Population Growth, Unemployment Rate, and Economic Development in Sub–Saharan African Countries (1990-2020)

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Abstract: The study examined the impact of population growth and unemployment on Economic Development in sub-Saharan African countries from 1990-2020. Using econometric analysis, the study used data on gross domestic product (GDP), population growth rate (POP), unemployment rate (UNEM), and human development index (HDI). The result showed that unemployment has a negative significant relationship with economic development, and population growth has a positive significant relationship with economic development in sub-Saharan African countries. The study, therefore, recommended that government should make sure that the life expectancies in the countries increase, which will reduce the death rate and consequently increase the population and the economic development in the sub-Saharan African countries. It recommended policies to reduce the unemployment rate and promote economic Development in Sub-Shaharan African Countries.

Keywords: Population, unemployment, economic development

1. INTRODUCTION

The population rate in sub-Saharan African countries has increased over time and the level of unemployment has grown large that it cannot be addressed by mere campaign or word of mouth. It required the combined efforts of both individuals and the government of the country in particular and the world at large to formulate a lasting solution to it. In normal conditions as the population, increases there will be an increase in the level of labor supply, which should be an advantage to the economy but in developing countries, this is always the other way around. According to Malthus, population increases faster than food production, population increases at a geometric rate unless prevented by a

powerful check, and food production increase only at an arithmetic rate. It indicates per head food tends to decrease as the population increases, which means the laws of decreasing returns to labor.

Unemployment in Sub-Saharan African countries has affected the youth and the economic development of the country from a broad spectrum of socio-economic perspectives. It is obvious that unemployment especially that of graduates impedes African's progress in several ways. Apart from the economic waste it brought to the nation, it also constitutes political unrest for the country (Ipaye, 1998).

Every nation strives for development. Economic progress is an essential component, but it is not the only component. In an ultimate sense, it must encompass more than the material and financial side of people's lives, to expand human freedoms. Development should therefore be perceived as a multidimensional process involving the reorganization and reorientation of entire economic and social systems. In addition to improvements in incomes and output, it typically involves radical changes in institutional, social, and administrative structures as well as in popular *attitudes and even customs and beliefs. Finally, although development is usually defined in a national context, its more widespread realization may necessitate modification of the international economic and social system as well. This situation has contributed to the increase in crimes and other social vices experienced in our society in recent times because an idle hand is always the devil's workshop. This study is determined to address some of these challenges.

2.0 LITERATURE REVIEW
2.1 The Keynesian Theory

Keynes denied that an economy would automatically adapt to provide full employment even in equilibrium and believed that markets' volatile and ungovernable psychology would lead to periodic booms and crises. The Keynes theory of employment was based on the view of the short run. In the short run, he assumed that the factors of production, such as capital goods, supply of labor, technology, and efficiency of labor, remain unchanged while determining the level of employment. Therefore, according to Keynes, the employment level depends on national income and output.

One of the key implications of Keynesian theory in this context is the importance of effective demand in driving economic growth and reducing unemployment. With a growing population, there is an increasing need for job creation to absorb the expanding labor force. Keynes' emphasis on the role of aggregate demand suggests that policies aimed at stimulating consumption and investment can be vital in providing employment opportunities for the youth and fostering economic development in the region.

In addition, Keynes advocated that if there is an increase in national income, there would be an increase in the level of employment and vice versa. Therefore, Keynes's theory of employment is also known as the theory of employment determination and the theory of income determination.

Cumulatively, applying Keynesian economics in the context of population growth, unemployment rate, and economic development in Sub-Saharan Africa can offer valuable insights into the importance of demand-side policies and the role of effective demand in achieving full employment. However, the region's unique challenges and diverse economic landscape necessitate a multidimensional approach that incorporates a range of economic theories and considers specific contextual factors to devise effective and sustainable solutions for economic development and inclusive growth.

2.2 Empirical findings from developing countries
Okafor (2004:84), argued that population is a critical factor in the development plans of any civilized society. For planning to be effective for the less developed countries' development, it is essential to have a count of the population (i.e. census). This will enhance the government to know how many people to whom they should distribute the amenities and social services.

Akintunde et al (2013) examined the relationship between population dynamics and economic growth in sub-Saharan Africa from 1975 to 2005 using the five-year average. The researchers employed the use of both pooled OLS and dynamic panel techniques on data obtained from thirty-five (35) countries in the sub-Saharan countries. Among the

variables listed in the model include gross capital formation (as a percentage of GDP), gross domestic product per capita, primary school enrolment, mortality rate, and fertility rate among others. The empirical research result revealed that the total fertility rate hurts economic growth while life expectancy at birth was found to have a positive relationship with economic growth during the considered period. The researchers concluded that for economic growth and development to be achieved in studied economies, population growth must be properly addressed.

Rutger and Jeroen (2011) investigated the impact of population dynamics (age structure) on economic growth in developing countries from 1997 to 2008. The variables included in the model are the asset (wealth) index (used as a proxy for district GDP), GDP per capita growth, the growth rate of working-age share, urbanization rate, landlocked, life expectancy, and trade openness. The result of the study revealed a robust positive effect of the working-age population on the growth rate of GDP. Therefore, the researchers recommended the need for government to create a conducive investment environment as this would provide more employment that can absorb the growing youth population. So also, Dao (2012) examined the relationship between population and economic growth in Africa using data that covered selected forty-five (45) African economies. The researcher employed the use of panel data regression analysis for the study, among the variables listed in the model include fertility rate, per capita GDP growth, trade openness, and dependency ratio (old and young) among others. The researcher deduced from the findings that the relationship between population growth and per capita GDP growth is linear and negative.

Gill (1992) investigated the relationships between population growth and economic development for the economy of India. He concluded that population growth is good but up to some extent, while large population growth caused pressure on resources within the economy. Large population growth harms economic development.
David Byrne and Eric Strobl argued that Persons who are not searching for a job but want and are willing to work, are likely to be of substantial numbers and may, in many cases, not be that different in behavior from the standard unemployed. Excluding these may then result in substantially underestimating the true degree of labor market slack in a developing country. Thus, while comparability of unemployment rates across countries certainly requires the adoption of standards, if these standards are stringently applied there may be some trade-off in terms of applicability. The optimal definition of unemployment in developing countries should instead be evaluated on a case-by-case basis.

2.3 Empirical Findings from Nigeria.
Davis Ojima (2019) investigated the relationship that exists between unemployment and economic development in Nigeria. From the result of the data analyzed, the researcher concludes that an inverse relationship exists between unemployment and economic development in Nigeria. This implies the higher the rate of unemployment the lower the rate of economic development. This shows unemployment is a cog in the wheel of our development. This is because the human development index the proxy for economic development is negatively affected by unemployment.
Amassoma and Nwosu (2013) examined the impact of unemployment on productivity growth in Nigeria using an error correction modeling approach and co-integration technique to analyze the data used from 1986 to 2010. The regression estimate based on the short-run and long-run models showed that the unemployment rate had an insignificant influence on productivity growth in Nigeria over the study period.
According to Udabah (2002:59), Population is a central problem of economic development. If a country's population increases as fast as national income, then per capita income will not increase. Rapid population growth leads to the low standard of living of the people. Much of the problems of developing countries like Nigeria is population growth as they have made appreciable gains in income but the increasing population has eaten up most of the gains.

Akeju and Olanipekun (2014) validated Okun's law in Nigeria using the Error Correction Method and Johansen co-integration technique. The findings showed that there is both a short and long-run relationship between the unemployment rate and output growth in Nigeria. Hence, there is a need to incorporate fiscal measures and increase the attraction of foreign direct investment (FDI) to reduce the high rate of unemployment in the country. Eastern (1996) and Schofield and Reher (1991) also show that the dire living conditions that came with the industrial revolution and modern economic growth in cities of Europe during the nineteenth Century might have raised mortality rates. On the other hand, evidence from contemporary developing economies tends to show that it is mortality decline that leads to

economic growth, developing economies tend to show that it is mortality decline that leads to economic growth, as it increases investment in both physical and human capital via increased savings rates and education (see, for instance, Bloom and Canning (2001) and Kalemli-Ozcan (2002).

3.0 MODEL SPECIFICATION

This study employed multi-regression in analyzing the effect of population growth, unemployment rate, and economic development in ten selected countries in sub-Saharan Africa countries 1990 and 2020. This method is adopted because it remains the best linear unbiased estimate. This study adopted the Aidi Hakeem O *et al* (2016) model, however, the variables included in the model are not the same as the model specified for this study.

$Y=f(X_1, X_2)$

POP=f(BIR,DEA,MIG)……………………………………………………………… (1)

UNEM=f(POP,   DED,INFL,TECH,RES,GOV)……………………………………..…........(2)

This can be linearized into development equation as below;

$$Y=\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \mu \text{ ....(3)}$$

$$HDI= \beta_O + \beta_1 POP + \beta_2 UNEM + \beta_3 \ GDP + \mu \text{ ....(4)}$$

Where;

RES=Availability Of Resources

TECH=Level Of Technology

HDI=Human development index, a proxy of economic development.

INFL=Rate Of Inflation In Economy

DED=Demand Deficiency

POP= Total Population

β_1= a priori expectation which is the coefficient of POP

RES=Availability Of Resources

β_2=a priori expectation which is coefficient of UNEM

EDU= Educational Level

TEC=Level Of Technology

GOV=Government Intervention

μ= It sometimes called white noise error/error term.

3.1 Definitions and measurement of the variable.

Independent variable:

Gross Domestic Product: it represents the total monetary value of all final goods and services produced (and sold on the market) within a particular period usually a year.

Unemployment Rate: This is the percentage of the labor force that is jobless. It is also the unemployment rate is the proportion of the labor force that is not currently employed but could be. It is a lagging indicator, meaning that it generally rises or falls in the wake of changing economic conditions, rather than anticipating them. When the economy is in poor shape and jobs are scarce, the unemployment rate can be expected to rise. When the economy is growing at a healthy rate and jobs are relatively plentiful, it can be expected to fall. This can be measured by dividing the total number of the labor force (people in the labor market i.e., willing to work) but are unemployed. It is calculated as;

$$UNME= \frac{\text{TOTAL NUMBER OF PEOPLE IN THE LABOUR FORCE}}{\text{TOTAL NUMBER OF UNEMPLOYED}}$$

Population (POP): A population is defined as a group of individuals of the same species living and interbreeding within a given area. Members of a population often rely on the same resources, are subject to similar environmental

constraints, and depend on the availability of other members to persist over time. it also the whole number of people or inhabitants in a country or region.

Dependent Variable

Human development index: This is a statistic composite index of life expectancy, education (mean years of schooling completed and expected years of schooling upon entering the education system), and per capita income indicators, which are used to rank countries into three tiers of human development.

4.0 RESULT

Data analysis.
Table 1 Descriptive Statistics of the Study Variables.

	HD	POP	UNEM	GDP
Mean	0.473422	45189251	11.88003	1.01E+11
Median	0.471000	20202238	6.735000	1.71E+10
Maximum	0.709000	2.06E+08	33.29000	5.47E+11
Minimum	0.000000	949493.0	0.000000	0.000000
Std. Dev.	0.188137	54062236	9.888218	1.43E+11
Skewness	-1.045651	1.465131	0.662578	1.423443
Kurtosis	3.671884	4.005343	1.964356	3.676980
Jarque-Bera	30.96023	61.58173	18.15016	54.94632
Probability	0.000000	0.000000	0.000114	0.000000
Sum	72.90700	6.96E+09	1829.525	1.55E+13
Sum Sq. Dev.	5.415532	4.47E+17	14959.86	3.14E+24
Observations	154	154	154	154

Source: Researcher's computation (2021)

Table 1 above presents the characteristics of the variables used in the models of this study. Out of 154 observations, the mean value of the human development index (HDI), total population (POP), unemployment rate (UNEM), and gross domestic product (GDP) are 0.473422, 45189251, 11.88003, and 1.01E + 11 respectively. The minimum human development index (HDI) is 0.000000 and its maximum value is 0.709000, the minimum value of total population (POP) is 949493.0and its maximum value is 2.06E+08, the minimum value of unemployment rate (UNEM) is 0.000000 and its maximum value is 33.29000, the maximum value of the gross domestic product (GDP) is 5.47E+11 and its minimum value is 0.000000.

