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POPULATION GROWTH AND ECONOMIC DEVELOPMENT IN NIGERIA

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Abstract

This study examines the Granger causality between population growth and economic development in Nigeria from 1980 to 2024. Using time series data, both variables were found to be non-stationary but became stationary after first differencing. Granger causality tests revealed that population growth does not cause economic development, but economic development does cause population growth. Additionally, the Johansen co-integration test showed no long-run relationship between the two. These results suggest a one-way short-term influence of economic growth on population dynamics, with no long-term equilibrium. Policy recommendations focus on aligning development planning with demographic trends.

Keywords: Demographic dividend, Economic development, Granger-causality, Jobless growth, Population growth, Vector–Autoregressive model.

Introduction

Nigeria has witnessed backward economic development marked by some periods of structural weaknesses and a limited conversion of economic growth into meaningful development outcomes. Although the country is endowed with substantial natural resources and remained one of the largest economies in Africa, its development trajectory continued to raise critical concerns regarding sustainability and inclusiveness.

Comparatively, Nigeria's economic performance has lagged behind that of many other Sub-Saharan African countries. While the region has achieved moderate growth rates in recent years, Nigeria's average growth has remained relatively lower, reflecting deeper structural and policy-related constraints. This relative underperformance signals inefficiencies in economic management and highlights the need for more effective development strategies. World Bank (2023) revealed that Nigeria's growth pattern over this period has been highly volatile, as real GDP growth has averaged just about 3 to 4% over the long term, with recent figures hovering slightly above 3%. While this suggests positive economic performances, such growth rates are insufficient to reap demographic dividend associated with high population. Moreover, the economy has experienced notable downturns, including the sharp contraction during the COVID-19 period, underscoring its vulnerability to external shocks especially fluctuations in global oil prices.

Moreover, the United Nations Development Programme UNDP (2023) reported that Nigeria consistently ranked among countries with relatively low human development, reflecting the weak linkage between economic growth and social progress. In addition, Nigeria's economic structure remains narrowly based and heavily reliant on the oil sector. This dependence exposes the economy to external volatility and undermines diversification efforts. Although

the services sector has recently contributed to growth, key productive sectors such as agriculture and manufacturing, which are essential for employment creation and industrialization, these sectors have not expanded sufficiently to support sustainable development. This structural imbalance limits the economy's capacity to reap demographic dividends.

Another dimension of the problem is the phenomenon of "jobless growth," where increases in GDP do not correspond with adequate employment opportunities. Data from the National Bureau of Statistics indicate persistent unemployment and underemployment, particularly among the youth population. This reflects inefficiencies in the labor market and highlights the inability of the economy to absorb its growing labor force productively, thereby constraining income generation and aggregate demand. Macroeconomic instability further compounded Nigeria's development challenge. Persistent inflation, exchange rate fluctuations, and fiscal imbalances have weakened economic stability and eroded purchasing power. International Monetary Fund (2024) reported the adverse effects of rising inflation and currency depreciation on household welfare and investment decisions. These issues are exacerbated by infrastructural deficits, weak institutions, and low levels of industrial capacity, all of which hinder long-term development.

Overall, the central problem lies not merely in the rate of economic development but in its quality, inclusiveness, and sustainability. Despite numerous policy interventions including structural adjustment programs, liberalization reforms, and macroeconomic stabilization efforts, the Nigerian economy has struggled to achieve meaningful structural transformation and broad-based improvements in living standards. The economy has not been able to effectively translate its growth potential into tangible benefits such as employment generation, poverty reduction, and improved human welfare.

Conversely, Nigeria's rapid population growth raises concerns about its sustainability and impact on economic development. While a large population can provide a demographic dividend through a sizable labour force, it can also strain resources, increase unemployment, and exacerbate poverty if not accompanied by commensurate economic growth. Conversely, economic development may influence population dynamics by improving healthcare, reducing mortality, or altering fertility rates. Existing studies on Nigeria, such as Aidi, Emecheta and Ngwudiobu (2016) suggested no predictive relationship between population and economic growth, but these findings are based on data up to 2013. The lack of recent studies incorporating Nigeria's economic and demographic trends up to 2024 creates a gap in understanding the causal dynamics. This study addresses this gap by applying the Granger causality test to determine whether population growth predicts economic development or vice versa in Nigeria over the period 1980 – 2024.

