Demographic Transition and Economic Growth in Nigeria: An Empirical Investigation

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ABSTRACT

This study examines the impact of demographic transition on Nigeria's economic growth from 1981 to 2021 using the ARDL model and Granger causality tests. It finds a strong long-run relationship between demographic structure and GDP per capita, confirmed by an F-statistic of 9.16, which exceeds the 1% significance critical bounds. Long-run results show that a 1% increase in the child population leads to a 23.76% rise in GDP per capita, while a 1% rise in the working-age population results in a 6.30% increase, both reinforcing the demographic dividend hypothesis. However, a 1% increase in the aged population causes a 0.1118% decline in GDP per capita. In the short run, only life expectancy significantly influences growth. Causality analysis reveals a bidirectional relationship between the aged population and economic growth, while child and working-age populations have unidirectional causal effects on growth. The study concludes that strategic investment in education, healthcare, and inclusive economic policies is essential to harness Nigeria's demographic potential for sustainable growth.

Keywords: Demographic transition, demographic dividend, ARDL, Granger causality, JEL Classification: J11, O47, C22

INTRODUCTION

Nigeria, Africa's most populous country, is projected to exceed 400 million people by 2050, becoming the third most populous nation globally (United Nations, 2015). With a population growth rate of 3.2% and fertility exceeding five children per woman, demographic pressures are mounting (World Bank, 2021). Over 40% of the population is under 15 years, indicating a youthful structure with significant economic implications (NPC, 2019). Since independence, persistently high fertility and mortality rates have constrained development (Omotosho et al., 2017). Population growth from 96 million in 1990 to over 207 million in 2020 has strained infrastructure and services, worsening urban insecurity, unemployment, and poverty (Abbas & Abubakar, 2021; Okeke et al., 2019). These pressures intensified with the 2016 recession and the COVID-19 pandemic (Nwosu et al., 2020; Asogwa et al., 2019).

Despite these challenges, Nigeria is undergoing a demographic transition, shifting from high to lower fertility and mortality altering its age structure. A rising share of working-age individuals relative to dependents offers a "demographic dividend": a potential boost in economic productivity (Bloom et al., 2003; Mason et al., 2009). However, this potential is contingent on investments in education, health, and employment (Bloom & Canning, 2004). Empirical studies confirm the growth-enhancing role of a productive age structure (Asogwa et al., 2019; Abbas & Abubakar, 2021), though others stress that benefits depend on institutional and policy readiness (Peterson et al., 2017). The Nigerian context presents both opportunity and risk.

Therefore, this study examines the economic impact of Nigeria's demographic transition by addressing two objectives: (i) identifying which population cohort (children, working-age, or elderly) most significantly influences economic growth, and (ii) determining the existence of a long-term relationship between demographic structure and growth. The findings will inform development strategies for harnessing Nigeria's demographic potential

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Demographic Structure and Real GDP Profile in Nigeria

Understanding the interplay between demographic structure and economic performance is vital for assessing how Nigeria's population dynamics affect economic growth. The demographic structure typically categorises the population into three broad age groups: children (0–14 years), the working-age or independent population (15–64 years), and the elderly (65 years and above). The working-age population represents the labour force that drives productive activity in an economy, while children and the elderly are classified as dependents.

Figure 1. 1: Dependent and Independent Population in Nigeria (1960-2021)