The skewness statistics revealed that all variables except HDI (POP, UNEM, and GDP) are positively skewed meaning the series has a long right tail, however, HDI was negatively skewed meaning the series has a long-left tail. Based on the result of skewness UNEM is moderately skewed (normally distributed) since their value is found between 0.5 and 1, while HDI, POP, and GDP are highly skewed greater than -1 and 1.

The kurtosis statistics of UNEM are below three meaning the tails of these series are tiny while the kurtosis statistics for all the remaining variables (HDI, POP, and GDP) are above three, meaning that the tails of these series are tick. Based on the result of the kurtosis, all the series except UNEM are not normally distributed because their kurtosis statistics were not equal to three.

Furthermore, it is seen in Table 1 that the Jarque-Bera probability for all variables under study is less than 0.05 significant level. The rule states that the null hypothesis (series are normally distributed) will be rejected if the Jarque-Bera probability is less than 5 percent and accepted if it is greater than 5 percent. Thus, at a 5 percent significant level, the null hypothesis that series are normally distributed is rejected for all variables under consideration. This is deduced from the probability value for Jarque-Bera supported by Skewness and Kurtosis for the series.

Correlation Analysis

Table 2 Correlation Matrix

	HDI	POP	UNEM	GDP
HDI	1			
POP	-0.160118	1		
UNEM	0.656325	-0.197808	1	
GDP	0.279597	0.733756	0.278290	1

Source: Researcher's computation (2021)

Table 2 presents the result of the correlation analysis between the dependent variable and explanatory variables. It can be seen from the table above that above that, there is evidence of a negative correlation between HDI and POP (-0.160118) that is the higher the GDP the lower the population, and vice versa. The correlation coefficient between GDPCAL and UNEM was 0.706956, meaning a strong correlation exists between GDP and UNEM. In addition, the correlation coefficient between HDI and GDP was 0.279597, which means that a weak positive correlation exists between HDI and GDP. The table showed further the correlation coefficient between the independent variables to examine the presents of multicollinearity in the data set. It can be observed from the table above that the correlation coefficient between independent variables is relatively low, thus the independent variables are not highly correlated with each other which is evidence of absents of a multicollinearity problem in the data set. Hence, the data series under consideration is suitable enough to be used to estimate the regression model.

Stationary Test
Table 3 Unit Root Test

Variables	ADF	Critical Value			Prob	Order Of Integration
		1% level	5% level	10% level		
HDI	-12.24956	-3.473956	-2.880591	-2.577008	0.0000	(0)
POP	-12.48236	-3.473382	-2.880336	-2.576871	0.0000	(1)
UNEM	-16.34377	-3.473382	-2.880336	-2.576871	0.0000	(1)
GDP	-10.65428	-3.473382	-2886336	-2.576871	0.0000	(1)

Source: Researcher's computation (2021)

Table 3 shows the result of the unit root test for checking the stationarity of the variables under consideration using the Augmented Dickey-Fuller test. From the table it can be visualized that variables HDI, POP, UNEM, and GDP are all stationary at first difference. However, at a 5 percent level of significance, the data series under consideration is of order one.

Granger Causality Test
The Granger causality test result
Pairwise Granger Causality Tests

Date: 10/17/21   Time: 21:42
Sample: 1990 2020
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
POP does not Granger Cause HDI	144	0.20366	0.8160
HDI does not Granger Cause POP		1.45012	0.2381
UNEM does not Granger Cause HDI	144	0.16732	0.8461
HDI does not Granger Cause UNEM		0.20072	0.8184
GDP does not Granger Cause HDI	144	0.41154	0.6634
HDI does not Granger Cause GDP		0.01137	0.9887
UNEM does not Granger Cause POP	145	11.7701	2.E-05
POP does not Granger Cause UNEM		1.10866	0.3329
GDP does not Granger Cause POP	145	7.21686	0.0010
POP does not Granger Cause GDP		5.71059	0.0041
GDP does not Granger Cause UNEM	145	7.35748	0.0009
UNEM does not Granger Cause GDP		0.07664	0.9263

Source: Researcher's computation (2021)

Table 4 above shows the evidence of causality that exists among the variables. The decision rule for the Granger causality test, therefore, states that a p-value less than 0.05 should be sufficient to reject the null hypothesis. The table shows that POP neither granger cause HDI nor HDI granger cause POP, with the F-Statistics value of 0.20366 and 1.45012, and the P-value of 0.8160 and 0.2381 respectively therefore null hypothesis is accepted and therefore concludes that both HDI and POP do not granger cause each other. Also, at F-Statistics value of 0.16732 and P-value of 0.8461 the null hypothesis that UNME does not granger cause HDI was accepted, also, at F-statistics of 0.20072 and p-value of 0.8184 the null hypothesis that HDI does not granger cause UNEM was accepted, therefore we conclude that UNME does not granger cause HDI neither HDI granger cause UNEM. GDP and HDI do not granger cause each other at a p-value of 0.6634 and 0.9887 respectively, however, the null hypothesis was accepted and therefore concluded that both do not granger cause each other. At P-Value of 0.0010 and 0.0041, and F-Statistics of 7.21686 and 5.71059, the null hypothesis was rejected; therefore, conclude that GDP and POP do granger cause each other. The null hypothesis that GDP does not granger cause UNEM was rejected at a P-Value of 0.0009 and F-Statistics of 7.35748, however, the null hypothesis that UNEM does not granger 0.2381cause GDP was accepted at a P-Value of 0.9263 and F-Statistics of 0.07664, therefore concluded that GDP does granger cause UNEM, but UNEM does not granger cause GDP.

Result of the Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	81.473962	3	0.0000

** WARNING: estimated cross-section random effects variance is zero.

Source: Researcher's computation (2021)

Hypothesis test

H_0=pooled ols is better/ there is no significance
H_1=fixed effect is better and significant

The table above presents the result of the Hausman test to choose the best panel least square model. The tables show the Hausman test result with a Chi-Sq of 353.249323 and a p-value of 0.0000 which is less than the acceptable 0.05 level of significance which significant, therefore we will accept H_1 and reject H_0 and then conclude that the fixed effect is better. Therefore, we employ the fixed effect method which states that the variable is deferred in the intercept.

Panel Regression Analysis
Table 5 Panel Regression Result
Dependent Variable: HDI
Method: Panel Least Squares
Date: 10/17/21   Time: 21:54
Sample (adjusted): 1991 2020
Periods included: 30
Cross-sections included: 5
Total panel (unbalanced) observations: 149

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LHDI	0.658678	0.088180	7.469714	0.0000
POP	4.98E-09	1.16E-09	4.296765	0.0000
UNEM	-0.004821	0.003697	-1.303940	0.1950
GDP	-4.68E-13	1.65E-13	-2.830624	0.0055
C	0.039136	0.045034	0.869040	0.3867

Effects Specification

Cross-section fixed (dummy variables)
The period fixed (dummy variables)

R-squared	0.922897	Mean dependent var		0.476940

Adjusted R-squared	0.897197	S.D. dependent var	0.185200
S.E. of regression	0.059381	Akaike info criterion	-2.594043
Sum squared resid	0.391394	Schwarz criterion	-1.827936
Log-likelihood	231.2562	Hannan-Quinn criteria.	-2.282786
F-statistic	35.90922	Durbin-Watson stat	1.525995
Prob(F-statistic)	0.000000		

Source: Researcher's computation (2021)

5.0 DISCUSSION

Table 5 shows the result of panel least square analyses (fixed effect) for studying the population growth, unemployment rate, and economic development in sub-Saharan African countries. A critical examination of the results as reported above shows that about 92.29% of the total variation in the dependent variable could be explained by the explanatory variables. This is indicated by the coefficient of determination (R^2) value of 0.922897. This implies that POP, UNEM, and GDP account for 92.29% of the variation in the human development index a proxy of economic development. The remaining balance of 7.71% variation in the dependent variable (human development index HDI) can be explained by other factors, which are excluded from the model. The LHDI is a dependent lag variable, which allows the researcher to remove the autocorrelation series problem that previously occurred, and because of lagging the dependent variable at order 1, the autocorrelation was removed.

The Durbin Watson statistics of 1.525995 is now significantly close to 2.00 and signifies the absence of autocorrelation. At a significance level of 0.05, the F-statistics is 35.90922 while the p-value of the F-statistics is 0.000000, which is less than 0.05. Furthermore, at t-statistics of 7.469714 and p-value of 0.0000 in the regression table above shows that the total population has a positive significant impact on HDI, meaning that holding other variables as constant, a unit increase in POP will bring about an increase in HDI by 4.98E-09. Unemployment rate UNEM is negatively and significantly influencing the human development index (HDI), meaning that, holding other independent variables constant, a unit increase in unemployment rate (UNEM) will bring about a reduction of -0.004821 in the human development index (HDI). The result shows further that gross domestic product (GDP) has a negative significant impact on the human development index (HDI), meaning that a unit increase in GDP will bring about a -4.68E-13 increase in HDI.

The above study examined the research objectives using regression statistical analysis. The finding from the above revealed that the total population (POP) has a positive significant impact on the human development index (HDI) a proxy of economic development of Sub-Saharan African countries for the period studied. The implication of this finding is that total population (POP) will adversely influence economic development in Sub-Saharan African countries for the period studied. Again, the finding shows that unemployment has a negative insignificant impact on the human development index (HDI), meaning that unemployment cannot influence economic development in sub-Saharan African countries for the period under the study. However, based on the above findings the gross domestic product harms the human development index, the implication is that gross domestic product will adversely influence economic development in sub-Saharan African countries for the period studied.