Hence**,** the main objective of this study is to investigate the Granger causality between population growth and economic development in Nigeria from 1980 to 2024. The specific objectives are to:

i. examine whether population growth granger-causes economic development in Nigeria
ii. determine whether economic development granger-causes population growth in Nigeria.
iii. assess the presence of bi-directional or no causality between population growth and economic development.

Hence, the study tests the following null hypotheses:

$H0_1$: Population growth does not granger-cause economic development in Nigeria.

$H0_2$: Economic development does not granger-cause population growth in Nigeria.

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$H0_3$: There is no causality between population growth and Economic development in Nigeria:

The rationale for undertaking an investigation into the causal relationship between population growth and economic development in Nigeria is grounded in both theoretical relevance and practical policy considerations. Nigeria's demographic expansion over the past decades has been substantial; however, this rapid population increase has not been consistently matched by corresponding improvements in key development indicators such as per capita income, employment generation, and overall human welfare. This divergence creates a compelling need to rigorously assess the direction and strength of causality between population dynamics and economic development outcomes.

Thus, this paper is further divided into four sections: Section II covered Literature Review while Section III examined the research methodology with particular reference to Granger causality. Section IV explored the research findings and compared it with previous findings in existing literature. Section V concluded the research and provided recommendations based on the research findings.

Literature Review

The section reviewed the Malthusian theory, demographic dividend theory of population growth and the Endogenous Growth theory as relevant to this study and vital empirical findings and methodological reviews related to this paper:

Malthusian Theory

Thomas Malthus (1798) argued that population growth outpaces food production, leading to resource scarcity and economic stagnation. In Nigeria, rapid population growth could strain resources, potentially hindering economic development unless offset by technological advancements or resource management (Todaro and Smith, 2020).

Demographic Dividend Theory

The demographic dividend theory posited that a growing working-age population can boost economic growth if supported by investments in education, health, and employment (Bloom, Canning, and Sevilla, 2003). Nigeria's youthful population offers potential for a demographic dividend, but this depends on economic policies to create jobs and improve human capital.

Endogenous Growth Theory

Endogenous growth theory, developed by Romer (1990), emphasizes human capital and innovation as drivers of economic growth. He further explained that population growth can contribute to economic development by expanding the labour force and fostering innovation, provided education and skills development are prioritized.

Empirical and Methodological Review

Barro (1991) found that population growth negatively affects economic growth in countries with low human capital, a relevant concern for Nigeria. Conversely, Bloom and Williamson (1998) showed that population growth in East Asia contributed to economic growth through a demographic dividend. Ali, Ali and Amin (2013) also asserted that the impact of population growth on economic development in Pakistan between 1975 and 2008 is positive and significant. These contrasting findings highlight the context-specific nature of the population-economic development nexus.

In Nigeria, Aidi et al. (2016) applied the granger causality test data from 1970 to 2013 and found no causality between population growth and economic growth, suggesting neither variable predicts the other. Similarly, Nwankwo and Orji (2019) examined the impact of population growth on economic growth in Nigeria (1980–2015) and found a negative relationship, attributing it to low human capital development. Conversely, Adeyemi and Olayemi (2020) found that economic growth influences population dynamics through improved healthcare and reduced mortality.

Under methodological review, Granger causality has been widely used to study economic relationships. For example, Odhiambo (2010) found that economic growth Granger-causes financial development in South Africa, but not vice versa. In Nigeria, Olusanya (2012) used Granger causality to show that public expenditure on education Granger-causes economic growth, highlighting the role of human capital. These studies underscore the applicability of Granger causality in testing directional relationships.

While studies like Aidi et al. (2016) provide insights into the population - economic growth relationship in Nigeria, they cover earlier periods (up to 2013) and do not account for recent economic trends, such as Nigeria's GDP growth of 3.84% in Q4 2024 (NBS, 2024). Additionally, few studies explore bi-directional causality or incorporate recent demographic data. Hence, this study addresses these gaps by using updated data (1980–2024) and applying Granger causality within a robust VAR framework.