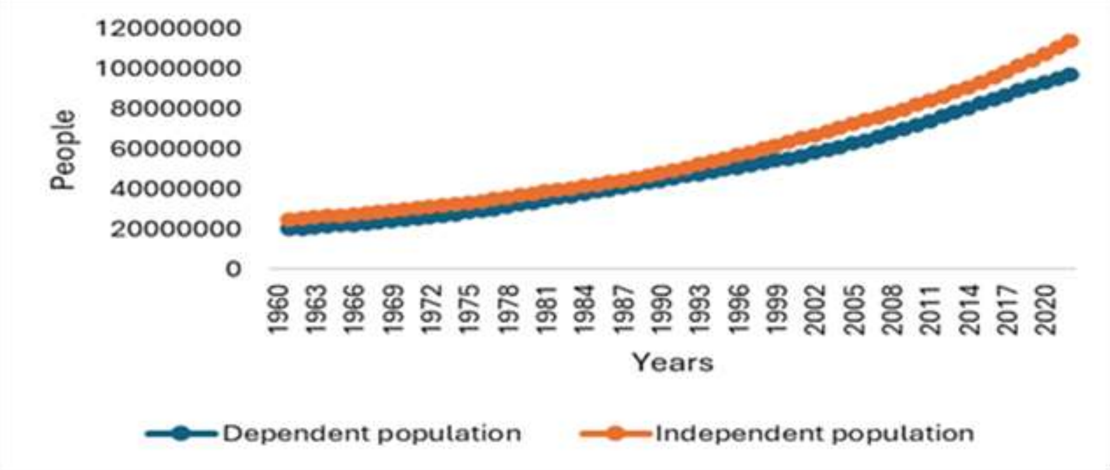
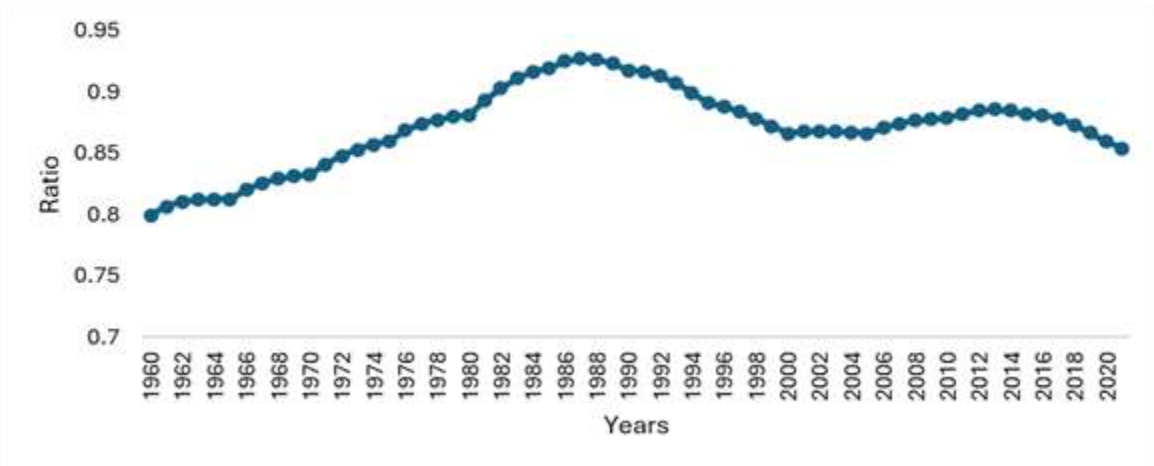


Figure 1.1 illustrates the trends in Nigeria's dependent and independent populations from 1960 to 2021. The data reveal that the labour force population consistently exceeds both the children and elderly groups individually and even collectively across the period. This indicates that, demographically, Nigeria is favourably positioned with a larger working-age population relative to dependents, a condition often referred to as the demographic dividend (Bloom et al., 2003; Lee & Mason, 2014). From a macroeconomic standpoint, when the independent population outnumbers dependents, there is less pressure on the labour force to support non-working individuals, theoretically enabling increased savings, investment, and economic growth (Mason, 2005; UNDESA, 2022). Conversely, when the dependent population outweighs the working-age group, the labour force is stretched thin, affecting productivity and public resource allocation.

Figure 1.2: Age Dependency Ratio in Nigeria (1960-2021)



The age dependency ratio, defined as the ratio of dependents (0–14 and 65+) to the working-age population (15–64), serves as an indicator of the economic burden borne by the productive segment of the population. A ratio below one suggests that the labour force can support the dependent population with relatively less strain. Figure 1.2 reveals that Nigeria's dependency ratio remained consistently high, averaging above 84% throughout the study period. The highest recorded ratio was 91% in 1992, indicating a substantial burden on

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the labour force during that year. Although the ratio decreased slightly in subsequent years falling to around 87% between 2000 and 2005, it remained elevated, averaging approximately 85% by 2021. Despite having a numerically superior labour force, the persistently high dependency ratio indicates that the dependent population still places considerable pressure on Nigeria's economic resources. This highlights the need for policies that enhance productivity, particularly through human capital development.

