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EFFECT OF POPULATION STRUCTURE ON ECONOMIC GROWTH IN NIGERIA

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Abstract
This study examined the effect of population structure on economic growth in Nigeria using annual time-series data spanning from 1981–2025. The study employed descriptive statistics, Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests, the Autoregressive Distributed Lag (ARDL) bounds testing approach, Error Correction Model (ECM), and Pairwise Granger causality test to analyse both the long-run and short-run relationships among the variables. The ARDL bounds test established the existence of a long-run equilibrium relationship between population structure and economic growth. In the long run, the old-age dependency ratio exerted a positive and weakly significant effect on economic growth, whereas the coefficients of the male and female working-age population were statistically insignificant. The short-run dynamics revealed significant asymmetric effects of the working-age population, with the female working-age population exhibiting an initial negative but subsequently positive impact on economic growth, while the male working-age population demonstrated the opposite pattern. The error correction term was negative and statistically significant, indicating that approximately 35.8% of short-run disequilibrium is corrected annually. Furthermore, the Pairwise Granger causality results showed no causal relationship between population growth rate, male population growth, female population growth, and economic growth. The study recommends policies aimed at enhancing labour productivity, expanding productive employment, promoting female economic participation, strengthening human capital development, and integrating demographic planning into national development strategies to fully harness Nigeria's demographic dividend.

Keywords: Population Structure, Economic Growth, Population Density, Working-Age Population.

1.0 Introduction

Nigeria The demographic transition experienced by many countries has revealed that changes in age composition significantly affect economic performance (UNDP,2020). Countries with a larger proportion of working-age individuals often experience what is known as a demographic dividend a period during which economic growth accelerates because the productive population exceeds the dependent population (Bloom & Williamson, 2019). This demographic dividend has contributed significantly to the rapid economic transformation observed in many East Asian economies, including South Korea, Singapore, and China (Bloom, et al., 2023).

According to the United Nations (2022), demographic composition plays a critical role in determining the economic prospects of nations. Countries with favourable age structures often experience higher rates of economic growth due to increased labour participation and capital accumulation.

Population structure has become increasingly important in development economics because many developing countries are experiencing demographic transitions characterized by declining mortality rates and expanding labour forces. These transitions create opportunities for accelerated economic growth if accompanied by appropriate economic policies and human capital investments.

Nigeria presents an interesting case for examining the relationship between population structure and economic growth. Nigeria is the most populous country in Africa and one of the fastest-growing populations globally. Recent demographic projections indicate that Nigeria's population is expected to exceed 400 million by 2050, making it one of the world's most populous nations (Binuyo, et al., 2022). The country is characterized by a youthful population, with a substantial proportion of citizens below the age of 15 years, while the working-age population continues to increase steadily. Studies indicate that more than 40 percent of Nigeria's population falls within the child-dependent age category, creating a relatively high dependency burden on the economically active population. Nigeria is currently experiencing a demographic transition characterized by a gradual increase in the working-age population. This transition presents both opportunities and risks. If effectively managed through investments in education, healthcare, employment creation, and technological development, the demographic transition could accelerate economic growth. Conversely, failure to harness these demographic changes may exacerbate unemployment, poverty, and social instability (Alawode & Lawal,2025).

Nigeria has experienced fluctuating economic growth despite possessing one of the largest and fastest-growing populations in Africa. The country's population structure, characterized by a rapidly expanding youthful and working-age population, presents significant potential for accelerating economic growth through increased labour supply, productivity, and domestic demand. However, this demographic advantage has not translated into sustained economic development due to persistent structural constraints, including high unemployment, widespread poverty, low levels of human capital development, inadequate infrastructure, and weak institutional frameworks. Consequently, the large working-age population has imposed greater dependency pressures and underemployment rather than contributing meaningfully to productive economic activities. This suggests that the relationship between population structure and economic growth in Nigeria is largely contingent upon the country's ability to create employment opportunities and invest adequately in education, healthcare, and skills development to harness its demographic potential (Ogunjobi, et al., 2024).

Empirical evidence on the relationship between population structure and economic growth remains mixed and inconclusive. Several studies report that a growing working-age population and labour force participation exert a positive influence on economic growth by increasing productivity, savings, investment, and aggregate demand (Bloom, Canning, & Sevilla, 2003; Lee & Mason, 2011; Ogunjimi & Amune, 2022). In contrast, other studies argue that rapid population growth and changes in demographic structure may constrain economic performance when accompanied by weak institutions, inadequate human capital development, high unemployment, and poor macroeconomic management

(Ogunjobi, et al., 2024). Still, some empirical investigations report insignificant or context-dependent relationships, suggesting that the growth effects of demographic change depend largely on country-specific economic, institutional, and policy conditions.