Methodology

The paper adopted a quantitative research design, using time series analysis to test Granger causality. The period 1980–2024 is chosen to capture recent trends in Nigeria's population and economic development. The Granger causality test is conducted within a Vector Autoregressive (VAR) framework, with robustness checks for stationarity and co-integration. Annual time series data for population growth rate from 1980–2024 were sourced from the World Development Indicators (WDI) and the National Bureau of Statistics (NBS) while Real GDP @ constant 2010 prices, were sourced from the Central Bank of Nigeria (CBN) statistical bulletin (2023).

The two major variables examined in this paper are: Population Growth (POPGR), which measures annual population growth rate (%) or total population (millions) and Economic Development (RGDP or GDPGR) which measures real GDP (constant 2010 prices, in billions of Naira) or GDP growth rate (%).

The Granger causality test is conducted using a VAR model with the two variables: POPGR (X) and GDPGR (Y). The model is specified as follows:

Equation 1 (for GDPGR)

$$\boldsymbol{Y_t = \alpha_0 + \sum_{i=1}^{m} \alpha_i Y_{t-1} + \sum_{j=1}^{n} \beta_j X_{t-j} + \epsilon_t}$$

Equation 2 (for POPGR)

$$\boldsymbol{X_t = \gamma_0 + \sum_{i=1}^{m} \gamma_t X_{t-1} + \sum_{j=1}^{n} \delta_j Y_{t-j} + \mu_t}$$

Where:
$\boldsymbol{Y_t}$: GDPGR at time t
$\boldsymbol{X_t}$: POPGR at time t
(m, n): Number of lags
$\boldsymbol{\epsilon_t, \mu_t}$: Error terms
$\boldsymbol{\alpha, \beta, \gamma, \delta}$: Coefficients

$H0_1$: $\boldsymbol{\beta_j}$ = 0 for all j (POPGR does not Granger-cause GDPGR).

$H0_2$: $\boldsymbol{\delta_j}$ = 0 for all j (GDPGR does not Granger-cause POPGR)

To ensure valid results, stationarity was tested using the Augmented Dickey-Fuller (ADF) Test and Phillips-Perron (PP) Test to test the Robustness to heteroskedasticity. If variables are non-stationary, first differences are taken until stationarity is achieved.

The optimal number of lags is selected using the Akaike Information Criterion (AIC) to minimize information loss. Also, a maximum of 4 lags was considered, given the annual data frequency using the Schwarz Information Criterion (SIC).

The VAR model is estimated using statistical software (R). Granger causality is tested using F-tests or Wald tests on the coefficients of lagged variables. A p-value < 0.05 rejects the null hypothesis, indicating Granger causality.

The data analysis was conducted using R (package: vars). This tool is suitable for time series analysis and Granger causality testing.

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Presentation and Analysis of Data

The dataset comprises 45 annual observations (1980–2023) of Nigeria's population growth rate (POPGR, %) and GDP growth rate (GDPGR, %). The data was verified to ensure completeness, numeric format, and consistency with the study period. The analysis uses data up to 2023, as noted in NBS (2024).

Stationarity Test Results

Table 4.1: ADF Test Results for Stationarity

Variable	Test statistics	P-value	Stationarity	Action taken
POPGR	-1.620	0.7268	No	First differenced
GDPGR	-2.537	0.3588	No	First differenced

Interpretation: For population growth rate, the test statistic (-1.620) is greater than the critical value at 5% (approximately -2.89), with a p-value of 0.7268 (> 0.05), indicating non-stationarity. The first difference of population growth rate was used to achieve stationarity. Also, for GDP growth rate the test statistic (-2.537) is greater than the critical value at 5%, with a p-value of 0.3588 (> 0.05), indicating non-stationarity. The first difference of GDP growth rate was used.

Both variables were non-stationary at levels but became stationary after first differencing, confirming they are integrated of order one, I(1).

Lag Selection

The optimal lag length for the VAR model was determined using the VARselect function from the vars package, with a maximum of 4 lags and a constant term. The AIC criterion selected 4 lags as optimal.

Result**:** Optimal lags (AIC) = 4

This lag length balances model fit and complexity, given the sample size of approximately 44 observations after differencing (1981–2023).