Figure 1. 2: Total Male and Female Population in Nigeria (1960-2021)

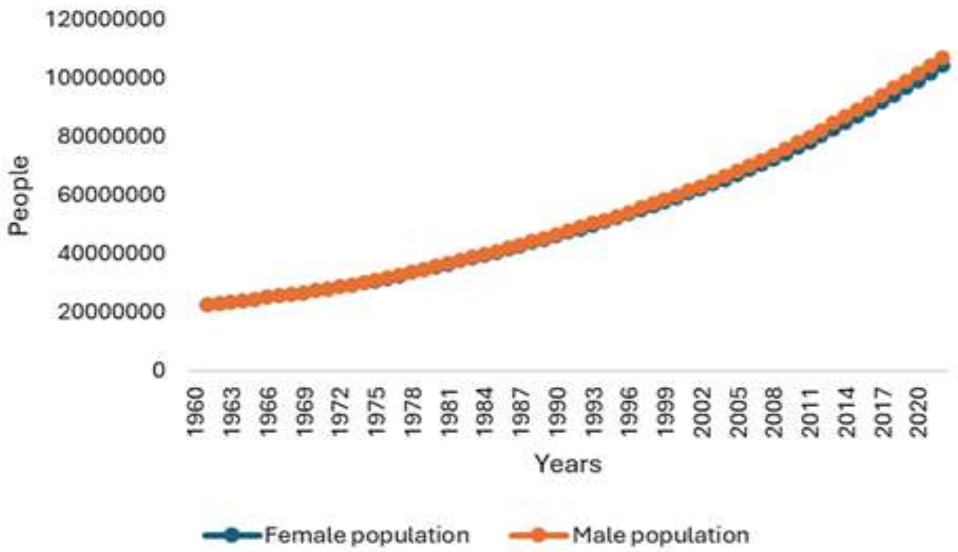


Figure 1.3 displays the total male and female population over the same period. The figure shows a near-equal growth trend for both genders, with the male population marginally higher throughout the timeframe. While demographic transitions are often gender-neutral in aggregate terms, gender-specific disparities in labour force participation, education, and health outcomes can influence how demographic changes affect economic growth (World Bank, 2019). The nearly symmetrical trends suggest demographic balance, but further disaggregated analysis would be required to assess gender-specific economic participation and its implications for national growth strategies.

Figure 1.3; Trend of Real GDP of Nigeria (1960-2021)

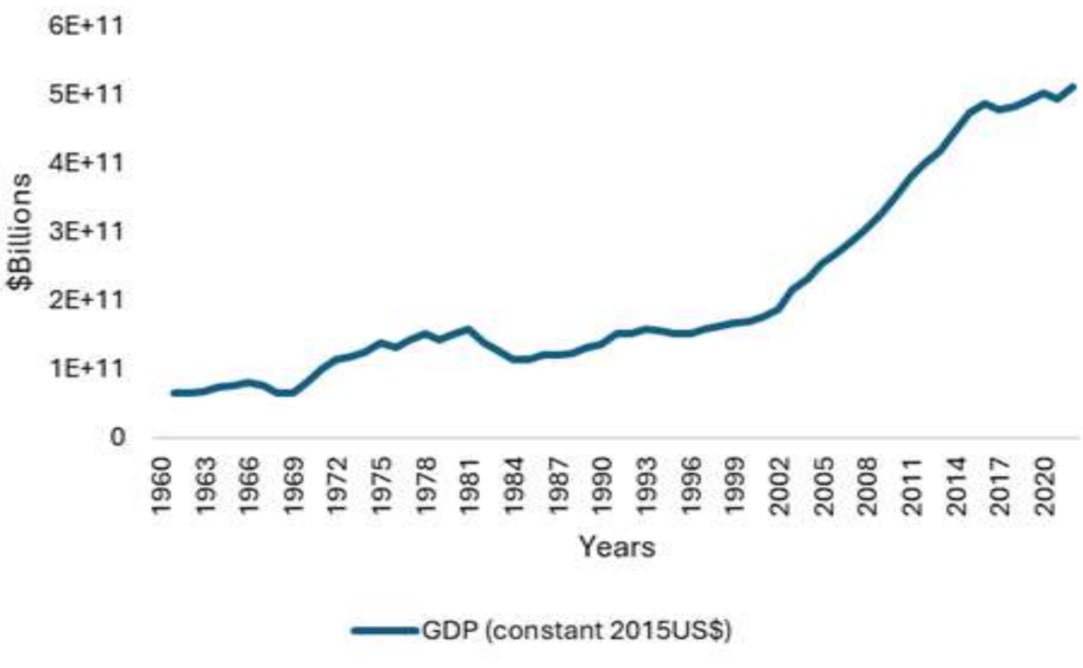
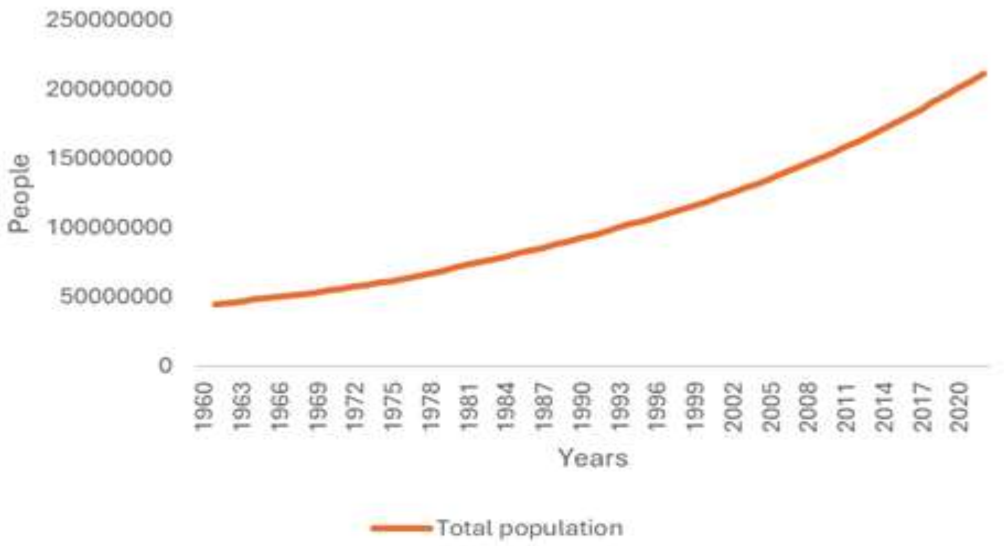


