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POPULATION GROWTH AND UNEMPLOYMENT IN NIGERIA

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Abstract: *The study explores the impact of population growth on unemployment in Nigeria using time series data spanning from 1991 to 2022. The study uses Autoregressive Distributed Lag Model (ARDL), to estimate the long run and short run effects of population growth on unemployment. The estimated result reveals a positive and significance relationship between population growth and unemployment in both the long run and short run form. In light of these findings, several policy recommendations are proposed to address the challenges posed by unemployment in Nigeria. Government should Implement targeted job creation programs aimed at absorbing the growing labor force, particularly among youth and women. Enhance access to education, vocational training, and skills development programs to improve human capital and match skills with labor market demands. Foster a conducive business environment to attract domestic and foreign investment, with a focus on sectors with high employment potential. Implement monetary policies aimed at maintaining stable interest rates to stimulate investment and economic growth while avoiding inflationary pressures. Strengthen social protection programs to provide support to vulnerable groups and mitigate the negative impact of unemployment.*

1. Introduction

The continuous rise in the rate of unemployment across emerging economies remains a factor of global concern, as countries strive to achieve sustainable economic development amid growing populations. Population growth is the

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change in population over time, is often expressed as a percentage of the initial population. Ojimadu and Calitus (2023) note that population increases occur through births and immigration.

Population refers to the total number of individuals living in a specific geographical area at a given time. In statistics and economics, it also denotes the entire group from which a statistical sample is drawn (Pratiwi, 2020). Population growth, therefore, represents the change in population over a specified period.

Alam et al. (2020) highlight the importance of population growth indicators in predicting future population trends and addressing the basic needs of the population. According to classical economists, economic growth depends on population, capital stock, land area, natural resources, and technology levels. However, achieving economic growth involves various factors.

The global population, estimated at 6.1 billion, as projected by the United Nations to reach 9.2 billion by 2050 and potentially 11 billion by 2200, with over 90% of this growth expected in the developing world (Kurnianto et al., 2018). Population growth historically correlated with increased production and prosperity, driven by agricultural productivity. Nigeria, for example, has seen significant population growth over the decades.

Nigeria's population surged from 45.14 million at Independence in 1960 to 218.54 million in 2022 (World Development Indicator of World Bank [WDI], 2023). This population growth has contributed to employment generation globally by stimulating demand for goods and services, thus creating job opportunities. However, if economic expansion fails to keep pace with population growth, unemployment rates can rise (Akpan et al., 2018).

Nigeria has faced challenges with fluctuating unemployment rates, particularly among its youth, due to various economic, social, and political factors (Maijama'a et al., 2020). Job seekers often lack the necessary skills and qualifications, exacerbating the unemployment issue. The Nigerian economy aim to create enough jobs to accommodate the growing population, with limitations in both the formal and public sectors. But economic challenges, including recessions and fluctuations in oil prices, as well as corruption and inefficiency in the public sector, which hinder job creation and investment. Poor infrastructure further compounds these challenges (Akpan et al., 2018).

Given these circumstances, the study aims to examine the impact of population growth on unemployment in Nigeria. The findings will inform policymakers on employment generation, poverty reduction, and economic growth strategies and serve as a valuable reference for future research.

2. Literature Review

• Theoretical Review

The theoretical linkage between population growth and unemployment is supported by

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Keynesian theory, which posits a relationship between population, unemployment and inflation. According to Keynes, some unemployment is necessary for price stability. High population growth can lead to unemployment when demand exceeds supply, affecting price stability (Gideon, 2018). As population increases, unemployment also increases, and as population decreases, the rate of unemployment rises. Conversely, as the rate of high population increment rises, the relationship presents an unfortunate trade-off in which unemployment is the cost of price stability, and inflation is the cost of full employment (Gideon, 2018). The Keynesian theory clarified the relationship between population growth and unemployment by postulating that, as long as there is some increase in population, unemployment will tend to rise if demand exceeds supply.

- **Empirical Review**

Empirical studies have explored the relationship between population growth and unemployment. Alam et al. (2020) observed a long-run relationship exists among the population and unemployment in Bangladesh. Pratiwi (2020) found that population growth has an impact on the unemployment rate in Makassar City. In the work of Kurnianto et al. (2018), it was argued that there is a negative relationship between population growth, economic growth, and unemployment. Studies examined the effect of population growth on unemployment in Nigeria, such as those by Akpan et al. (2018), Maijama'a et al. (2019), Afolabi and Bobola (2020), Obayori et al. (2020), and Ojimadu et al. (2023). They found a positive relationship between population growth and unemployment and some evidence of causality in both short and long-run forms.