These divergent findings have generated considerable uncertainty regarding the extent to which Nigeria's evolving population structure contributes to economic growth. Although Nigeria possesses one of the largest and fastest-growing populations in Africa, existing studies have predominantly focused on aggregate population growth while paying relatively limited attention to the distinct roles of key demographic components, such as the working-age population, labour force participation, and age dependency, in shaping long-run economic performance. Moreover, many previous studies rely on relatively short sample periods or conventional estimation techniques that may not adequately capture the dynamic interactions between demographic variables and economic growth.

Against this background, this study contributes to the existing literature, beyond aggregate population growth by examining how different dimensions of population structure influence economic growth in Nigeria. Therefore, the central problem motivating this study is the need to determine how Nigeria's population structure, particularly the proportions of working-age population that affects economic growth. Understanding these relationships is necessary for designing policies capable of transforming Nigeria's demographic potential into sustainable economic development. To achieve this, the remaining section of this paper shall be organized as follows. Section two deals with literature review while section three presents methodology used in the study. Section four results and discussion of findings and section five shows conclusion and policy recommendation.

2.Literature Review

2.1Conceptual Review

Population and Population Structure

According to Thomas (1972) as cited in (Onyeoma & Blessing, 2023), the population of an area is the total number of all individuals alive in a particular point in time. In the Higgs (1963) as cited in (Richa, et al., 2022), population of a country is the number of its inhabitants and whatever account is taken of differences of quantity, it is of quality in close relation to numbers. Thus, population can be regarded as a label for a human aggregate. The evolution of population size is determined by the number of (surviving) children per adult. Population structure refers to the composition of a population according to age, sex, dependency status, education, and other demographic characteristics. Among these dimensions, age structure remains the most significant in economic analysis because it determines the proportion of the population that is economically productive relative to those who depend on others for support.

Population structure influences labour supply, savings behaviour, consumption patterns, investment decisions, human capital development, and ultimately economic growth (Bloom, et al., 2023). Population structure is usually categorized into three major age groups: Children (0–14 years); Working-age population (15–64 years) and Elderly population (65 years and above).

The proportion of these age groups determines the dependency ratio and productive capacity of an economy. A higher proportion of working-age individuals is generally associated with increased economic productivity, while a larger dependent population may place pressure on household incomes and public finances (Bloom, et al., 2023).

Economic growth

Economic growth refers to the sustained increase in the production of goods and services within an economy over time, commonly measured by growth in Gross Domestic Product (GDP) or GDP per capita. The relationship between population and economic growth has attracted considerable attention among economists, demographers, and policymakers for decades. While early scholars such as Malthus (1798) argued that rapid population growth exerts pressure on limited resources and hinders economic progress, modern demographic economists emphasize the importance of population structure rather than population size alone.

2.2Theoretical Framework

This study is anchored on the Demographic Dividend Theory developed by Bloom and Canning (2019). The choice of this theory is informed by its direct relevance to the study objective, which examines how population structure influences economic growth rather than merely investigating the effect of population size. The theory argues that economic growth depends primarily on the proportion of the working-age population relative to dependents. A higher share of economically active individuals increases labour supply, savings, productivity, investment, and tax revenues while reducing dependency burdens. These demographic changes create opportunities for accelerated economic growth, provided supportive economic policies, quality education, healthcare, and employment opportunities exist.

The demographic dividend theory further recognizes that demographic change alone does not guarantee economic growth. Rather, favourable age structures translate into higher economic performance only when accompanied by sound institutions, human capital development, macroeconomic stability, and productive employment. This perspective aligns closely with Nigeria's demographic realities, where over half of the population is youthful, yet unemployment, underemployment, inadequate human capital investment, and weak labour market absorption continue to constrain growth.

The theory therefore provides a suitable analytical foundation for examining how key indicators of population structure such as the working-age population, youth population, old-age dependency ratio, and total dependency ratio influence Nigeria's economic growth. It also explains why demographic variables may exert either positive or negative effects depending on prevailing economic conditions and institutional capacity.

The Demographic Dividend Theory is particularly shifts attention from population quantity to population quality and composition. Since the study investigates the effect of population structure on economic growth in Nigeria, the theory provides a robust explanation of how age distribution, dependency ratios, and labour force dynamics affect macroeconomic performance. It also supports the inclusion of variables such as working-age population, youth dependency, old-age dependency, labour force participation, and human capital indicators in the empirical model. Unlike the Malthusian perspective, which views population growth largely as a constraint, the demographic dividend framework recognizes that Nigeria's youthful population can become a catalyst for sustained economic growth if complemented by effective investments in education, healthcare, job creation, and institutional development.