GROSS DOMESTIC PRODUCT TREND ACROSS THE COUNTRIES

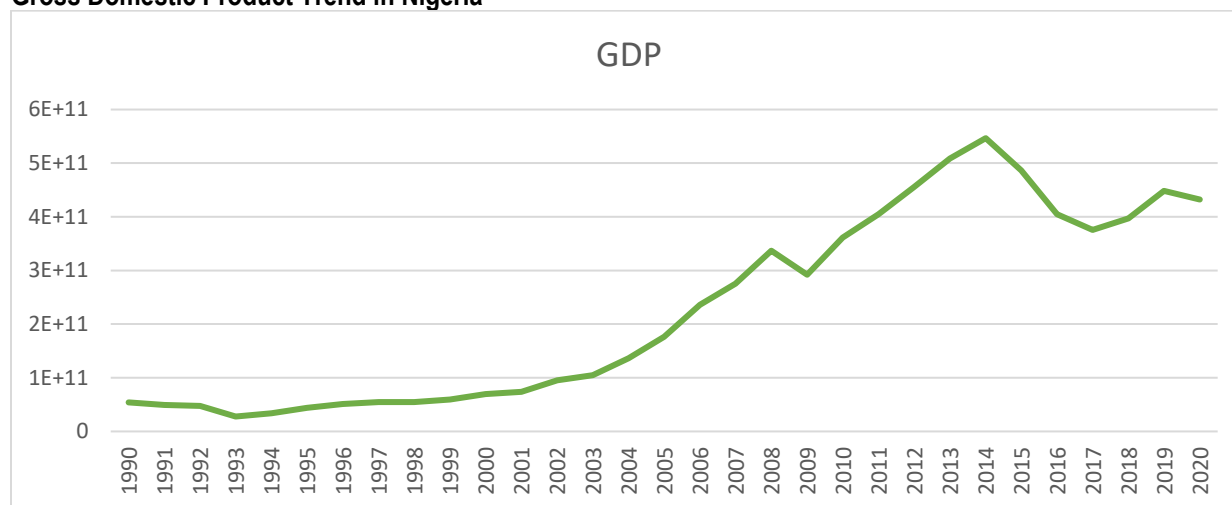**Gross Domestic Product Trend in Nigeria**

FIG 4.1: Shows the trend of gross domestic product in Nigeria from 1990 to 2020

The graph shows that Nigeria's Gross Domestic Product in 1990 fell due to the financial crisis that occurred in 1989, hence, all the state-run enterprises were privatized especially communication, power, and transportation to enhance the quality of service and reduce dependence on the government to finance the budget. In the year 1990, the trend also declined and the reason being that there was an economic recession in the country. In 1992, the trend was positive but remained unchanged compared to the end of 1991, although there was an improvement in the economy all the gain realized was to be compensated on employment, productivity, and the promotion of greater efficiency in the economy, and the fiscal policy was adopted. In 1993, the trend shows a negative move and the reason could have been a result of the change in government which gave rise to a second republic as a result of Coup D'état led by Late General Sanni Abacha. Towards the end of 1993 to 1997 the trend was positive. In 1998 the trend was negative and the reason could have been as a result of falling in the oil price. Also, towards the end of 1998 to the earlier of 2008 the trend was upward moving; however, the trend was turned from upward moving to downward moving in the middle of 2008 to 2009 and the reason might be the fall in the oil price. From 2009 towards the end of the year, to the earlier 2014, the GDP rose, although fell towards the end of 2014 as a result of a decrease in oil output. However, from the end of 2014 to 2016 the GDP fell the reason could have been such as; a fall in oil prices, budget deficit, economic recession, etc. Furthermore, the GDP rose from 2017 to 2019 and this might have been a result of a sharp recovery in the oil sector, although towards the end of 2019 GDP fell and the reason could have been a result of the high inflation rate in the economy. Finally, the GDP fell in 2020 as a result of globe crisis, consequently, a fall in the oil price which give rise to a budget deficit.
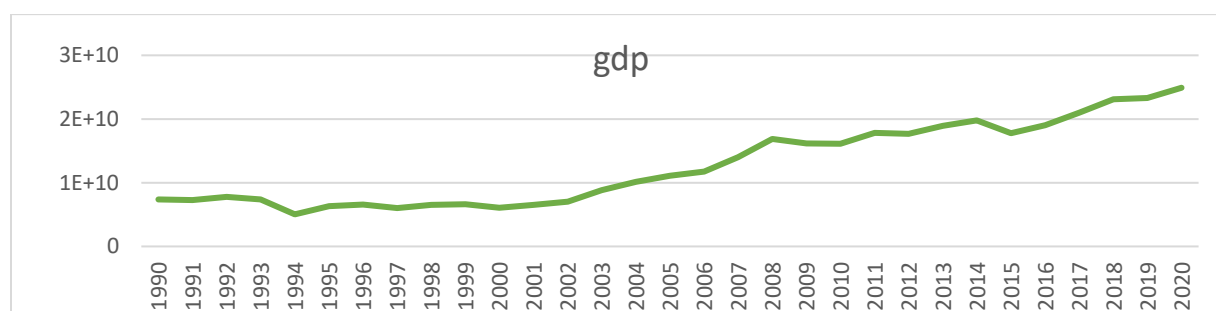
Gross Domestic Product Trend in Senegal

Fig 4.2: Shows the trend of gross domestic product in Senegal from 1990 to 2020.

The graph shows that from 1990 to 1992 the GDP rose and it fell between 1993 and 1994, however, from late 1994 to 2008 it rose but later fell between 2009 and 2010, although it later rose from late 2011 to 2014, it fell between the late 2014 and 2015, and from late 2015 till date it increases. The main reason for the rising gross domestic product (GDP) in the economy could have been due to the increase in demand for their domestic product by foreign countries e.g. India which consequently induced investment, however, leading to an increment in exportation and the overall economy prosperity.

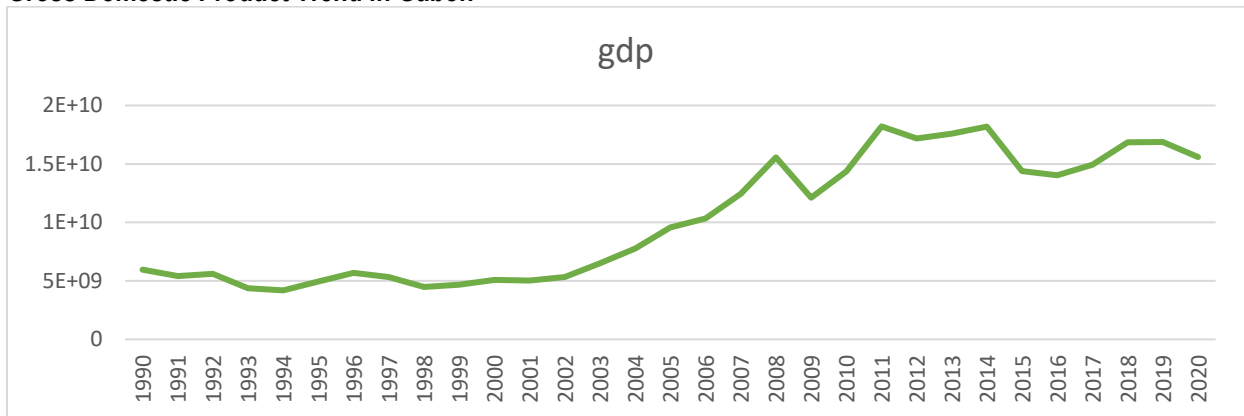**Gross Domestic Product Trend in Gabon**

Fig 4.3: Shows the trend of gross domestic product in Gabon from 1990 to 2020.

The graph shows that from 1990 to 1994 it rose from late 1994 to 1996, it fell between 1997 and 1998, and from late 1998 to 2008 it rose again due to low inflation which accounted for income in the oil sector but there was a decline in the non-oil sector, and it fell between the late 2008 and 2009 the reason may be due to the change in government, however, from late 2009 to 2011 it increased the reason could have been because the country authorities embark on economic diversification plan, also it fell in 2012 and rose again between 2013 and 2014, it fell in the year 2015 and it rose again from 2016 to 2018, however, from 2019 till date it decreases. The reason for the above fluctuation in the GDP could be due to over-rely on the oil sector, which accounted mostly for the national income. However, any price crisis could cause a greater fall in their GDP and vice versa.

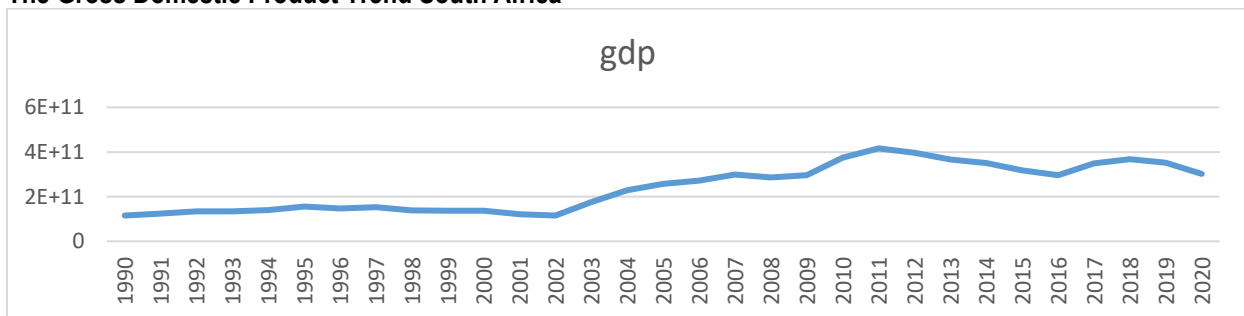**The Gross Domestic Product Trend South Africa**

Fig 4.4: Shows the trend in gross domestic product in South Africa from 1990 to 2020.

The graph shows that from 1990 to 1995 gross domestic product rose but it fell from 1996 to 2002 reason may be due to the crisis that arose in Soweto which led to the bombing and it rose again the could have been due to the constitutional court approval the country constitutional and macroeconomic policy was introduced, also from 2003 to 2011 although later fell from 2012 to 2016 the may be because the economy faced some challenges as soft commodity price, slow domestic, etc., however, it rose between 2017 and 2018, and from 2019 till date it increases. The reason

for the fluctuation in the above graph could be that South Africa is the one of most industrialized, technologically advanced, and economically diversified African countries. The country also exports products such as diamond, iron ore, timber, sugar, etc. which accumulated for the increment in gross domestic product in the economy.

The Gross Domestic Product Trend in Mozambique

Fig 4.5: Shows the trend of gross domestic product in Mozambique from 1990 to 2020.

The graph shows that in 1990 and early 1992 the GDP rose and it fell between the late 1991 and 1992 this may be due to a civil war that ended in 1992, however from 1993 to 1999 it rose again, from 2000 to 2002 it fell, although rose again from 2003 to 2008 and between 2009 and 2010 it fell, from late 2010 to 2014 it rose again the reason could have been due to the discovery of natural gas in the country, although fell between 2015 and early 2016 the reason may be due to the change in government, and from late 2016 to 2019 it rose the reason could have been because government embarked on the economic strategic plan, however, from early 2019 till date it decreases. The reason for the increase in the gross domestic product in the country over the years could have been due to the increase in the export which accumulated for the agricultural product such as tobacco, cooking coal, etc., and the natural resources such as gold, titanium, copper, etc. and those products are exporting to countries like South Africa, Portugal, China, etc.

THE UNEMPLOYMENT RATE TREND ACROSS THE COUNTRIES

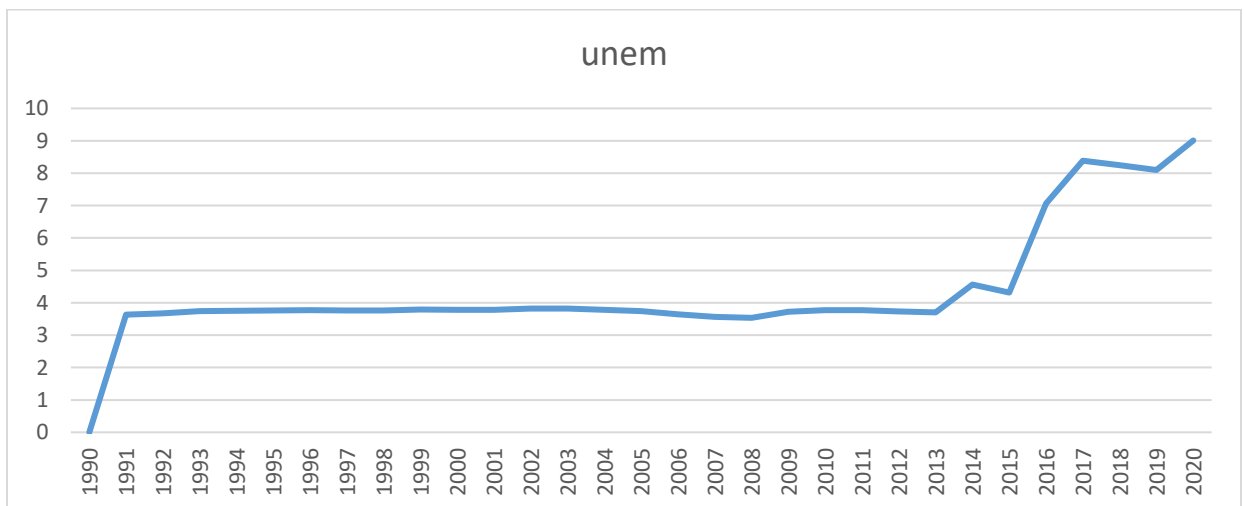**Unemployment Rate Trend in Nigeria**

Fig 4.6: Displays the trend of the unemployment rate from 1990 to 2020 in Nigeria.