However, in similar studies, Cynthia (2016) found an inverse relationship between unemployment rate and economic growth using a multiple regression model. Bala et al. (2020) observed a negative impact of population growth, poverty, and unemployment on economic growth in Nigeria. However, Wahyuningrum and Soesila (2021) found that population has a significant effect on the Human Development Index (HDI) and the rate of economic growth, while the open unemployment rate does not significantly affect the HDI the study conducted using a combination of time series data from 2014-2018 and a cross-section of 38 cities in East Java. In reviewing empirical studies, no study or the study examine the impact of population growth on unemployment using the period of 1991 to 2022 are little in literature. Therefore, the study will investigate the population growth effect on unemployment in Nigeria, covering the period from 1991 to 2022.

3. Methodology

To examine the link between population growth and unemployment in Nigeria, the study employed time series data for the spanning period of 1991-2022. All the data of the study were obtained from World development Indicators (WDI, 2022).

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- ***Model Specification***

Generally, specification of economic model is based on economic theory and on the available data relating to the topic of study (Akpan et al, 2018). The empirical model used in this study takes its base from the Keynesian theory of unemployment as captured in the work of (Obayori & Udeorah, 2020) and the model specified as:

$$UNE_t = f\,(PGR_t, PCI_{t,}) \text{..} (1)$$

Where: UNE is stand for Unemployment, PGR is stand for population growth and PCI is stand for per capita income.

The model modifies above equation 1 by adding variables namely, DIV, domestic investment and INR which is interest rate were the variable, considered useful for the study to examine the causal link between population growth on unemployment in Nigeria. Therefore, the modified model was specified below in equation 2.

$$UNE_t = f\,(PGR_t, PCI_{t,} DIV_{t,} INR_t) \text{..} (2)$$

The model presented in econometric log form and it will be written in equation 3 below:

$$UNE_t = \beta o + \beta 1 InPGR_t, + \beta 2 InPCI_{t,} + \beta 3 InDIV_{t,} + \beta 4 INR_t + \varepsilon_t \text{............................} (3)$$

Where: UNE is the unemployment; InPGR Natural log of population growth, InPCI is the natural log of per capita, InDIV is the natural log of domestic investment, INR is standing interest rate, and t stands for the time trend and is the residual or error term.

- ***Method of Estimation***

In order to investigate how population growth affects unemployment in Nigeria, this study utilized time series analysis and secondary data. The analysis was structured to include Unit Root tests using the Augmented Dickey Fuller Unit Root test (ADF) and Philips Peron (PP) to test the stationarity of the variables. If the variables showed stationarity both in the first difference and level, Auto Regressive Distributive Lag (ARDL) models were used to establish the long-term relationship between the variables. The model is outlined as follows:

- ***Unit Root***

The Augmented Dickey Fuller (ADF) and Philip Perron (PP) unit root tests were utilized to establish the level of integration of the variables being studied. ADF and PP were selected for their effectiveness in identifying the level of integration of the variables in time series analysis.

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Unit root test Equation

$$\Delta Y_t = \beta_0 + \sum_{j=1}^{A} \Delta\beta Y_{t-1} + \mu_t \quad \text{.....(4)}$$

$$\Delta Y_t = \beta_0 + \beta_1 t + \beta_1 Y_{t-1} + \sum_{j=1}^{A} \Delta\beta Y_{t-1} + \mu_t \quad \text{.....(5)}$$ Where μ_t is the error term and $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$, $\Delta Y_{t-p} = (Y_{t-c} - Y_{t-d})$, and c represents the number of recent time and as the number of previous times or years.

Lag Selection Test

The lag length selection criteria test will be followed and is mainly to show the appropriate number of lags that would give the best cointegration Result

- ***Lag length Equation***

$$UNE_t = \chi_0 + \sum_{i=0}^{A} \chi_{1i} InPGR_{t-i} + \sum_{i=1}^{A} \chi_{2i} InPCI_{t-i} + \sum_{i=0}^{A} \chi_{3i} \ln DIV_{t-i} + \sum_{i=0}^{A} \chi_{4i} INR_{t-i} + \varepsilon_t \text{.....(6)}$$