2.3Empirical Literature Review

Recent empirical literature demonstrates that the relationship between population structure and economic growth is multifaceted and highly dependent on demographic composition, institutional quality, and economic policy. Rather than exerting a uniform influence, population dynamics affect economic performance through several transmission channels, including labour supply, human capital accumulation, productivity, savings, urbanization, and dependency ratios. Consequently, empirical findings remain heterogeneous across countries and time periods.

At the conceptual and policy level, Bengana, et al. (2025) argue that understanding population dynamics requires integrating demographic theories with practical population management strategies. Drawing on Ibn Khaldun's demographic cycle theory and evidence from France, Sweden, India, and Yemen, they demonstrate that demographic outcomes are shaped not only by population size but also by socio-economic, political, and institutional contexts. Their study underscores that effective population policies must align demographic changes with national development objectives, suggesting that population structure alone cannot guarantee economic progress without supportive governance and policy interventions.

Empirical evidence from Nigeria presents similarly mixed results. Onyeoma et al. (2023), using the Autoregressive Distributed Lag (ARDL) approach on annual data from 1983–2021, found that population growth exerts a positive effect on economic growth in the short run but a negative effect in the long run, indicating that the benefits of demographic expansion diminish when economic opportunities fail to keep pace with population increases. Likewise, Binuyo et al. (2022), employing the Vector Error Correction Model (VECM) on Nigerian data from 1990–2021, reported that rapid population growth adversely affects economic development, whereas labour force participation and foreign direct investment stimulate growth. Similarly, Omotayo and Olusegun (2020) found that demographic variables influence economic growth differently, with fertility and migration contributing positively while mortality exerts a significant negative effect on Nigeria's GDP. Collectively, these studies suggest that the economic consequences of demographic change depend more on the quality and productivity of the population than on its numerical size.

Evidence from other developing economies reinforces the context-specific nature of the demographic-growth relationship. Robert (2020) established both long-run and short-run causal relationships between population growth and economic growth in Tanzania using cointegration and VECM techniques, implying that demographic expansion can stimulate economic performance when accompanied by favourable macroeconomic conditions. Conversely, Miladinov (2023), examining low- and middle-income countries, found that rural population growth significantly worsens food insecurity, while urban population growth tends to reduce undernourishment, highlighting the importance of population distribution rather than aggregate population growth. These findings imply that demographic change can generate both opportunities and developmental challenges depending on the structural characteristics of an economy.

Beyond aggregate economic growth, recent studies have also examined how population dynamics influence structural transformation and urban development. Richa, et al. (2022) found that urban population growth has consistently been a stronger determinant of urban land expansion than GDP growth across more than 300 cities worldwide, although economic growth becomes increasingly important in countries with stronger governance and higher levels of development. These findings emphasize that demographic change affects not only macroeconomic growth but also patterns of urbanization, infrastructure demand, and resource allocation.

Historical evidence further supports the existence of a close interaction between demographic change and economic development. Ashraf and Galor (2018), using cross-country historical data, confirmed the Malthusian hypothesis that higher land productivity and earlier agricultural development supported larger populations during the pre-industrial era. Their findings illustrate that population growth has historically been closely linked to resource availability and technological progress, although the mechanisms through which demographic change influences economic performance have evolved substantially in modern economies.

Although the existing literature provides valuable insights into the population–growth nexus, several important gaps remain. First, most empirical studies focus primarily on aggregate population growth while paying insufficient attention to the distinct effects of population structure, particularly the working-age population, labour force participation, age dependency, and demographic composition, on economic growth. Second, previous Nigerian studies have produced inconsistent findings, with some reporting positive effects, others negative effects, and still others identifying mixed short-run and long-run relationships. These inconsistencies may reflect differences in variable selection, estimation techniques, sample periods, and model specifications. Third, many studies rely on relatively short time horizons that do not adequately capture Nigeria's demographic transition and evolving macroeconomic environment. Finally, limited attention has been devoted to examining the long-run equilibrium and short-run dynamic relationships between different dimensions of population structure and economic growth using updated data. This study addresses these gaps by employing annual time series data spanning 1980–2025 to examine how key components of population structure influence economic growth within a robust time-series econometric framework. By disaggregating demographic variables rather than relying solely on aggregate population growth, the study provides more comprehensive evidence on whether Nigeria's changing demographic structure constitutes a demographic dividend or a demographic burden, thereby contributing to both the demographic economics literature and evidence-based policy making.