The above graph shows that the unemployment rate in Nigeria increased from 1990 to 1997 although a slight increase, it fell in 1998 but rose again from 1999 to 2004, it also fell from 2005 to 2008, it rose again from 2009 to 2011, in 2012

and 2013 it also fell this may be due to falling in oil price, also it increased in 2014 although later fell in 2015 the reason could have been due to falling in the oil price which led to borrowing. From 2016 during the time of recession till to date, it has been showing an upward trend, perhaps resulting from market failure, a fall in the general level of investment, lack of information to know there is work, urbanization, demand deficiency, etc.
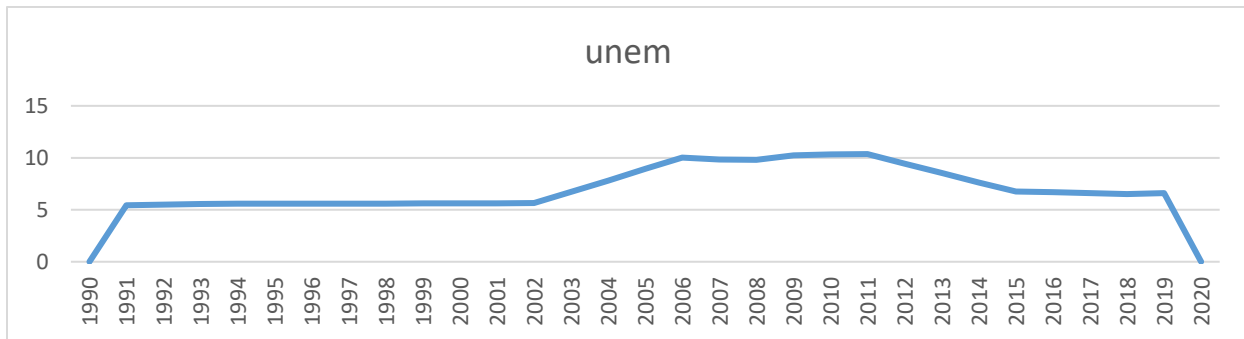
Unemployment Rate Trend in Senegal

Fig 4.7: Displays the movement of the unemployment rate in Senegal.

The graph shows that from 1990 to early 2011 UNEM rose and the reason may be due to the fall in industrial sector production which may be as a result of demand deficiency and other economic factors affecting employment such as government. However, from late 2011 till to date it creases. These might have been that the government did not pay attention to the factors that do affect the unemployment rate or the economy was greeted by the demand efficiency, or the production of output increased with the efficient market and consequently, created income and income created employment with other things remain unchanged. Also, the Senegal public expenditure has been focused on the educational sector and the public resources were allocated in 2011 in line with the aim of the government development strategy.
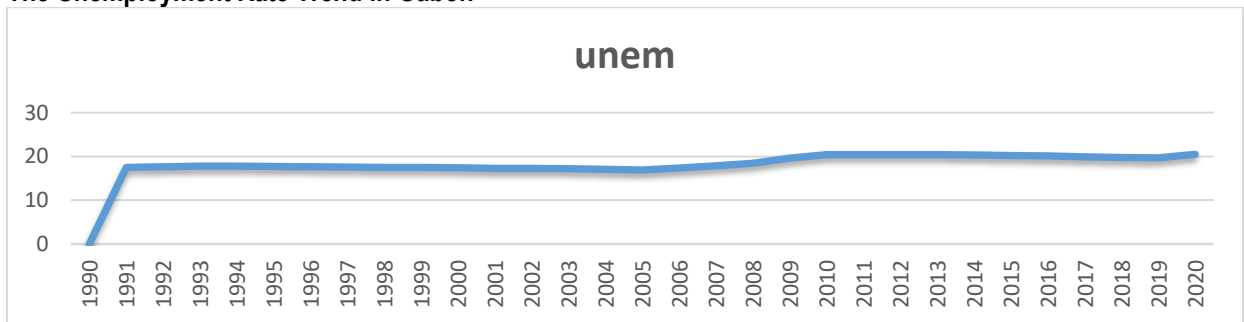
The Unemployment Rate Trend in Gabon

Fig 4.8: Shows the trend of unemployment in Gabon from the year 1990 to 2020.

The graph shows that from 1990 to till date the unemployment rate has been increasing even to date. The reason could be because the government did not pay attention to the factors that do affect the unemployment rate or the economy was greeted by the demand efficiency, or the production of output increased with the efficient market and consequently, created income and income created employment with other things remain unchanged. Also, in 2005 the economy recorded a relatively strong growth in gross domestic product but investment fell and since then only the agriculture and oil sector have been the growth engine for the economy.

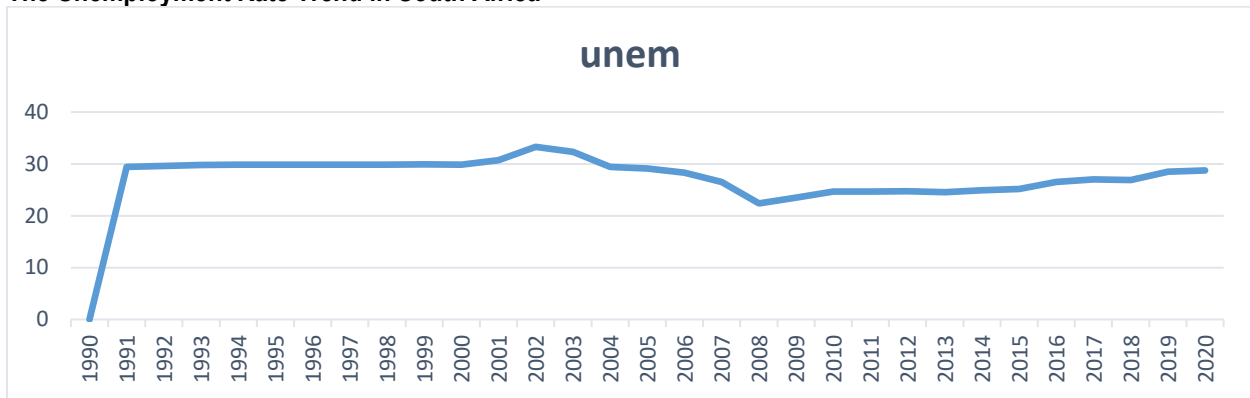**The Unemployment Rate Trend in South Africa**

Fig 4.9: Displays the trend of unemployment rate in Sought Africa from 1990 to 2020.

The graph shows that from 1990 to 2002 the unemployment rate increased, from late 2002 to 2008 it fell, and from 2008 till date it increases. The reason for the increase in the unemployment rate in the economy could have been that government failed to pay attention to those factors that could elevate the rate in the economy such as demand deficiency, inflation, etc., also most of the South African citizens are very lazy to extent that non-nationals where getting employed whereas the original citizens where remain idle and this led to xenophobic in 2019.

The Unemployment Rate Trend in Mozambique
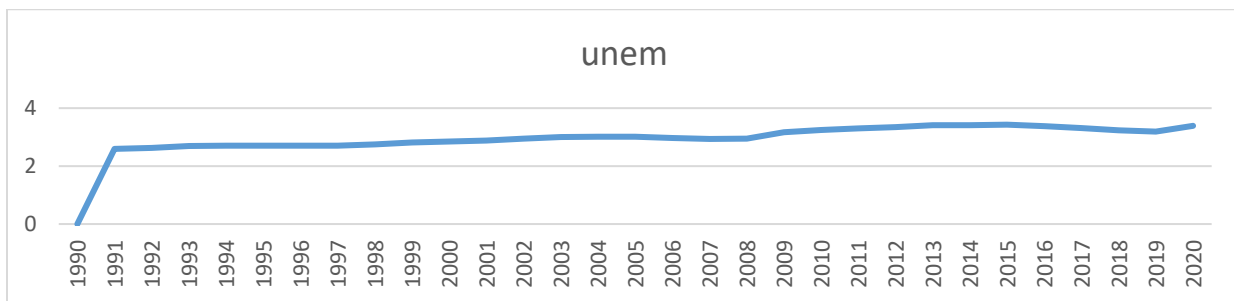
Fig 4.10: Displays the unemployment trend in Mozambique from 1990 to 2020.

The graph shows that from 1990 till date the unemployment rate has been increasing over time, the reason for the above trend could be due to an increase in demand deficiency, advances in technology, inflation, etc., and also may be due to an increase in the agricultural product which has been their economic mainstay and a decline in other sector production, the population grew more than economy capacity to get all the labor force employed, even more than half of them have remained unemployed.

THE POPULATION TREND ACROSS THE COUNTRIES
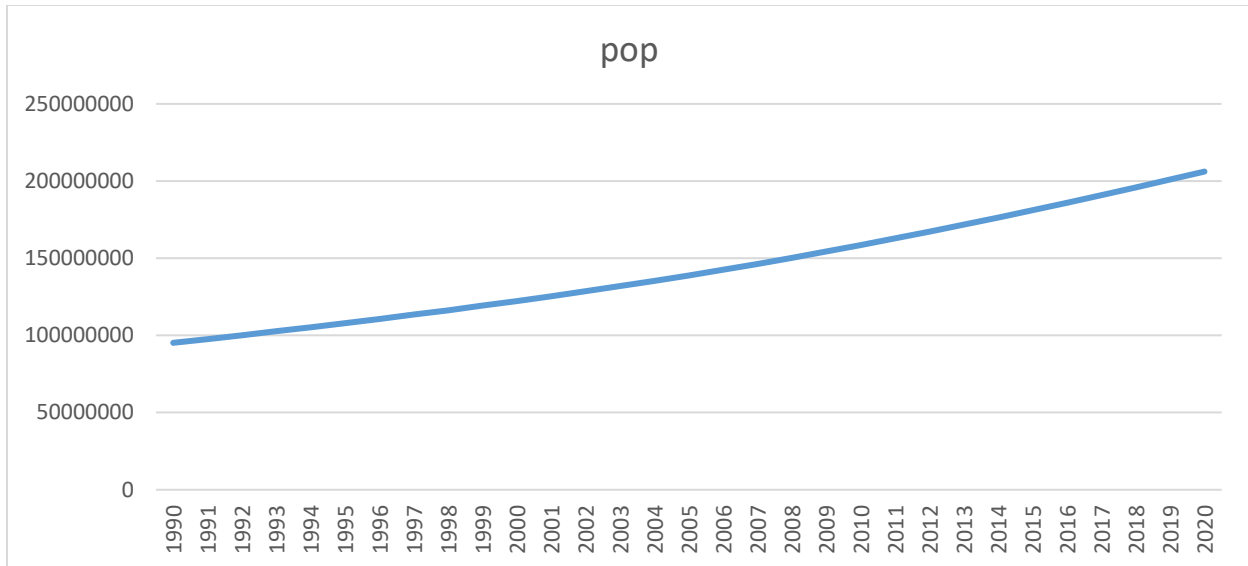
Total Population Trend

FIG 4.11: Displays the trend of total population from 1990 to 2020 in Nigeria.

The graph shows that there is an upward trend in population from 1990 till date. It also shows a great move in the population in the country, and the reason could have been a result of the high fertility rate and immigration in the country, which may be a result of economic and political reasons. Although it is an advantage to the country because of surplus labor supply it is not as it was expected and the reason being low productivity and narrow market in the economy, per capita, etc. Also, there has been a decrease in the birth rate globally and the imbalance between the birth rate and death rate may account for the growth and migration can also signal the growth.