ARDL Test

Autoregressive Distributed Lag (ARDL) bounds test approach for co-integration developed by Pesaran, Shin and Smith (2001) were applied in the study to estimate the long run and short run connection between population growth and unemployment. The ARDL approach gives more statistical advantages than other co-integration techniques. ARDL test procedure provides valid results whether the variables are I (0) or I (1) or mutually co-integrated and provides very efficient and consistent estimates in small and large sample sizes (Pesaran, Shin & Smith 2001). The ARDL estimators can also be applied to mix order of integrated variables in Cointegration frame-work. The ARDL model is shown in equation 8

$$\Delta UNE_t = \beta_0 + \sum_{i=1}^{A} \theta_{1i} \Delta UNE_{2t-i} + \sum_{i=0}^{A} \theta_{2i} \Delta \ln PGR_{t-i} + \sum_{i=0}^{A} \theta_{3i} \Delta PCI_{t-i} + \sum_{i=0}^{A} \theta_{4i} \Delta DIV_{t-i} + \sum_{i=0}^{A} \theta_{5i} \Delta INR_{t-i} +$$

$$\chi_1 UNE_{1t-i} + \chi_2 \ln PGR_{t-i} + \chi_3 \ln PCR_{t-i} + \chi_4 InDIV_{t-i} + \chi_5 InINR_{t-i} + \mathcal{E}_t \text{.....(8)}$$

- **ARDL Diagnostic tests**

The diagnostic tests will also be applied to test the accuracy of the model which includes the serial correlation LM test, the heteroscedasticity test, the normality test, the Ramsey Reset test for specification and the stability test.

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4. Result and Discussions

- ***Descriptive Statistics Analysis***

Table 1 Descriptive statistics result

Variables	UNE	PGR	PCI	DIV	INR
Mean	4.176	2.596	1.384	28.31	18.538
Median	3.900	2.568	1.499	26.46	17.690
Maximum	6.000	2.764	12.27	53.12	31.650
Minimum	3.700	2.380	-4.507	14.16	11.483
Std. Dev.	0.667	0.108	3.615	11.39	3.880
Skewness	1.794	-0.140	0.494	0.394	1.160
Kurtosis	4.867	1.925	3.908	2.048	5.597
Jarque-Bera	21.82	1.644	2.404	2.036	16.183
Probability	0.000	0.439	0.300	0.361	0.000
Sum	133.66	83.08	44.30	905.9	593.23
Sum Sq. Dev.	13.808	0.363	405.30	402.031	466.90
Observations	**32**	**32**	**32**	**32**	**32**

Source: Author's computation using EViews10

Table 1 results indicate that the per capita income (PCI) had low mean and median values throughout the study period, highlighting issues within the Nigerian economy. The low standard deviation values suggest that all variables are closely clustered around the mean. Skewness analysis reveals that most variables exhibit symmetrical distributions, with values falling between -0.5 and 0.5, although exceptions were noted for unemployment and interest rates which had values exceeding this range, indicating heavy tails and potential outliers with extremely high values. Furthermore, kurtosis values exceeding 3 were only observed for unemployment and interest rates, suggesting that most variables do not have heavy tails and exhibit relatively normal distributions. Please ensure to review for any errors in the data analysis.

- ***Correlation Analysis***

Table 2 Correlation Analysis

Correlation	UNE	PGR	PCI	DIV	INR
UNE	1				
PGR	0.776	1			
PCI	-0.401	0.620	1		
DIV	0.139	-0.289	-0.254	1	
INR	-0.532	0.184	0.030	0.541	1

Source: Author's computation using EViews10

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Results from table 2 shows that, the correlation among all the variables found negative, except population growth (PGR) and domestic investment (DIV) which indicate positive relationship among them, the correlation matrix conform the apriori expectation of the study, except population growth and domestic investment which not conform the expectation.

- ***Unit Root Tests***

Table 3 Unit Root Test Results

	ADF Test Statistics				PP Test Statistics			
	Constant		Trend		Constant		Trend	
Variables	Level	First difference	Level	First Difference	Level	First Difference	Level	First Difference
UNE_t	-1.694	-3.720***	0.9820	-4.270***	-0.276	-3.466***	0.987	3.736***
PGR_t	-2.209	-1.838***	-0.491	-2.394***	-2.176	-4.340***	-1.233	-4.629***
PCI_t	-2.989***	-7.929***	-2.926*	-7.782***	-2.842*	-8.533***	-8.53***	-8.409***
DIV_t	-1.638	-3.148***	-1.291	-4.124***	-2.252*	-3.134***	1.591	-4.111***
INR_t	-1.936*	-6.467**	-4.556***	-6.316***	-1.857**	-6.922***	-4.024***	-6.718***

Source: Author's computation using EViews10

Note***, ** and * Denotes 1%,5% and 10% significance level respectively.