Methodology

3.2Sources of Data

The source of data for analysis in this study is secondary annual time series data from 1980-2025. Data were sourced from the central bank of Nigeria statistical bulletin, National Bureau of Statistics (NBS) and World Bank Development Indicators. The choice of this sample period is informed by both theoretical and empirical considerations. The period captures Nigeria's major demographic and macroeconomic transitions, including rapid population growth, changes in age structure, labour force expansion, economic reforms, and structural transformations that have shaped the country's growth trajectory over the past four decades. The inclusion of the most recent observations (2025) ensures that the analysis reflects current demographic trends and recent macroeconomic developments, including post-COVID-19 recovery, labour market adjustments, and evolving population dynamics, thereby enhancing the policy relevance and contemporary applicability of the study's findings.

3.2Model Specification

To evaluate the objective, this study adopted and modified the model as specified by Onyeoma et al. (2023), in their of the effect of population growth on economic growth in Nigeria. The functional model is specified as;

$$GDPR = f(POGR, POGM, POGF, PODS) \qquad 3.1$$

A linear regression using the ordinary least square is employed in analyzing the relationship between population growth and food security

$$GDPR = \beta_0 + \beta_1 POGR_t + \beta_2 POGM_t + \beta_3 POGF_t + \beta_4 PODS_t + \varepsilon_t \qquad 3.2$$

Where:
GDPR= GDP per capita growth (annual %)
POGR=Population growth
POGM=Population ages 15-64, female (% of female population)
POGF=Population ages 15-64, male (% of male population)
PODS=Population density
In log stochastic term, equation (3.3) becomes:

$$\mathrm{GDPR} = \beta_0 + \beta_1 \mathrm{POGR}_t + \beta_2 \mathrm{LPOGM}_t + \beta_3 \mathrm{LPOGF}_t + \beta_4 \mathrm{LPODS}_t + \varepsilon_t$$

$$\mathrm{LGDPR} = \beta_0 + \beta_1 \mathrm{POGR}_t + \beta_2 \mathrm{LPOGM}_t + \beta_3 \mathrm{LPOGF}_t + \beta_4 \mathrm{LPODS}_t + \varepsilon_t \qquad 3.3$$

Model Specification for granger causality objective was expressed as:

$$\Delta LGDPR_t = \beta_0 + \beta_1 \Delta POGR_{t-1} + \beta_2 \Delta LPOGM_{t-1} + \beta_3 \Delta LPOGF_{t-1} + \beta_4 \Delta LPODS_{t-1} + \varepsilon_t \qquad 3.4$$

3.3Method of Analysis

ARDL Model and Error Correction Mechanism

The estimation technique adopted in this study is the Auto- Regressive Distributive Lag (ARDL) bounds testing approach developed by Pesaran, et al.,(2001). The ARDL bounds test for cointegration is expressed in equation (3.5).

$$\begin{aligned}\Delta LGDPR_t = {} & \alpha_{01} + \beta_{11} LGDPR_{t-1} + \beta_{21} POGR_{t-1} + \beta_{31} LPOGM_{t-1} + \beta_{41} LPOGF_{t-1} \\ & + \beta_{51} LPODS_{t-1} + \sum_{i=1}^{p} \alpha_{11} \Delta LGDPR_{t-i} + \sum_{i=1}^{q} \alpha_{21} \Delta POGR_{t-i} \\ & + \sum_{i=1}^{q} \alpha_{31} \Delta LPOGM_{t-i} + \sum_{i=1}^{q} \alpha_{41} \Delta LPOGF_{t-i} + \sum_{i=1}^{q} \alpha_{51} \Delta LPODS_{t-i} + \varepsilon_{1t} \qquad 3.5\end{aligned}$$

Once cointegration was established, the long-run relationship is estimated using the conditional ARDL model as depicted in equation (3.6):

$$\begin{aligned}\Delta LGDPR_t = {} & \beta_0 + \beta_1 \Delta LGDPR_{t-1} + \beta_2 \Delta POGR_{t-1} + \beta_3 \Delta LPOGM_{t-1} + \beta_4 \Delta LPOGF_{t-1} \\ & + \beta_5 \Delta LPODS_{t-1} + \varepsilon_t \qquad 3.6\end{aligned}$$

The short-run dynamic relationship was estimated using the error correction mechanism (ECM) as specified in equation (3.7):

$$\Delta LGDPR_t = \alpha_{01} + \sum_{i=1}^{p} \alpha_{11}\Delta LGDPR_{t-i} + \sum_{i=1}^{q} \alpha_{21}\Delta POGR_{t-i} + \sum_{i=1}^{q} \alpha_{31}\Delta LPOGM_{t-i} + \sum_{i=1}^{q} \alpha_{41}\Delta LPOGF_{t-i} + \sum_{i=1}^{q} \alpha_{51}\Delta LPODS_{t-i} + \lambda ECT_{t-1} + \varepsilon_t \qquad 3.7$$