Figure 1.4: Trend of Demographic Transition of Nigeria (1960-2021)



Understanding Nigeria's real GDP and population dynamics, Economic growth, proxied by real Gross Domestic Product (GDP), has shown a generally upward trend over the decades, albeit with some downturns. Figure 1.4 shows that Nigeria's real GDP increased steadily from 1960, with notable declines such as the 2016 recession. In Figure 1.5 overlay this economic trend with demographic structure, revealing that as the population increased, real GDP also grew, suggesting a positive association between population growth and economic output. The simultaneous rise in both GDP and total population implies that Nigeria may be experiencing scale effects from population growth. However, this positive relationship does not automatically indicate causation. The quality of labour, educational attainment, and employment generation play pivotal roles in translating demographic advantages into tangible economic outcomes (Barro, 1991; AfDB, 2021).

LITERATURE REVIEW

This study anchors its investigation on four interrelated theories: the Demographic Transition Theory, Human Capital Theory, the Demographic Dividend Hypothesis, and the Solow Growth Model. Together, these frameworks provide a robust foundation for understanding the dynamic interaction between demographic shifts and economic growth in the context of developing economies like Nigeria.

Theoretical review

Demographic Transition Theory

The Demographic Transition Theory (DTT) provides the foundational framework for understanding changes in population structure over time. First articulated by Notestein (1945), the theory posits that societies transition from a regime of high fertility and mortality to one characterized by low fertility and mortality, driven by improvements in public health, education, and socioeconomic conditions. This transition alters the age structure of the population, initially increasing the youth dependency ratio, followed by a rise in the working-age population. For Nigeria, the demographic transition is currently characterized by a large and youthful population, with declining mortality but persistent high fertility rates (Akinlo & Salisu, 2019). While this offers the potential for an expanded labour force, it also poses risks of unemployment and underinvestment if not matched by institutional reforms and economic planning.

Human Capital Theory

The Human Capital Theory, advanced by Schultz (1961) and Becker (1964), posits that the accumulation of skills, education, and health among individuals significantly raises productivity and economic output. Within the context of demographic change, falling fertility allows households and governments to invest more resources per child, enhancing the quality of human capital. This is particularly pertinent to Nigeria, where demographic transition creates an opportunity to shift focus from quantity to quality in human capital investments. However, inadequate infrastructure, poor educational outcomes, and weak healthcare systems can hinder the realization of these gains (Kelley & Schmidt, 2005). Without substantial investment in human capital, the economic benefits of demographic change may remain elusive.

Demographic Dividend Hypothesis

The Demographic Dividend Hypothesis, formalized by Bloom, Canning, and Sevilla (2003), extends the implications of demographic transition by arguing that a bulge in the working-age population relative to dependents can yield a temporary boost in economic growth. This dividend arises through multiple channels: increased labour supply, higher savings rates, and more productive investments in human capital. However, the dividend is not automatic. It is contingent on supportive policies, including labour market reforms, macroeconomic stability, educational improvements, and gender-inclusive development (Salihu & Tsauni, 2018). In Nigeria, the potential for a demographic dividend exists, but capturing it depends critically on institutional preparedness and policy coherence.