As shown in table 3, the results of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests indicate that all variables are non-stationary at the level, except for the coefficients of per capita income and interest rate. This suggests that all variables are integrated at the first order of integration, while only the coefficients of unemployment and interest rate exhibit integration at both the level and the first difference. Consequently, this implies that the

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variables may possess a long-run relationship. This underscores the applicability of the Autoregressive Distributed Lag (ARDL) model as the preferred method for estimating the dataset.

- ***Optimal Lag Selection Test***

Table 4 Optimal Lag Selection Test Result

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-210.6187	NA	3.360538	15.40133	15.63923	15.47406
1	-77.12457	209.7765	0.001498	7.651755	9.079117	8.088114
2	-45.99538	37.79973	0.001168	7.213956	9.830786	8.013947
3	6.967821	45.39703	0.000277	5.216584	9.022883	6.380208
4	87.93096	40.48157*	2.16e-05*	1.219217*	6.214984*	2.746473*

Source: Author's computation using EViews10

Note. * Indicate lag order selected by the criterion. LR = sequential modified LR test statistic; FPE = Final prediction error, AIC = Akaike information criteria, SC = Schwarz information criteria, HQ = Hannan-Quinn information criteria, LogL = log likelihood, LR = likelihood ratio

The lags selected to fit the model for the study is shown in Table 4. From the result LR, FPE, AIC and HQ, all suggested the use of lag 4. Thus, lag was selected for further estimations.

- ***Cointegration Results***

Having identified the optimal lag length, the next step was to estimate the long-run relationship among the variables using the ARDL bound test.

Table 5 ARDL Bounds Test Result

				Bounds critical values [Unrestricted intercept & no trend]	
Model	**F-stats**	**Lag**	**Level of significance**	**I(0)**	**I(1)**
$UNE_t = F(PGR_tPCI_tDIV_tINR_t)$	**13.67**	**4**			
			10%	2.45	3.52
			5%	2.86	4.01
			2.5%	3.25	4.49
			1%	3.74	5.06

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Source: Author's computation using EViews10.

The cointegration results of the model in table 5 indicate that the calculated F-statistic of 13.67 exceeds the upper critical values at the 10%, 5%, 2.5%, and 1% significance levels. Consequently, this suggests a long-run relationship between the dependent and independent variables in the model.

- ***Estimated ARDL Short run and long run Result***

Table 6. ARDL Short run and Long Run Result.

	Dependent variable, UNE	
Short Run Result		
Regressors	**Coefficient**	**T. Ratio (p values)**
D(PGR)	7.092248	1.331(0.0080) **
D(PCI)	-0.042734	-1.69(0.0096) ***
D(DIV)	-0.036168	-1.949(0.0087) ***
D(INR)	-0.102272	-1.242 (0.0135) ***
ECT-1	-0.313839	-1.699(0.0395) **
Long Run Result		
PGR	2.364586	2.260718 (0.0189) *
PCI	-0.014837	-2.019545(0.0367) *
DIV	0.045116	3.989659(0.0082) ***
INR	-0.065561	-5.319458(0.0130) ***
C	-2.397952	-0.790370(0.4870)
R-square		0.694
Durbin Watson-statistics		2.47
Probability(F-statistic)		21.56 (0.013) ***

Source: Author's computation using EViews10

Note***, ** and * Denotes 1%, 5% and 10% significance level respectively.

As depicted in table 6, an increase in population growth correlates with an increase in Nigeria's unemployment in both the short run and long run. Specifically, a percentage increase in population growth resulted 7.09% increase in unemployment in the short run and a 2.3% increase in the long run. This relationship was found to be significant at the 5% level in the short run and 10% level in the long run. These findings align with those of Afolabi et al. (2020).

Conversely, there is negative and significant relationship between per capita income and unemployment. A 1% increase in per capita income corresponds to a decrease in

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unemployment by -0.042 in the short run and -0.014 in the long run. This relationship was significant at the 1% level in the short run but at the 10% level in the long run. These results contradict those of Obayori and Udeorah (2020). Furthermore, the coefficient of domestic investment demonstrates a positive and significant effect on unemployment at the 1% level in the short run. A 1% increase in domestic investment leads to -0.0361 decrease in unemployment in the short run. However, in the long run, it results in a 0.0451 increase in unemployment, with the relationship being positive and significant at the 5% level. These findings are supported by the work of Afolabi and Bobola (2020).