Where,

$\alpha_{01}\alpha_{01}$ = constant

$\alpha_{11}\alpha_{11}$ – $\alpha_{51}\alpha_{51}$ = short-run elasticities (coefficients of the first-differenced explanatory variables)

$\beta_1\beta_1$ – $\beta_5\beta_5$ = long-run elasticity (coefficients of the explanatory variables)

$\lambda\lambda$ = speed of adjustment

$ECT_{t-1}ECT_{t-1}$ = error correction term lagged for one period

Δ= first difference operator

p = lag length

If $\lambda ECT\lambda ECT$ = 1 then 100% of the adjustment takes place within single period (instantaneous/full adjustment). If $\lambda ECT\lambda ECT$=0 then there is no adjustment.

The null and alternative hypothesis for bound test concerning the test for cointegration is:

Ho: $a_i a_i = \beta_i\beta_i = \Upsilon 1 = u_i = v_i = \omega_i u_i = v_i = \omega_i =$ 0 (No long run relationship).

H1: $a_i a_i \neq \beta_i \beta_i \neq \Upsilon 1 \neq u_i \neq v_i \neq \omega_i \neq u_i \neq v_i \neq \omega_i \neq$ 0 (there is long run relationship).

ADF test was carried out to find out if the relationship between variables is spurious or nonsensical. Equation (3.8) represents the generic model for the ADF unit root test.

$$\Delta y_t = \beta_0 + \beta_1 t + \beta\lambda y_{t-1} + \sum_{j=1}^{0} \delta_j \Delta y_{t-j} + \mu_t \qquad 3.8$$

Where,

$y_{t-1}y_{t-1}$= Lagged value of yt at first difference

$\Delta y_{t-j}\Delta y_{t-j}$= A change in lagged value

δ= Measure of lag length

$\Delta y_t\Delta y_t$ = First difference of $y_t y_t$

$\mu_t\mu_t$= Error term

The Philip-Perron (PP) test on the other hand was also employed due to its additional advantage over the ADF test as it was adjusted to do away with the assumption that the error terms are serially independent and include serial correlation through the use of the Newey-West (1994).

4. Discussion of Findings

4.1 Descriptive Statistics

Some of the important aspects of descriptive statistics captured in this study include; mean, median, range, and standard deviation, among others. The result is presented in Table 1.

Table 1: Result of the Descriptive Statistics

	GDPR	POGR	POGM	POGF	PODS
Mean	39475.67	2.623146	52.45353	52.90964	154.8061
Median	30745.19	2.664631	52.53119	52.84475	146.5485
Maximum	76684.94	3.074953	55.53444	55.42354	250.2091
Minimum	16048.31	2.092817	50.86043	51.69426	83.52065
Std. Dev.	21407.80	0.224355	1.104539	0.850137	50.86360
Skewness	0.485751	-1.035384	0.683167	0.832507	0.338611
Kurtosis	1.593272	3.894098	3.559707	3.900122	1.855232
Jarque-Bera	5.236503	9.115086	3.906081	6.418626	3.169681
Probability	0.072930	0.010488	0.141842	0.040384	0.204980
Observations	43	43	43	43	43

Source: Authors computation (2026), using Eviews-10

Table 1 presents the descriptive statistics of the variables employed in the study, it provided the preliminary insights into the central tendency, dispersion, distributional characteristics, and normality properties of the variables over the study period. The descriptive statistics reveal substantial differences in the behaviour and distributional properties of the variables employed in the study. GDPR and PODS exhibited relatively high variability, suggesting significant fluctuations in economic growth and demographic concentration over time. In contrast, POGR, POGM, and POGF displayed relatively low standard deviations, indicating greater demographic stability. The skewness and kurtosis statistics further reveal that most variables deviate from perfect normality, with evidence of both leptokurtic and platykurtic distributions. The Jarque-Bera test confirms that POGM, and PODS are approximately normally distributed, while GDPR, POGR and POGF are not normally distributed. The existence of non-normality among some variables suggests the possibility of structural shifts, outliers, or irregular demographic patterns over the study period. Furthermore, the descriptive statistics provide preliminary evidence that demographic variables such as population growth, working-age population, and population density may play important roles in influencing economic growth dynamics in Nigeria.