Granger Causality Test Results

The Granger causality test was conducted using the vars package to assess whether lagged values of one variable improve the prediction of another. The VAR model was fitted with 4 lags, and causality was tested in both directions: POPGR → GDPGR and GDPGR → POPGR

Table 4.2: Granger Causality Test Results

Direction	P-value	Significant (p<0.05)
POPGR→GDPGR	0.1789	NO
GDPGR→POPGR	0.0117	YES

Interpretations

POPGR → GDPGR: The p-value of 0.1789 (> 0.05) fails to reject the null hypothesis, indicating that population growth does not Granger-cause GDP growth at the 5% significance level. This suggests that past values of POPGR do not significantly improve the prediction of GDPGR.

GDPGR → POPGR: The p-value of 0.0117 (< 0.05) rejects the null hypothesis, indicating that GDP growth Granger-causes population growth at the 5% significance level. This implies that past values of GDPGR significantly predict POPGR, suggesting that economic development influences population dynamics.

Co-integration Test Results

Since both POPGR and GDPGR are non-stationary at levels (I(1)), the Johansen cointegration test (trace statistic) was conducted using the ca.jo function from the vars package to check for a long-run relationship. The test used 4 lags, consistent with the VAR model.

Table 4.3: Johansen Cointegration Test Results (Trace Statistic)

Null Hypothesis	Trace statistic	Critical value (5%)	Rejection Null (Cointegration)
r ≤ 0	0.33	8.18	NO
r = 0	9.57	17.95	NO

Eigenvectors (Normalized to First Column):

Variable	Cointegration Relation 1	Cointegration Relation 2
POPGR	1.000	1.000
GDPGR	0.169	-0.009

Weights (Loading Matrix):

Variable	POPGR (▲)	GDPGR (▼)
POPGR	0.0025	-0.0280
GDPGR	-3.2253	-0.9039

Interpretation

The trace statistic for r = 0 (9.57) is less than the 5% critical value (17.95), failing to reject the null hypothesis of no cointegration. Similarly, for r ≤ 1, the trace statistic (0.33) is less than the critical value (8.18).

No cointegration was detected at the 5% significance level, indicating no long-run equilibrium relationship between POPGR and GDPGR.

The eigenvectors and weights are provided for completeness but are not interpreted further, as cointegration is not supported.

Discussion of Findings

The study investigated whether population growth Granger-causes economic development or vice versa in Nigeria, using annual data from 1980 to 2023. The key findings are summarized as follows:

The ADF test revealed that both POPGR (test statistic = -1.620, p-value = 0.7268) and GDPGR (test statistic = -2.537, p-value = 0.3588) are non-stationary at levels (p > 0.05), indicating they are integrated of order one, I(1). First differencing was applied to achieve stationarity, as confirmed by the test results (Chapter 4, Table 4.1).

The VAR model, using the Akaike Information Criterion (AIC), selected an optimal lag length of 4, balancing model fit with the sample size of approximately 44 observations after differencing (1981–2023).

The Granger causality test showed no significant causality from POPGR to GDPGR (p-value = 0.1789, p > 0.05), indicating that population growth does not predict economic growth in Nigeria (Chapter 4, Table 4.2). Conversely, significant causality was found from GDPGR to POPGR (p-value = 0.0117, p < 0.05), suggesting that economic growth predicts population growth. This implies that improvements in GDP growth influence demographic trends, possibly through enhanced living standards or healthcare access (Aidi et al., 2016).

The Johansen trace test indicated no cointegration between POPGR and GDPGR (trace statistic for r = 0: 9.57 < critical value 17.95 at 5%; r ≤ 1: 0.33 < critical value 8.18), suggesting no long-run equilibrium relationship between the variables (Chapter 4, Table 4.3).

These findings highlighted a unidirectional causal relationship where economic growth influences population growth, but population growth does not significantly drive economic development in Nigeria over the study period. The empirical results have significant implications for economic theory and policy in Nigeria:

The significant Granger causality from GDPGR to POPGR supports theories that link economic growth to demographic changes. For instance, improvements in GDP growth may enhance healthcare, education, and living standards, leading to changes in

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fertility or mortality rates, thus affecting population growth (Bloom et al., 2003).

The absence of causality from POPGR to GDPGR challenges the demographic dividend hypothesis, which posits that a growing population can boost economic growth through an expanded labor force or market size (Bloom et al., 2003). In Nigeria's context, structural constraints such as unemployment, inadequate infrastructure, or skill mismatches may limit the economic benefits of population growth (Aidi et al., 2016).