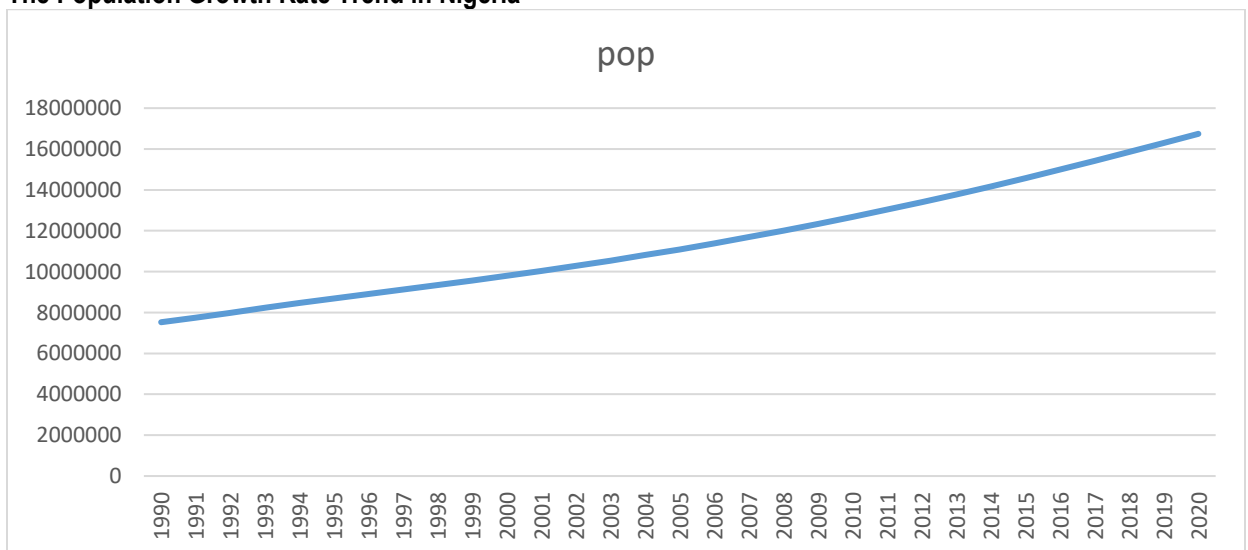**The Population Growth Rate Trend in Nigeria**

Fig 4.12: Displays the trend of total population from 1990 to 2020 in Nigeria.

The graph shows that in this country, the population has been increasing over the years, which gives rise to the upward-moving trend of the population. It also shows a great move in the population in the country, and the reason could have

been the high fertility rate and immigration in the country, which may be a result of economic and political reasons. Although it is an advantage to the country because of surplus labor supply but it is not as it was expected and the reason being low productivity and narrow market in the economy, low per capita, etc. Have greeted the population increases.

The Population Trend in Senegal

Fig 4.13: Shows that there is an upward-moving trend in the population from 1990 to 2020.

It also shows a great move in the population in the country, and the reason could have been a result of the high fertility rate and immigration in the country, which may be a result of economic and political reasons. Although it is an advantage to the country because of surplus labor supply, conversely, it slows down the attainment of economic growth and development, the reason being low productivity and narrow market in the economy, low per capita, etc.
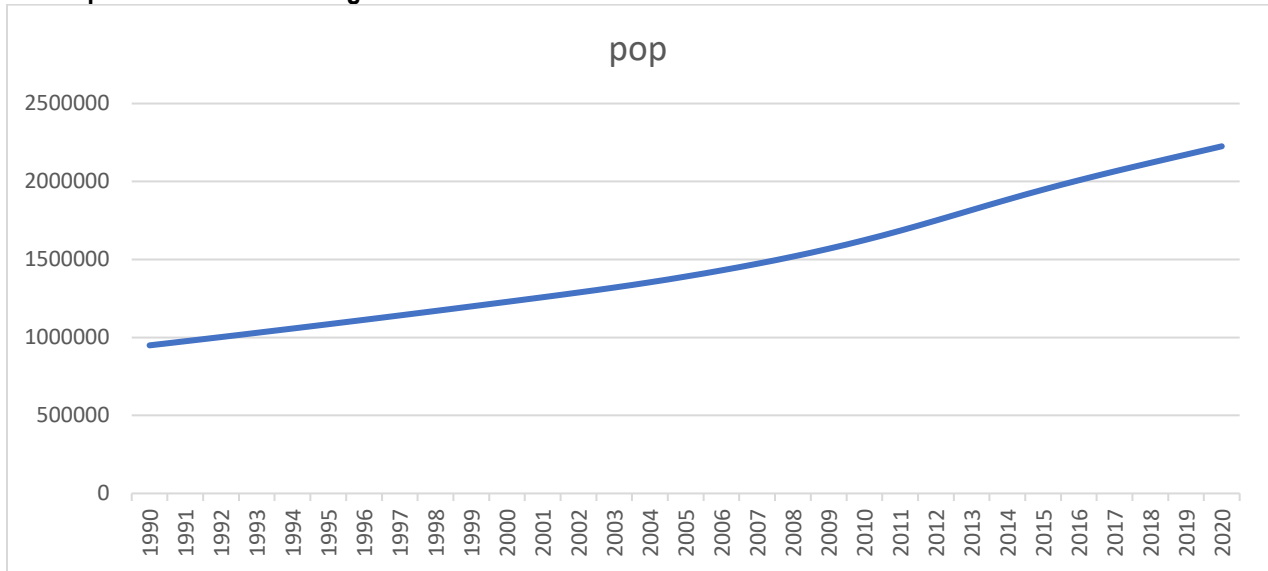
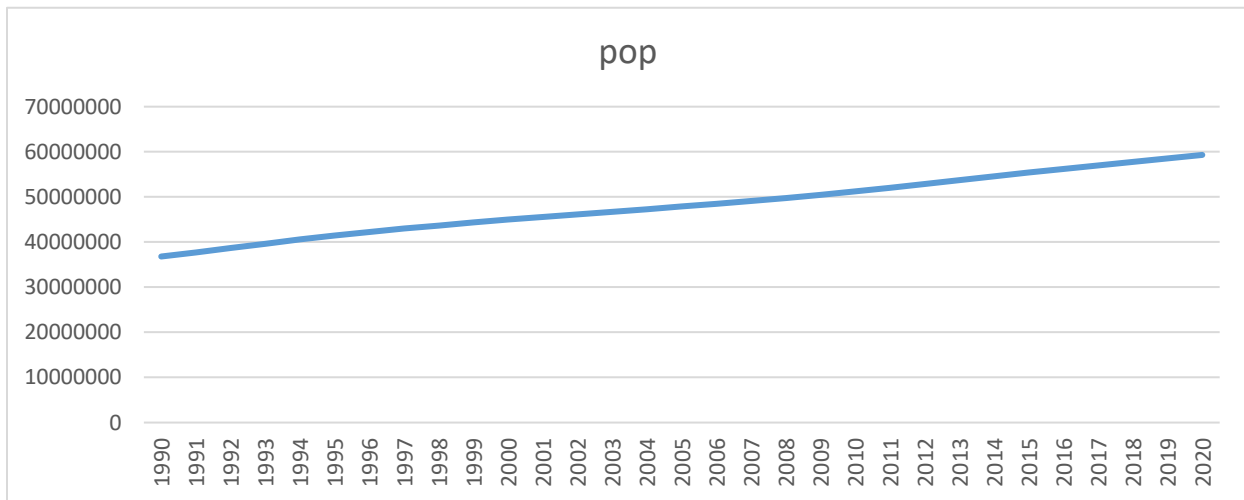**The Population Trend in South Africa**

Fig 4.14: Shows that there is an upward-moving trend in population from 1990 to 2020.

It also shows a great move in the population in the country, and the reason could have been a result of the high fertility rate and immigration in the country, which may be a result of economic and political reasons. it is advantageous to the

country because of the surplus labor supply, but it works in the opposite direction and the reason being that low productivity and narrow market in the economy, per capita, etc. also the neglected immigration has contributed a lot to their population growth rate.

The Population Trend in Mozambique
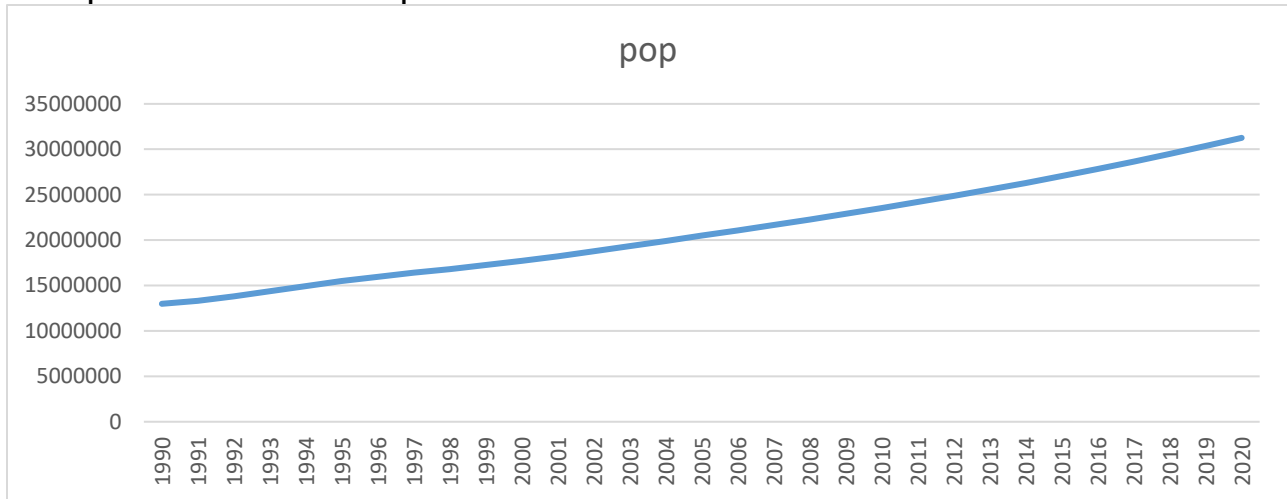
Fig 4.15: Shows that the population trend is moving upward. It also shows a great move in the population in the country, and the reason could have been the high fertility rate and immigration in the country, which may be a result of economic and political reasons. It is gainful to the country because of surplus labor supply but it is not as it was expected and the reason being low productivity and narrow market in the economy, per capita, etc.

THE HUMAN DEVELOPMENT INDEX ACROSS THE COUNTRIES.

