could be as a result of differences placed on the importance of human capital as driver of growth, as reflected in the different levels of investment in human capital development and the disparity in their human capital index.

5 Conclusion and Recommendation

The human capital theorists have asserted that investment in human capital is of great importance compared to investment in physical capital. This points to the need to invest in key aspects of the economy like education and health. It is from this angle that the United Nations recommended a certain percentage to be allocated to these sectors – 26% for education and 8% to 10% in health. Poland has tried in meeting up to the health target which is reflected in its high life expectancy at birth of about 75 years while Nigeria is still at the rear, with a life expectancy of 55 years on the average. Going to the education sector, Poland records a higher literacy rate of about 98% of her population compared to Nigeria with just 62% from recent data. It therefore forms the basis for the low HCI of 0.36 recorded for Nigeria compared to 0.75 for Poland.

It is glaring from the above that given the HCI, Poland is considered to have high quality human resources compared to Nigeria. However, the population of Poland is far less than that of Nigeria; with Poland having about 37 million people while Nigeria has about 200 million people. It is on this basis that our paper tried to examine how the population growth of the two countries affect their respective economic growth. To elaborate, given that Poland has high quality population compared to Nigeria, could it be that the growth in the population of Poland would wield a positive effect on her economic growth while that of Nigeria would wield a negative effect? Our study proceeds from here to utilize data from 1991 to 2020 from the two countries, which were analysed using the ARDL technique.

Empirical findings indicated that population growth has a long-run sway on economic growth of the two countries as reported by the bounds test for cointegration. It is from here that we had to estimate both the short-run and long-run estimates of the model. In the short-run, population growth wielded a negative and significant influence on economic growth of the two countries – with the negative effect on the growth of Nigeria (-417.80) being far greater than that of Poland (-5.67). In the long-run, population growth put forth a positive but insignificant effect on Nigeria's economic growth while that of Poland still remains negative and statistically significant. It was also observed that life expectancy posed a negative and significant short-run effect on the growth of the Nigeria's economy while the effect remained negative and insignificant in the long-run. For Poland, the variable wielded a positive and significant effect on economic growth in the short-run and in the long-run, though the effect is only significant in the short-run.

The policy lesson that can be derived from the negative effect of population growth on economic growth is that though the two countries are at different population spectrum, the need to control population is of immense importance. Though the two countries exhibit a negative effect of population on the growth of their economies, there abound a divergence on the cause of the negative effect. For Poland, such negative could emanate of the adverse effect of aging population on growth; while for Nigeria, the outcome could be as a result of low investment in human capital development and underutilization of available human resources given the rising population trend in the country.

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