The lack of cointegration suggests that POPGR and GDPGR do not share a stable long-run relationship, possibly due to Nigeria's volatile economic environment, policy shifts, or external shocks (e.g., oil price fluctuations) (Engle & Granger, 1987).

The finding that GDP growth influences population growth underscores the importance of sustained economic development to manage demographic trends. Policies that enhance GDP growth, such as investments in infrastructure, education, and healthcare, could indirectly influence population dynamics by improving quality of life and reducing fertility rates.

The lack of causality from population growth to economic growth suggests that Nigeria's large and growing population (over 200 million as of 2023) is not automatically translating into economic gains. This highlights the need for policies that harness the potential of the population, such as job creation, skill development, and industrialization, to realize a demographic dividend.

The absence of a long-run relationship indicates that short-term economic policies may not stabilize population and economic growth interactions over time, necessitating targeted interventions to address structural economic challenges.

Conclusion

This study investigated the causal relationship between population growth and economic development in Nigeria from 1980 to 2023 using a time series econometric approach. The findings reveal a unidirectional Granger causality from GDP growth to population growth, indicating that economic development significantly predicts demographic trends, but population growth does not significantly influence economic growth. The absence of cointegration suggests no long-run equilibrium relationship between the variables, likely due to Nigeria's economic volatility and structural challenges. The results underscore the importance of fostering economic growth to manage population dynamics while highlighting the need for policies to harness Nigeria's demographic potential. Recommendations include promoting sustainable economic growth, investing in human capital, and improving healthcare and data collection. Despite limitations such as data constraints and model simplicity, the study provides valuable insights for policymakers and sets the stage for future research to explore more complex dynamics. By addressing these findings, Nigeria can better align its population and economic policies to achieve sustainable development.

Recommendations

Based on the findings, the following recommendations are proposed for policymakers in Nigeria:

(i) Invest in key sectors such as agriculture, manufacturing, and technology to boost GDP growth, which can positively influence population dynamics. For example, improving agricultural productivity can enhance food security and rural incomes, potentially stabilizing population growth rates. Also, there is the need to strengthen macroeconomic stability by diversifying the economy away from oil dependency, as oil price volatility has historically disrupted GDP growth in Nigeria.

(ii) Develop human capital through education and vocational training to improve employability and productivity of Nigeria's young

population. This could enhance the economic impact of population growth, which currently does not Granger-cause GDP growth. Also, there is the need to implement youth employment programs to address high unemployment rates, thereby enabling the population to contribute to economic development.

(iii) Expand access to healthcare and family planning services to manage population growth, given the influence of GDPGR on POPGR. Programs like the National Health Policy (2016) should be scaled up to reduce fertility rates and improve maternal and child health.

References

Aidi, H. O., Emecheta, C., and Ngwudiobu, I. M. (2016). Population and economic growth in Nigeria: Is there a causality? International Journal of Research in Social Sciences, 6(2), 24–37.

Ali, S., Ali, A., and Amin, A. (2013). The impact of population growth on economic development in Pakistan. *Middle-East Journal of Scientific Research*, *18*(4), 483-491.

Bloom, D. E., Canning, D., and Sevilla, J. (2003). The demographic dividend: A new perspective on the economic consequences of population change. RAND Corporation. https://www.rand.org/pubs/monograph_reports/MR1274.html

Central Bank of Nigeria. (2024). Economic reports. https://www.cbn.gov.ng/

Dickey, D. A., and Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. Journal of the American Statistical Association, 74(366), 427–431. https://doi.org/10.2307/2286348

Engle, R. F., and Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation, and testing. Econometrica, 55(2), 251–276. https://doi.org/10.2307/1913236

Granger, C. W. J. (1969). Investigating causal relations by econometric models and cross-spectral methods. Econometrica, 37(3), 424–438. https://doi.org/10.2307/1912791

Johansen, S. (1991). Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. Econometrica, 59(6), 1551–1580. https://doi.org/10.2307/2938278

National Bureau of Statistics. (2024). Nigeria GDP growth report Q4 2024. https://www.nigerianstat.gov.ng/

World Bank. (2023). World Development Indicators. https://data.worldbank.org/country/nigeria