The Human Development Index in Nigeria
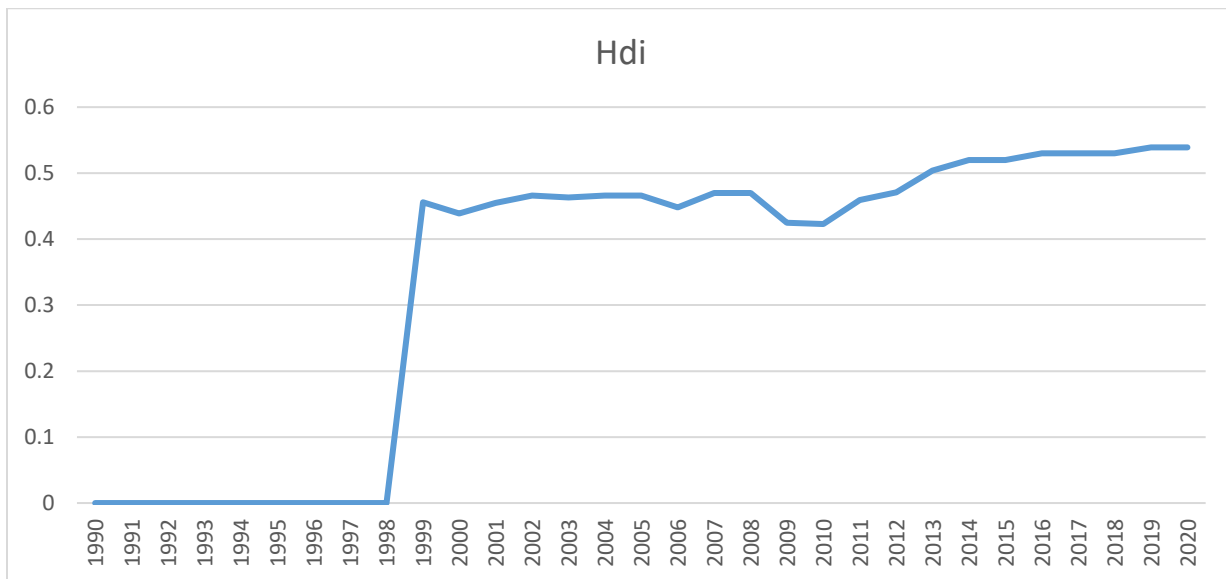
Fig 4.16: Shows the trend of human development in Nigeria from 1990 to 2020

The graph shows that in 1999 the human development index fell the reason for this may be because the gross national income fell, also, since human development takes into account Per capita income, educational level, and life expectancy it means that if any of these fall it will reflect on human development index as well, although the GNI per

capita rose and HDI fell. In addition, from 2001 to 2005, it rose, although it fell in 2006, however, between 2007 and 2008 it rose, between 2009 to 2010 and from 2011 to date it rises. For human development to increase at least one of the factors, affecting it must be increased such as per capita income, educational level, and life expectancy.

The Human Development Index in Senegal

Fig 4.17: Displays the trend of the human development index from 1990 to 2020.

The above graph shows that from 1990 till date the human development index has been increasing, the reason for the above increment may be due to an increase in life expectancy and educational level although the country has been facing some challenges such as political instability and economic fluctuation yet their human development increases. Also, their maternal mortality rate continues to decrease each year, however, Senegal has established a national social safety net program to help the extremely poor afford education, food, medical assistance, and more.

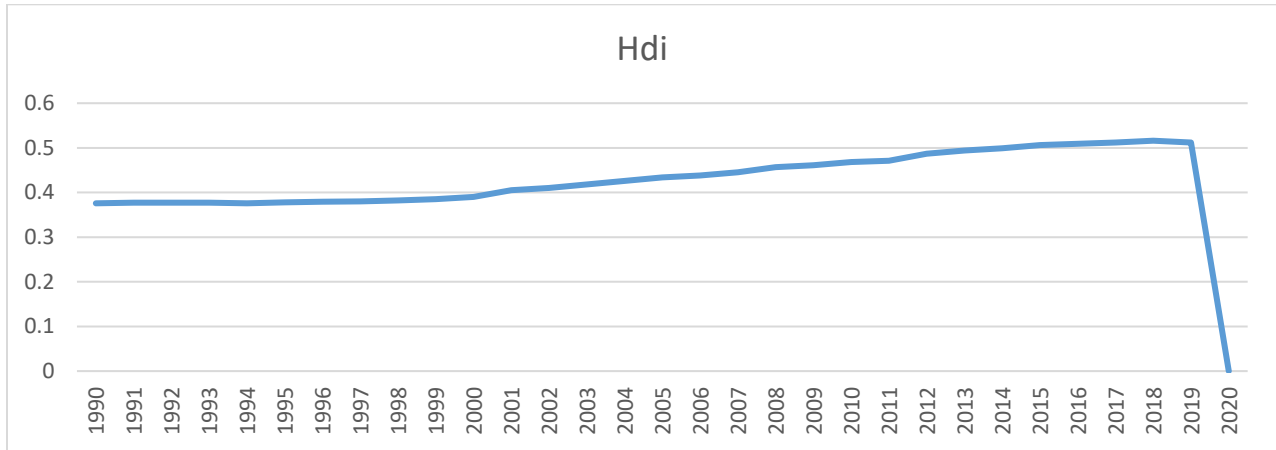**The Human Development Index in Gabon**

Fig 4.18: Displays the trend of the human development index in Gabon from 1990 to 2020.

The graph shows that from 1990 till date the human development index has been increasing and the reason could have been because Gabon's total expenditure on health care is 3.44 percent of its gross domestic product, 31.62 percent come from private resources. Gabon has a low density of physicians and also maternal mortality rates have seen a downward trend since the 1990s. Also, the literacy rate in Gabon is 82.28 percent for the population aged 15 years and above.

The Human Development Index in South Africa

Fig 4.19: Shows the trend of the human development index in South Africa from 1990 to 2020.

The graph shows that from 1990 to 1995, the human development index in South Africa rose, and from 1996 to 2001-it fell and from 2002 until date it rises. The reason for the above graph may be because between 1990 to 2019, south Africa's HDI value increased from 0.627 to 0.709, an increase of 13.1 percent, and life expectancy at birth increased by 0.8 percent years, means of schooling increased by years and expected years of schooling increased by 2.4% years. In addition, South Africa's GNI per capita increased by 21.6 percent between 1990 to 2019 and the life expectancy in 2019 was 64.13 years.

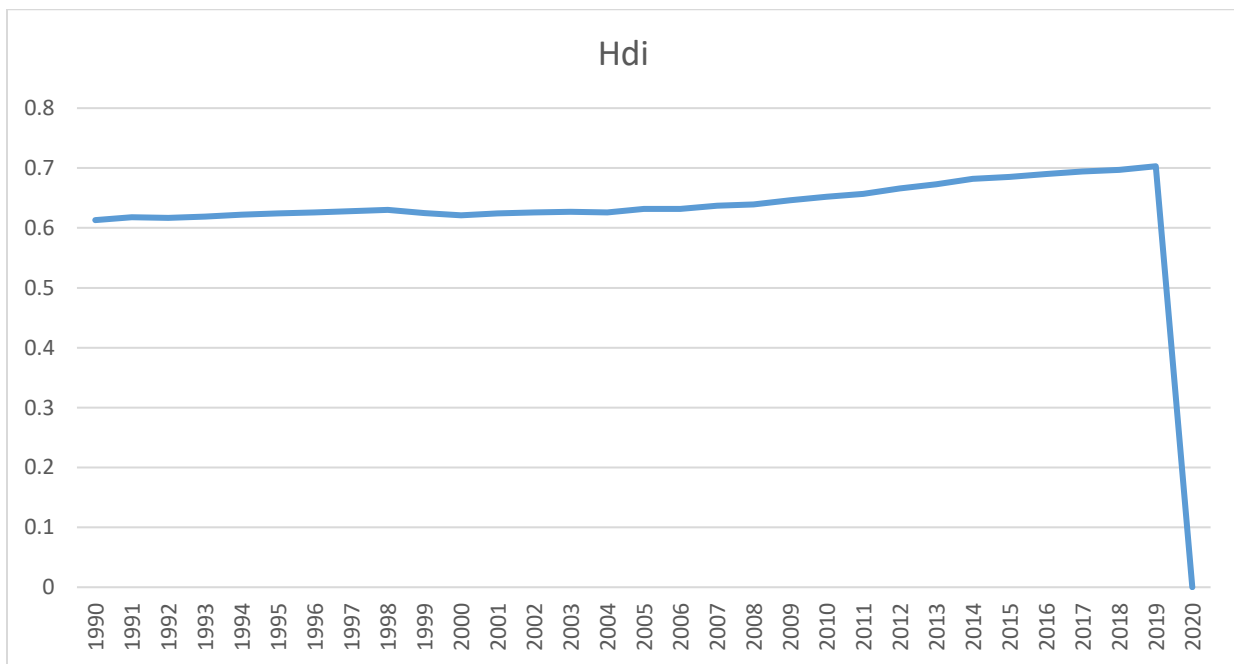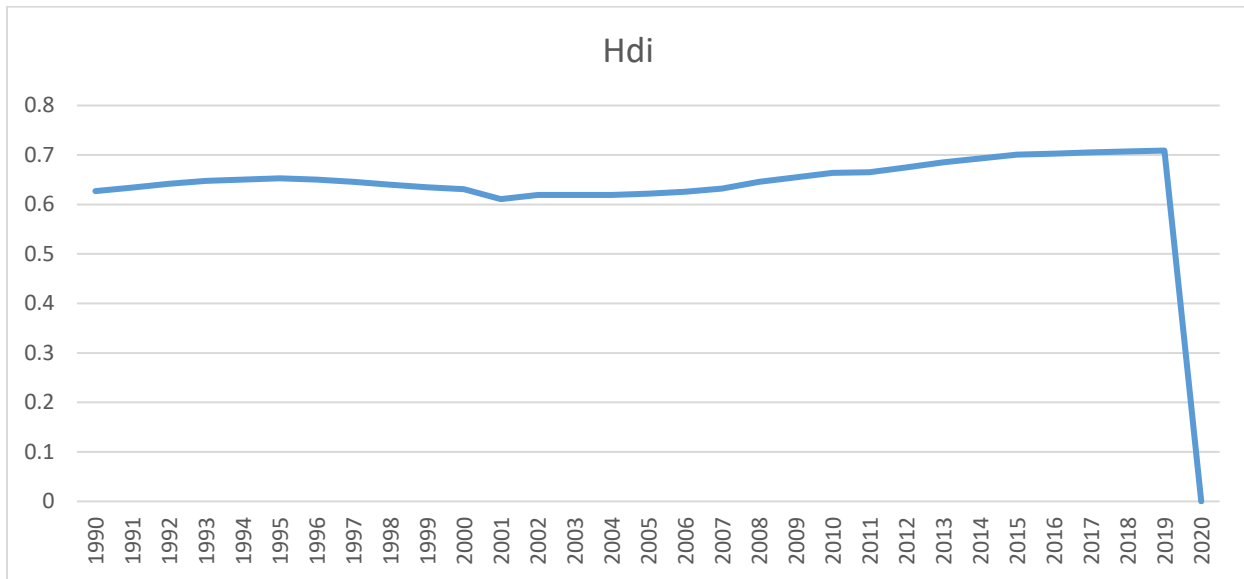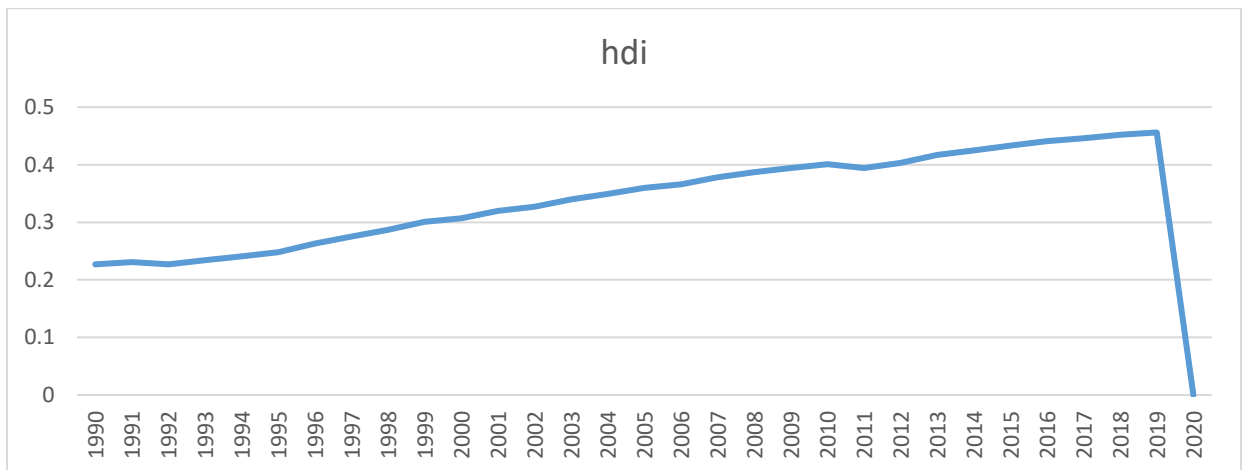**The Human Development Index in Mozambique**

Fig 4.20: Displays the trend of the human development index in Mozambique from 1990 to 2020.