Moreover, the results indicate a negative and significant effect of the interest rate on Nigeria's unemployment. An increase in the interest rate is associated with a 0.10 decrease in unemployment in the short run and a -0.065 decrease in the long run. This relationship is significant at 1% level in both the short run and long run, the result is consistent with the findings of Akpan et al. (2018).

The error correction term (ECT) is negative, less than one (in absolute value), and significant. With a coefficient of -0.313839 and a probability value of 0.0395, this confirms the earlier long-run relationship among the data series and also indicates the speed of adjustment towards long-run equilibrium to be 31% in the first year. The slow speed of adjustment suggests that only 69% of the short-term disequilibrium between the explained and the explanatory variables will converge to equilibrium in the long run.

The R-squared value indicates that 69% of the proportion of the dependent variable has been explained by the independent variables, suggesting that the model is a good fit. Furthermore, the Durbin-Watson statistic falls within the range of 1.5 and 2.5, indicating that the model is free from first-order serial correlation. Additionally, the probability of the F-statistic is significant at less than 5% (0.000<0.05), signifying that the independent variables are jointly significant in explaining the dependent variable.

- ***Diagnostics Test***

Table 7 ARDL Diagnostic Test Result

Test Statistics	F Version
A. Serial Correlation	F(2,1) = 0.222 (0.831)
B. Heteroskedasticity	F(2,25) = 1.648 (0.211)
C. Normality	0.553 (0.758)

Source: Author's computation using EViews10

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Note: * **, **and* Denotes 1%, 5% and 10% significance level respectively.

The results of the diagnostic tests presented in table 7 indicate that the model is devoid of serial correlation, heteroscedasticity, and normality issues. This suggests that the model is free from serial correlation, the error terms exhibit homoscedasticity, the model is correctly specified, and the data is well-modeled. Additionally, cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests for stability were conducted, with the results depicted in Figures 1 and 2.

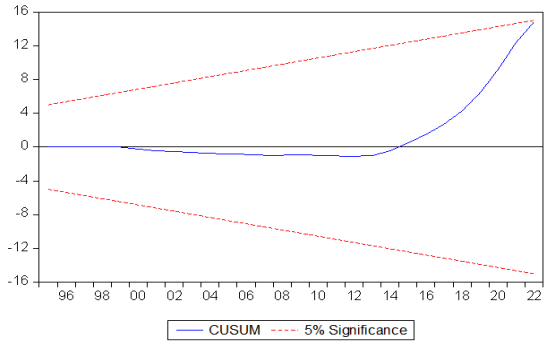

Fig 1 CUSUM

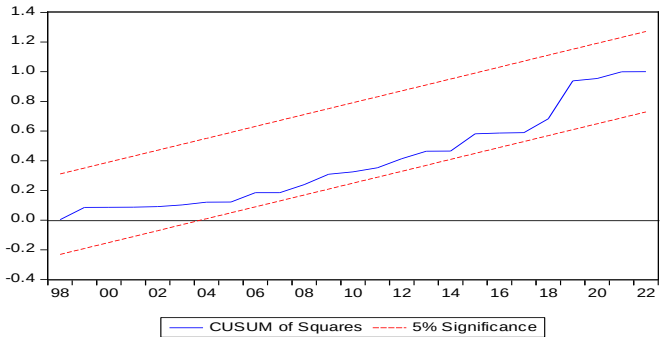

Fig 2 CUSUM of Square

Finally, the stability test via the CUSUM reported in Figure 1 indicated that errors were stable since the CUSUM lines are within the five percent significance boundary. Similarly,' the CUSUM sum of square in figure 2 also indicate all the errors were stable due to CUSUM sum of square line is within five percent significance boundary.

5. Conclusion and Recommendation.

Conclusion

The empirical study was carried out to examine the impact of population growth on Nigeria's unemployment, the study used time series data covering the period of 1991 to 2022, autoregressive distributed lag Model (ARDL) were used to determine long run and short run. The study concluded that, population growth has positive significant effect on Nigeria's Unemployment in Both long run and short runs

Recommendations

- Government should Implement targeted job creation programs aimed at absorbing the growing labor force, particularly among youth and women.
- Enhance access to education, vocational training, and skills development programs to improve human capital and match skills with labor market demands.
- Foster a conducive business environment to attract domestic and foreign investment, with a focus on sectors with high employment potential.

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- Implement monetary policies aimed at maintaining stable interest rates to stimulate investment and economic growth while avoiding inflationary pressures.
- Strengthen social protection programs to provide support to vulnerable groups and mitigate the negative impact of unemployment.

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