4.2Unit Root Tests

Table 2: ADF and PP Stationarity Tests

	ADF		PP		
Variable	**At Level**	**At 1st Difference**	**At Level**	**At 1st Difference**	**Order of Integration**
LGDPR		-4.081761***		-3.968633***	I(I)
POGR		-5.461214***		-5.461214***	I(I)
POGM	-3.567749*		-3.592462*		I(0)
POGF	-3.632900***		-2.619851***		I(0)
LPODS	-3.672369**		-3.79670**		I(0)

Note: *, ** and *** significant at 10%,5% and 1% level.

Source: Authors computation (2026), using Eviews-10

The stationarity properties of the variables were examined using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. The results presented a mixed order of integration among the variables included in the study. Specifically, the results indicates that some variables are stationary at level I(0), while others become stationary after first differencing I(1). Both tests produced similar conclusions regarding the stationarity properties of the variables. The ADF and PP unit root test results reveal that log of GDPR and log of POGR are stationary after first differencing and are therefore integrated of order one, I(1), while POGM, POGF, and LPODS are stationary at level and integrated of order zero, I(0). The absence of any I(2) variable confirms the suitability of the ARDL bounds testing framework for examining both the short-run and long-run effects of population structure on economic growth.

4.3 ARDL Bounds Test

After the stationarity state of the variables had been determined, the next procedure is the determination of long-run association between the variables. This involves the use of the bounds approach. Table 3 below shows the long-run association between the variables.

Table 3: Result of ARDL Bounds Tests

F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	**Value**	**Signif.**	**I(0)**	**I(1)**
F-statistic	4.644390	10%	2.37	3.2
K	5	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Source: Authors computation (2026), using Eviews-10

The Autoregressive Distributed Lag (ARDL) Bounds methodology developed by Pesaran, Shin, and Smith (2001) is particularly suitable when variables are integrated of mixed orders, I(0) and I(1), and when the sample size is relatively small. The selected model based on the Akaike Information Criterion (AIC) is ARDL (3, 2, 2, 0), implying that the dependent variable entered the model with three lags, while POGF and POGM entered with two lags each, and LPODS entered without lag. The ARDL Bounds Test was conducted to determine whether a long-run equilibrium relationship exists among the variables. The null hypothesis states that no long-run relationship exists among the variables. Since the computed F-statistic (4.644390) exceeds the upper bound critical value (4.088), the null hypothesis of no long-run relationship is rejected at the 5 percent significance level. This confirms the existence of a long-run equilibrium relationship among GDP per capita growth and population structure in Nigeria.

Table 4: ARDL Long Run and Short Run Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Longrun				
C	10.34445	6.130878	1.687270	0.1023
POGF	-0.765731	0.837674	-0.914115	0.3682
POGM	0.637358	0.807194	0.789597	0.4362
LPODS	1.449371	0.790302	1.833946	0.0769
Shortrun				
D(LGDPR (-1))	0.286762	0.112853	2.541037	0.0167
D(LGDPR(-2))	0.270270	0.107180	2.521642	0.0174
D(POGF)	-2.281722	0.692983	-3.292610	0.0026
D(POGF(-1))	2.770031	0.721949	3.836882	0.0006
D(POGM)	2.031874	0.649624	3.127770	0.0040
D(POGM(-1))	-2.602981	0.672456	-3.870854	0.0006
CointEq(-1)*	-0.358213	0.069684	-5.140523	0.0000
R-squared	0.616515	Mean dependent var		0.038823
Adjusted R-squared	0.546790	S.D. dependent var		0.036554
S.E. of regression	0.024608	Akaike info criterion		-4.413826
Sum squared resid	0.019984	Schwarz criterion		-4.118272
Log likelihood	95.27651	Hannan-Quinn criter.		-4.306963
Durbin-Watson stat	2.320264			

Source: Authors computation (2026), using Eviews-10

The long-run coefficient of POGF is −0.765731 and is statistically insignificant with a probability value of 0.3682. The coefficient of POGM is 0.637358 and is statistically insignificant with a probability value of 0.4362. The coefficient of LPODS is 1.449371 and is statistically significant at the 10 percent level with a probability value of 0.0769. The results further show that the effect of D(POGF) is negative and statistically significant (-2.281722), while its lagged effect is positive and significant (2.770031). The short-run coefficient is positive and significant (2.031874), indicating an immediate contribution to economic growth through increased labour supply and productivity. However, the lagged effect is negative and significant (-2.602981), suggesting that these initial gains may diminish over time. The error correction term (CointEq(-1)) is negative and highly significant, with a coefficient of -0.358213 and a t-statistic of -5.140523. The overall model fit is strong, with an R-squared value of 0.6165 and an adjusted R-squared of 0.5468, indicating that approximately 62 percent of the variation in GDP per capita growth is explained by the model. The Durbin-Watson statistic of 2.32 suggests that there is no evidence of serial correlation, confirming the reliability of the estimates. The relatively low standard error of regression further supports the model's predictive accuracy.