The graph shows that from 1990 to 2010 the human development index rose, although fell in 2011, and from 2012 until date it increases. Mozambique's life expectancy at birth increased by 15.6 years, mean years of schooling increased by 2.7 years and expected years of schooling increased by 6.2 years, and the GNI per capita increased by about 172.7 percent between 1990 and 2019 and life expectancy in Mozambique in 2019 was 60.85 years.

5.0 CONCLUSION

The study examined the impact of Unemployment and Population on Economic Development of Sub-Shaharan Countries. The result showed that unemployment has a negative significant relationship with economic development and population growth has a positive significant relationship with economic development in sub-Saharan African countries. The study, therefore, recommended that government should make sure that the life expectancies in the countries increase, which will reduce the death rate and consequently increase the population and the economic development in the sub-Saharan African countries. it also recommended policies that will reduce the unemployment rate and promote economic Development in Sub-Shaharan African Countries.

Conflict of interest
None.

REFERENCES:
1. Aigner-Walder, (2015). The effects of population aging on private consumption – a simulation for Austria based on household data up to 2050. *Eurasian Economic Review,* 2(1), 63-80.

2. Acemoglu, Daron, and Simon Johnson (2007). "Disease and Development: The Effect of Life Expectancy on Economic Growth." Journal of Political Economy, Vol. 115(6), pages 925-985.

3. Attane, (2002). "China's Family Planning Policy: An Overview of Its Past and Future." Studies in Family Planning, Vol. 33(1), pages 103-113.

4. Auer P., (2000). *Aging of the Labour Force in OECD Countries: Economic and Social Consequences.* Geneva: International Labour Office.

5. Bell, D.N.F, *et all*. (2011). Young people and the Great Recession. *Institute for the Study of La Arbor (IZA)* Discussion Paper, No. 5674. Retrieved October 5, 2015 from http://ftp.iz-a.org/dp5674.pdf

6. Betermier, S., (2012). Hedging labor income risk. *Journal of Financial Economics*, 105 (3), pp. 622-639.Chen, H.J.,

7. Borsch-Supan, A. (2003). Labor market effects of population aging. *Review of Labour Economics and Industrial Relations*, 17(1), 5–44, http://dx.doi.org/10.1111/1467- 9914.17.specialissue.2

8. Börsch-Supan A., *et all*. (2007). Productivity and age: Evidence from work teams at the assembly line. MEA *Discussion Paper* 148-2007, MEA – Munich Center for the Economics of Aging.

9. Bratberg, E., (2004). Assessing the effects of an early retirement program. *Journal of Population Economics*, 17(3), 387-408, http://dx.doi.org/10.1007/s00148-003-0165-y

10. Bratić, V., (2014). Fixed-term employment during transition: the Croatian experience. *Eastern European Economics,* 52(6), 57–76, http://dx.doi.org/10. 1080/00128775.2014.1003507

11. Cahuc, P., (2013). Youth unemployment in old Europe: the polar cases of France and Germany. *Institute for the Study of Labor (IZA)* Discussion Paper, No. 7490. Retrieved 14.10.2015 from http://ftp.iza.org/dp7490.pdf Life-Cycle Equilibrium Unemployment. *Journal of Labor Economics*, 31(4), 843-882, http://dx.doi.org/10.1086/669941

12. Conen, W. S., (2012). Aging and employers' perceptions of labor costs and productivity: A survey among European employers. *International Journal of Manpower*, 33(6), 629 – 647, http://dx.doi.org/1108/01437721211261796

13. Čepar, Ž.., (2008). Population aging and the education market in Slovenia and Croatia. *Eastern European Economics,* 46 (3), 68-86.

14. Chéron, A., (2013). Life-Cycle Equilibrium Unemployment. *Journal of Labor Economics,* 31 (4), pp. 843-882.

15. Da Costa, (2007). The risk properties of human capital and the design of government policies. *European Economic Review,* 51 (3), pp. 695-713.

16. Daly, M., (2012). A search and matching approach to labor markets: Did the natural rate of unemployment rise? *Journal of Economic Perspectives,* 26 (3), pp. 3-26.

17. David Canning, (2006). "The Effect of Population Health on Foreign Direct Investment Inflows to Low- and Middle-Income Countries", World Development, April, Vol. 34, No. 4, 613-630.

18. Dimovski, V., (2007). Ekonomski vidiki star Anja prebivalstva Slovenije: Kako ublažiti posledice s pristopom aktivnega star Anja [Economic aspects of population aging in Slovenia: How to mitigate the consequences with an active aging approach]. *Kakovostna starost*, 10 (1), 2-15.

19. Dixon, S. (2003). Implications of population aging for the labor market, in *Labour Market trends,* edited by A. Flowers, 67-76. London: Organisation for Economic Co-operation and Development.

20. Dolado, J.J., (2000). Youth labor markets in Spain: Education, training, and crowding-out. *European Economic Review*, 44(4-6), 943-956, http://dx.doi.org/10.1016/S0014- 2921(99)00050-1

21. Donangelo, A. (2014). Labor mobility: implications for asset pricing. *Journal of Finance*, 68 (3), pp. 1321-1346.

22. Dubska, D. (2010). Nova paradigma – zakaj je pomembno, da se meri napredek družbe? [The new paradigm-why is important to measure the progress of society?]. *Statistical days.* Http://www.stat.si/StatisticniDnevi/Docs/Radenci%202010/Dubska_New%20paradigm-prispevek.pdf (5.3.2011).

23. Dunsch, S. (2015). Okun's law and youth unemployment in Germany and Poland. European University Viadrina Frankfurt (ODER), Department of Business Administration and Economics, *Discussion Paper* No. 373. Retrieved October 8, 2015 from https://opus.zbw-kiel. de/dspace/bitstream/10419 /120898/1/835448711.pdf

24. Eichhorst, W., Hinte, H., and Rinne, U. (2013). Youth Unemployment in Europe: What to Do about It? *Institute for the Study of Labor (IZA)* Policy Paper, No. 65. Retrieved October 5, 2015 from http://hdl.handle. net/10419/91749

25. Employment Service of Slovenia (ESS). (2011). *Trg dela: Trg dela v številkah* [*Labour market: Labour market in figures*]. Retrieved February 2, 2015, from http://www. ess.gov.si/trg_dela/trg_dela_v_stevilkah. *Economic Perspectives*, 20(3), pp. 3-26.

26. Kacperczyk, M., (2011). Labor unions, operating flexibility, and the cost of equity. *Journal of Financial and Quantitative Analysis*, 46, pp. 25-58.

27. Klein, P. and Ventura, G., 2009. Productivity differences and the dynamic effects of labor movements. *Journal of Monetary Economics*, 56 (8), pp. 1059-1073.

28. Kroft, K., (2013). Duration Dependence and Labor Market Conditions: Evidence from a Field Experiment. *Quarterly Journal of Economics*, 128 (3), pp. 1123-1167.

29. Miyamoto, H., (2011). Productivity growth, on-the-job search, and unemployment. *Journal of Monetary Economics,* 58 (6), pp. 666-680.

30. Mortensen, D., (2011). Job Creation and Job Destruction in the Theory of Unemployment. *Economic Policy,* 1, pp. 1-19.

31. Silva, J., (2009). Labor turnover costs and the cyclical behavior of vacancies and unemployment. *Macroeconomic Dynamics,* 13, pp. 76-96.

Appendix

Null Hypothesis: HDI has a unit root
Exogenous: Constant, Linear Trend
Leg Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.29776	0.0000
Test critical values:	1% level	-4.019975	
	5% level	-3.439857	
	10% level	-3.144346	

Null Hypothesis: D(POP) has a unit root
Exogenous: Constant
Leg Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.48236	0.0000
Test critical values:	1% level	-3.473382	
	5% level	-2.880336	
	10% level	-2.576871	

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant
Leg Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.65428	0.0000
Test critical values:	1% level	-3.473382	
	5% level	-2.880336	
	10% level	-2.576871	

Null Hypothesis: D(UNEM) has a unit root
Exogenous: Constant
Leg Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-16.34377	0.0000
Test critical values:	1% level	-3.473382	
	5% level	-2.880336	
	10% level	-2.576871	

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	81.473962	3	0.0000

** WARNING: estimated cross-section random effects variance is zero.

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
POP	0.000000	-0.000000	0.000000	0.0000
UNEM	0.000094	0.008655	0.000007	0.0010
GDP	-0.000000	0.000000	0.000000	0.0000

Data presentation

COUNTRY NAME	YEAR	GDPCAL	POP	UNEM	CFM	GDP
NIGERIA	1990	567.5286	9.5E+07	0	2.9E+10	5.4E+10
NIGERIA	1991	502.9141	9.8E+07	3.638	2.4E+10	4.91E+10
NIGERIA	1992	477.1776	1E+08	3.673	2.1E+10	4.78E+10
NIGERIA	1993	270.224	1E+08	3.743	1.2E+10	2.78E+10
NIGERIA	1994	321.3207	1.1E+08	3.756	1.4E+10	3.38E+10
NIGERIA	1995	408.181	1.1E+08	3.759	1.6E+10	4.41E+10
NIGERIA	1996	461.5196	1.1E+08	3.77	1.9E+10	5.11E+10
NIGERIA	1997	479.9838	1.1E+08	3.761	2.1E+10	5.45E+10
NIGERIA	1998	469.4305	1.2E+08	3.758	2.2E+10	5.46E+10
NIGERIA	1999	497.8416	1.2E+08	3.793	2.3E+10	5.94E+10
NIGERIA	2000	567.9307	1.2E+08	3.78	2.4E+10	6.94E+10
NIGERIA	2001	590.3818	1.3E+08	3.778	2.3E+10	7.4E+10
NIGERIA	2002	741.7475	1.3E+08	3.817	2.6E+10	9.54E+10
NIGERIA	2003	795.3862	1.3E+08	3.821	3.1E+10	1.05E+11
NIGERIA	2004	1007.874	1.4E+08	3.786	3.7E+10	1.36E+11
NIGERIA	2005	1268.383	1.4E+08	3.74	4.6E+10	1.76E+11
NIGERIA	2006	1656.425	1.4E+08	3.646	6.6E+10	2.36E+11
NIGERIA	2007	1883.461	1.5E+08	3.565	5.9E+10	2.76E+11
NIGERIA	2008	2242.872	1.5E+08	3.539	6.7E+10	3.37E+11
NIGERIA	2009	1891.335	1.5E+08	3.722	6.4E+10	2.92E+11
NIGERIA	2010	2280.437	1.6E+08	3.767	6.3E+10	3.61E+11
NIGERIA	2011	2487.598	1.6E+08	3.77	6.6E+10	4.05E+11