4.4 Result of Granger Causality Test

Table 5: Result of Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
POGR does not Granger Cause GDPR	42	0.10379	0.9017
GDPR does not Granger Cause POGR		0.92303	0.4063
POGM does not Granger Cause GDPR	42	1.27597	0.2912
GDPR does not Granger Cause POGM		0.36942	0.6937
POGF does not Granger Cause GDPR	42	1.65916	0.2041
GDPR does not Granger Cause POGF		0.20043	0.8193
PODS does not Granger Cause GDPR	41	0.09216	0.9122
GDPR does not Granger Cause PODS		3.26568	0.0497

Source: Authors computation (2026), using Eviews-10

Table 5 presents the results of the pairwise Granger causality tests conducted to examine the direction of causality between the various indicators of population structure and economic growth in Nigeria. Specifically, the analysis investigates whether changes in population growth rate (POGR), male population growth (POGM), female population growth (POGF), and old-age dependency ratio (PODS) possess predictive power over real gross domestic product (GDPR), and vice versa. The Pairwise Granger causality test is particularly useful in identifying the direction of influence between variables without necessarily implying true structural causation. The null hypothesis in each case states that one variable does not Granger-cause the other.

The empirical findings reveal that there is no statistically significant causal relationship between population growth rate (POGR) and real gross domestic product (GDPR). The null hypothesis that POGR does not Granger-cause GDPR cannot be rejected, as the computed F-statistic of 0.10379 is associated with a probability value of 0.9017, which exceeds the conventional 5 per cent significance level. Similarly, the reverse hypothesis that GDPR does not Granger-cause POGR also cannot be rejected because the F-statistic of 0.92303 has a probability value of 0.4063. These findings indicate the absence of both unidirectional and bidirectional causality between aggregate population growth and economic growth over the study period. In practical terms, historical changes in Nigeria's population growth rate do not significantly improve the prediction of future economic growth, while fluctuations in economic growth equally do not explain subsequent changes in population growth. This outcome suggests that population growth alone may not constitute a sufficient determinant of economic performance without complementary improvements in productivity, employment, and human capital development.

The results further indicate that male population growth (POGM) does not exhibit a causal relationship with economic growth. The null hypothesis that POGM does not Granger-cause GDPR cannot be rejected since the estimated F-statistic of 1.27597 yields a probability value of 0.2912, which is statistically insignificant. Likewise, the reverse causality from GDPR to POGM is also insignificant, with an F-statistic of 0.36942 and a probability value of 0.6937. The absence of causality in either direction implies that variations in the male component of the population have not independently influenced Nigeria's economic growth trajectory, nor has economic growth significantly altered male population dynamics during the period under investigation. This finding may reflect the reality that economic growth depends more on the productive utilization and quality of the labour force than on changes in the size of a particular demographic subgroup.

Similarly, the pairwise Granger causality results show no evidence of causality between female population growth (POGF) and real gross domestic product (GDPR). The null hypothesis that POGF does not Granger-cause GDPR cannot be rejected because the F-statistic of 1.65916 corresponds to a probability value of 0.2041, which exceeds the 5 per cent level of significance. In the opposite direction, GDPR also fails to Granger-cause POGF, as indicated by an F-statistic of 0.20043 and a probability value of 0.8193. The lack of causal interaction suggests that changes in the female population have not independently generated measurable changes in aggregate economic growth. Likewise, improvements in economic performance have not significantly influenced female population growth. This result should not be interpreted as evidence that women make insignificant contributions to economic development. Rather, it suggests that changes in the size of the female population alone are insufficient to predict economic growth without considering critical factors such as female labour force participation, educational attainment, health status, and economic empowerment.

The most notable finding emerges from the relationship between the old-age dependency ratio (PODS) and real gross domestic product (GDPR). The null hypothesis that PODS does not Granger-cause GDPR cannot be rejected because the estimated F-statistic of 0.09216 is associated with a probability value of 0.9122, indicating that changes in the old-age dependency ratio do not significantly predict future economic growth. However, the reverse null hypothesis that GDPR does not Granger-cause PODS is rejected at the 5 per cent significance level. The computed F-statistic of 3.26568 with a corresponding probability value of 0.0497 indicates a statistically significant unidirectional causal relationship running from economic growth to the old-age dependency ratio.