NIGERIA	2012	2723.822	1.7E+08	3.735	6.8E+10	4.56E+11
NIGERIA	2013	2961.549	1.7E+08	3.703	7.6E+10	5.09E+11
NIGERIA	2014	3098.986	1.8E+08	4.562	8.6E+10	5.47E+11
NIGERIA	2015	2687.48	1.8E+08	4.311	7.5E+10	4.87E+11
NIGERIA	2016	2176.003	1.9E+08	7.06	6.2E+10	4.05E+11
NIGERIA	2017	1968.565	1.9E+08	8.389	5.8E+10	3.76E+11
NIGERIA	2018	2027.779	2E+08	8.243	7.9E+10	3.97E+11
NIGERIA	2019	2229.859	2E+08	8.096	1.1E+11	4.48E+11
NIGERIA	2020	2097.092	2.1E+08	9.01	1.3E+11	4.32E+11
SENEGAL	1990	982.0179	7526306	0	1.1E+09	7.39E+09
SENEGAL	1991	935.492	7755503	5.44	1.1E+09	7.26E+09
SENEGAL	1992	972.4318	7990090	5.481	1.2E+09	7.77E+09
SENEGAL	1993	895.6133	8226749	5.562	1.1E+09	7.37E+09
SENEGAL	1994	595.03	8461066	5.577	8.6E+08	5.03E+09
SENEGAL	1995	727.9897	8690155	5.582	9.7E+08	6.33E+09
SENEGAL	1996	735.9819	8912872	5.594	1.1E+09	6.56E+09
SENEGAL	1997	661.6538	9130876	5.584	9.6E+08	6.04E+09
SENEGAL	1998	695.9524	9347777	5.581	1.2E+09	6.51E+09
SENEGAL	1999	693.1805	9568717	5.622	1.5E+09	6.63E+09
SENEGAL	2000	617.1557	9797731	5.606	1.4E+09	6.05E+09
SENEGAL	2001	651.6099	1E+07	5.605	1.7E+09	6.54E+09
SENEGAL	2002	684.323	1E+07	5.65	1.7E+09	7.04E+09
SENEGAL	2003	835.7906	1.1E+07	6.713	2.1E+09	8.81E+09
SENEGAL	2004	937.4023	1.1E+07	7.803	2.4E+09	1.01E+10
SENEGAL	2005	998.1216	1.1E+07	8.943	2.8E+09	1.11E+10
SENEGAL	2006	1031.38	1.1E+07	10.03	2.7E+09	1.17E+10
SENEGAL	2007	1198.393	1.2E+07	9.852	3.5E+09	1.4E+10
SENEGAL	2008	1403.949	1.2E+07	9.802	4.4E+09	1.69E+10
SENEGAL	2009	1308.938	1.2E+07	10.233	3.3E+09	1.61E+10
SENEGAL	2010	1271.583	1.3E+07	10.345	3.2E+09	1.61E+10
SENEGAL	2011	1366.775	1.3E+07	10.36	3.7E+09	1.78E+10
SENEGAL	2012	1317.78	1.3E+07	9.427	4.3E+09	1.77E+10
SENEGAL	2013	1372.666	1.4E+07	8.542	4.6E+09	1.89E+10
SENEGAL	2014	1396.657	1.4E+07	7.611	5.1E+09	1.98E+10
SENEGAL	2015	1219.249	1.5E+07	6.757	4.6E+09	1.78E+10
SENEGAL	2016	1269.903	1.5E+07	6.706	4.8E+09	1.9E+10
SENEGAL	2017	1361.702	1.5E+07	6.615	6.3E+09	2.1E+10
SENEGAL	2018	1458.069	1.6E+07	6.527	7.5E+09	2.31E+10
SENEGAL	2019	1430.148	1.6E+07	6.604	7.4E+09	2.33E+10
SENEGAL	2020	1487.757	1.7E+07	0	8E+09	2.49E+10
GABON	1990	6268.918	949493	0	0	5.95E+09
GABON	1991	5536.998	975785	17.51	18.2482	5.4E+09

GABON	1992	5578.039	1002573	17.61	-12.5901	5.59E+09
GABON	1993	4252.065	1029769	17.78	1.56515	4.38E+09
GABON	1994	3963.879	1057252	17.77	-0.12528	4.19E+09
GABON	1995	4570.571	1084951	17.7	4.80713	4.96E+09
GABON	1996	5116.197	1112944	17.64	16.9072	5.69E+09
GABON	1997	4667.193	1141332	17.56	29.4998	5.33E+09
GABON	1998	3831.781	1170061	17.49	14.2969	4.48E+09
GABON	1999	3888.879	1199058	17.49	-38.7608	4.66E+09
GABON	2000	4135.992	1228359	17.39	-8.27034	5.08E+09
GABON	2001	3993.031	1258008	17.29	10.7302	5.02E+09
GABON	2002	4141.434	1288310	17.29	22.8726	5.34E+09
GABON	2003	4933.462	1319946	17.22	-17.3731	6.51E+09
GABON	2004	5739.613	1353788	17.08	0.68457	7.77E+09
GABON	2005	6891.362	1390550	16.91	3.29439	9.58E+09
GABON	2006	7221.37	1430144	17.37	8.34596	1.03E+10
GABON	2007	8458.309	1472565	17.84	12.1136	1.25E+10
GABON	2008	10254.17	1518538	18.44	7.19535	1.56E+10
GABON	2009	7721.019	1568925	19.59	-8.41691	1.21E+10
GABON	2010	8849.323	1624146	20.39	29.3429	1.44E+10
GABON	2011	10809.68	1684629	20.38	16.5059	1.82E+10
GABON	2012	9813.506	1749677	20.4	21.8787	1.72E+10
GABON	2013	9683.582	1817070	20.41	1.94655	1.76E+10
GABON	2014	9663.424	1883801	20.3	13.4878	1.82E+10
GABON	2015	7384.701	1947690	20.22	-13.6769	1.44E+10
GABON	2016	6984.42	2007882	20.11	-0.78953	1.4E+10
GABON	2017	7230.435	2064812	19.93	-11.5657	1.49E+10
GABON	2018	7956.628	2119275	19.77	11.995	1.69E+10
GABON	2019	7767.017	2172578	19.64	2.42364	1.69E+10
GABON	2020	7005.879	2225728	20.47	-11.699	1.56E+10
SOUTH AFRICA	1990	3139.966	3.7E+07	0	2.2E+10	1.16E+11
SOUTH AFRICA	1991	3285.972	3.8E+07	29.44	2.4E+10	1.24E+11
SOUTH AFRICA	1992	3479.083	3.9E+07	29.58	2.3E+10	1.35E+11
SOUTH AFRICA	1993	3388.772	4E+07	29.8	2E+10	1.34E+11
SOUTH AFRICA	1994	3445.228	4.1E+07	29.88	2.5E+10	1.4E+11
SOUTH AFRICA	1995	3751.839	4.1E+07	29.87	3E+10	1.55E+11
SOUTH AFRICA	1996	3494.424	4.2E+07	29.87	2.7E+10	1.48E+11
SOUTH AFRICA	1997	3549.551	4.3E+07	29.85	2.7E+10	1.53E+11

SOUTH AFRICA	1998	3154.012	4.4E+07	29.85	2.5E+10	1.38E+11
SOUTH AFRICA	1999	3081.561	4.4E+07	29.94	2.3E+10	1.37E+11
SOUTH AFRICA	2000	3032.439	4.5E+07	29.88	2.2E+10	1.36E+11
SOUTH AFRICA	2001	2666.475	4.6E+07	30.69	1.9E+10	1.22E+11
SOUTH AFRICA	2002	2502.277	4.6E+07	33.29	1.9E+10	1.15E+11
SOUTH AFRICA	2003	3751.282	4.7E+07	32.31	3E+10	1.75E+11
SOUTH AFRICA	2004	4833.628	4.7E+07	29.45	4.2E+10	2.29E+11
SOUTH AFRICA	2005	5383.657	4.8E+07	29.12	4.7E+10	2.58E+11
SOUTH AFRICA	2006	5602.01	4.8E+07	28.34	5.5E+10	2.72E+11
SOUTH AFRICA	2007	6095.622	4.9E+07	26.54	6.3E+10	2.99E+11
SOUTH AFRICA	2008	5760.805	5E+07	22.41	6.6E+10	2.87E+11
SOUTH AFRICA	2009	5862.797	5E+07	23.52	6.1E+10	2.96E+11
SOUTH AFRICA	2010	7328.615	5.1E+07	24.68	7.3E+10	3.75E+11
SOUTH AFRICA	2011	8007.476	5.2E+07	24.64	8.2E+10	4.16E+11
SOUTH AFRICA	2012	7501.661	5.3E+07	24.73	7.9E+10	3.96E+11
SOUTH AFRICA	2013	6832.726	5.4E+07	24.56	7.8E+10	3.67E+11
SOUTH AFRICA	2014	6433.4	5.5E+07	24.89	7.2E+10	3.51E+11
SOUTH AFRICA	2015	5734.633	5.5E+07	25.15	6.6E+10	3.18E+11
SOUTH AFRICA	2016	5272.544	5.6E+07	26.54	5.7E+10	2.96E+11
SOUTH AFRICA	2017	6131.479	5.7E+07	27.04	6.6E+10	3.5E+11
SOUTH AFRICA	2018	6372.606	5.8E+07	26.91	6.6E+10	3.68E+11
SOUTH AFRICA	2019	6001.401	5.9E+07	28.47	6.2E+10	3.51E+11
SOUTH AFRICA	2020	5090.715	5.9E+07	28.74	3.8E+10	3.02E+11
MOZAMBIQUE	1990	841.974	1.3E+07	0	11.5136	0
MOZAMBIQUE	1991	809.0511	1.3E+07	2.59	507.953	3.63E+09
MOZAMBIQUE	1992	619.3721	1.4E+07	2.63	-9.00672	2.64E+09
MOZAMBIQUE	1993	591.7197	1.4E+07	2.69	12.4833	2.73E+09

MOZAMBIQUE	1994	611.8653	1.5E+07	2.71	8.21951	2.8E+09
MOZAMBIQUE	1995	623.2096	1.5E+07	2.71	39.1504	2.9E+09
MOZAMBIQUE	1996	741.0959	1.6E+07	2.71	-7.07968	3.86E+09
MOZAMBIQUE	1997	731.9476	1.6E+07	2.7	9.30845	4.65E+09
MOZAMBIQUE	1998	544.9838	1.7E+07	2.75	17.9649	5.26E+09
MOZAMBIQUE	1999	580.0706	1.7E+07	2.82	63.1456	5.98E+09
MOZAMBIQUE	2000	563.0575	1.8E+07	2.85	-8.26026	5.66E+09
MOZAMBIQUE	2001	568.3863	1.8E+07	2.88	-8.75895	5.4E+09
MOZAMBIQUE	2002	530.5304	1.9E+07	2.95	4.50408	5.68E+09
MOZAMBIQUE	2003	478.0076	1.9E+07	3	-1.67132	6.3E+09
MOZAMBIQUE	2004	482.9985	2E+07	3.01	-3.04812	7.63E+09
MOZAMBIQUE	2005	476.5554	2E+07	3.01	5.0777	8.54E+09
MOZAMBIQUE	2006	447.8547	2.1E+07	2.97	9.37707	9.18E+09
MOZAMBIQUE	2007	431.7873	2.2E+07	2.94	8.48753	1.05E+10
MOZAMBIQUE	2008	356.6932	2.2E+07	2.95	28.1079	1.26E+10
MOZAMBIQUE	2009	771.599	2.3E+07	3.17	7.03336	1.19E+10
MOZAMBIQUE	2010	948.3315	2.4E+07	3.25	8.58474	1.11E+10
MOZAMBIQUE	2011	1093.653	2.4E+07	3.3	28.39	1.44E+10
MOZAMBIQUE	2012	1304.968	2.5E+07	3.35	75.4052	1.64E+10
MOZAMBIQUE	2013	1429.998	2.6E+07	3.41	9.29951	1.7E+10
MOZAMBIQUE	2014	1434.896	2.6E+07	3.41	2.38459	1.77E+10
MOZAMBIQUE	2015	1445.07	2.7E+07	3.43	-15.9213	1.6E+10
MOZAMBIQUE	2016	1464.589	2.8E+07	3.38	1.23074	1.19E+10
MOZAMBIQUE	2017	1335.665	2.9E+07	3.31	-17.0887	1.32E+10
MOZAMBIQUE	2018	1352.163	2.9E+07	3.24	42.3618	1.48E+10
MOZAMBIQUE	2019	1156.155	3E+07	3.19	3.13623	1.53E+10
MOZAMBIQUE	2020	1128.211	3.1E+07	3.39	0	1.4E+10