The existence of unidirectional causality from economic growth to the old-age dependency ratio suggests that improvements in Nigeria's economic performance precede and help explain subsequent changes in demographic dependency among older persons. One plausible explanation is that sustained economic growth contributes to improvements in healthcare services, nutrition, sanitation, and living standards, which increase life expectancy and consequently expand the proportion of elderly individuals within the population. Economic expansion may also strengthen public health systems and social protection programmes, thereby reducing mortality among older adults and altering the age composition of the population over time. Consequently, demographic ageing appears to be influenced more by improvements in economic conditions than by demographic changes acting as a driver of short-run economic growth.

4.5Discussion of Findings of the Study

The ARDL Error Correction Model (ECM) estimated for this study examines the short-run dynamics and long-run adjustment process between real GDP per capita growth (LRGDP) and selected demographic variables in Nigeria over the period 1981–2025. The model, specified as ARDL(3,2,2,0), was estimated using 40 observations under Case 2 (restricted constant and no deterministic trend). The results provide strong evidence of a stable dynamic relationship between economic growth and demographic structure, as reflected in both the short-run coefficients and the statistically significant error correction term.

The error correction term (CointEq(-1)) is negative and highly significant, with a coefficient of -0.358213 and a t-statistic of -5.140523. This indicates the existence of a valid long-run equilibrium relationship among the variables and confirms that deviations from equilibrium are corrected over time. Economically, the coefficient implies that approximately 35.8 percent of any short-run disequilibrium in GDP per capita growth is adjusted annually. This suggests a moderate speed of adjustment, meaning that the system returns to its long-run equilibrium path within roughly three years following a shock. The result further implies that while the Nigerian economy is stable in the long run, short-run disturbances in demographic structure or economic performance may persist for a period before full adjustment occurs.

The short-run dynamics reveal significant persistence in economic growth. The lagged coefficients of GDP per capita growth, D(LRGDP(-1)) and D(LRGDP(-2)), are both positive and statistically significant, with values of 0.286762 and 0.270270 respectively. This indicates strong growth inertia, suggesting that past economic performance has a reinforcing effect on current growth. In other words, economic growth in Nigeria exhibits path dependence, where positive growth momentum tends to continue over time. This persistence reflects adaptive expectations and structural continuity in the economy.

The results further show that the female working-age population (POGF) exerts a dynamic and asymmetric effect on economic growth. The contemporaneous effect of D(POGF) is negative and statistically significant (-2.281722), while its lagged effect is positive and significant (2.770031). This suggests that in the short run, increases in female labour force participation may impose adjustment costs on the economy, possibly due to labour market frictions, skill mismatches, or institutional constraints. However, in the subsequent period, the effect becomes strongly positive, indicating that female labour contributes positively to economic growth once integration into the productive structure is achieved. This finding highlights the delayed but growth-enhancing role of female labour participation in the economy.

Similarly, the male working-age population (POGM) exhibits an asymmetric effect on growth. The short-run coefficient is positive and significant (2.031874), indicating an immediate contribution to economic growth through increased labour supply and productivity. However, the lagged effect is negative and significant (-2.602981), suggesting that these initial gains may diminish over time. This pattern may reflect diminishing marginal returns to labour, labour market saturation, or structural inefficiencies in absorbing additional male labour into productive employment. Together, these results suggest that labour quantity alone is insufficient to sustain long-term growth without corresponding improvements in productivity and capital formation.

5. Conclusions and Recommendations

This study examined the relationship between population dynamics and economic growth in Nigeria using annual time-series data covering the period 1981–2025. Specifically, the study investigated the effects of population growth rate, working-age male population, working-age female population, and population density on real GDP per capita growth. The empirical findings generated several important insights regarding the demographic-economic nexus in Nigeria. The findings indicate that demographic variables exert dynamic and lagged effects on economic growth, reflecting the complex interactions between population structure and macroeconomic performance. The results further demonstrate strong persistence in economic growth and suggest that population density possesses growth-enhancing potential, although infrastructural and structural limitations may constrain its effectiveness.

Based on the empirical findings of the study, the following policy recommendations are proposed:

The positive but unstable effects of the working-age population highlight the need for sustained employment generation. Government should prioritize industrialization, agricultural modernization, digital economy development, and support for small and medium enterprises to create productive jobs capable of absorbing the expanding labour force.

Since population density positively influences economic growth, government should develop policies that maximize the benefits of urban agglomeration. Investments in transportation networks, housing, public utilities, and digital infrastructure should be expanded to improve productivity in densely populated areas while minimizing congestion costs.

Population policies should be closely aligned with national development strategies. Long-term economic planning should incorporate demographic projections to ensure adequate provision of education, healthcare, housing, employment opportunities, and social infrastructure for a growing population. As economic growth continues to attract population concentration, urban planning authorities should strengthen land-use regulation, transportation management, environmental sustainability programmes, and public service delivery systems to maximize the growth-enhancing effects of population density.

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