Solow Growth Model

The Solow Growth Model, developed by Solow (1956), provides a neoclassical framework for understanding long-run economic growth as a function of capital accumulation, labour force growth, and technological progress. The model assumes diminishing returns to capital and labour but underscores the role of exogenous technological progress in sustaining per capita income growth. Demographic transition influences the Solow model through its impact on labour force dynamics and savings. A larger working-age population can lead to increased output if savings and investment rates rise accordingly. However, in the absence of productivity-enhancing investments and technological adoption, the growth impact may be limited (Barro & Sala-i-Martin, 2004). Nigeria's demographic shift, if accompanied by structural transformation and innovation, could thus stimulate capital deepening and long-run growth in line with Solowian predictions.

Empirical review

Empirical research examining the relationship between demographic transition and economic growth in Nigeria and Sub-Saharan Africa has evolved significantly, relying on a variety of econometric techniques and data frameworks to capture both the static and dynamic dimensions of this nexus.

Akinlo and Salisu (2019) applied the Autoregressive Distributed Lag (ARDL) bounds testing approach to analyse the long-run relationship between demographic indicators such as fertility rate, age dependency ratio, and life expectancy and economic growth in Nigeria from 1960 to 2017. The ARDL technique was deemed appropriate due to the mix of I(0) and I(1) variables and the small sample size. Their findings indicated that declining fertility and increasing life expectancy significantly promoted long-run economic growth, supporting the demographic dividend hypothesis. However, they acknowledged that these positive effects were conditional on institutional and labour market responsiveness.

Similarly, Salihu and Tsauni (2018) utilized nonlinear time series regression to assess the impact of demographic transition on Nigeria's economic growth between 1980 and 2015. They introduced quadratic forms of the age dependency ratio and total fertility rate to account for threshold effects and diminishing returns. Their empirical results revealed a positive but nonlinear relationship, whereby demographic changes enhanced growth up to a point, beyond which the effects became neutral or negative. This methodological innovation highlighted the risk of over-reliance on demographic variables without commensurate investment in employment and education infrastructure.

Yusuf and Abdullahi (2020) adopted a Johansen co-integration framework and Vector Error Correction Model (VECM) to examine both long-run equilibrium and short-run dynamics between demographic factors and real GDP per capita in Nigeria. Their study incorporated life expectancy, crude birth rate, and age dependency ratio as proxies for demographic transition. The co-integration results confirmed the existence of a long-run relationship, while the VECM estimates showed that shocks in demographic variables corrected themselves slowly over time. The authors emphasized the mediating role of human capital development, recommending increased investment in health and education to harness demographic dividends.

In a more regional approach, Udoh and Akpan (2017) employed fixed effects and random effects panel regression models to analyse data from 20 Sub-Saharan African countries, including Nigeria, over 1990–2016. Their study included demographic transition indicators (life expectancy and dependency ratios) and interacted them with education expenditure to assess conditional effects. Methodologically, their use of interaction terms allowed them to measure how human capital modulates the growth impact of demographic transition. Their results confirmed that demographic transition alone does not guarantee economic growth unless accompanied by robust investments in human capital and institutional quality.

Olayemi and Oyelami (2021) adopted a panel threshold regression model to study the nonlinearity in the demographic dividend-growth relationship across West African countries. Using data from 1985 to 2018, their methodological innovation allowed them to identify critical thresholds in youth dependency beyond which the positive growth effects of demographic transition diminished. Their findings revealed that demographic transition yielded growth dividends only in countries that surpassed certain thresholds of educational attainment and employment absorption capacity. Nigeria, according to their analysis, lagged in harnessing the full benefits due to rising urban unemployment and declining quality of public education.

Several international studies have extended the demographic transition-growth debate to ageing populations and their macroeconomic consequences. Bloom et al. (2010) forecasted declining macroeconomic growth as a result of an aging population, a trend confirmed by Lindh and Malmberg (2016) who discovered that an aged population had a significant negative effect on the growth rate of real GDP per capita in a panel of OECD and 15 EU countries. Using Scotland as a case study, Lisenkova et al. (2012) found that ageing would negatively impact output productivity between 2006 and 2016. Cardoso et al. (2011) applied OLS, Fixed Effects, and GMM methodologies to Portuguese data from 1986 to 2008 and reported that an ageing population adversely affected productivity and wages. Further empirical confirmations of negative ageing effects come from China, where Hu et al. (2012), Sun and Liu (2014), and Loumrhari (2014) documented declines in economic growth due to ageing populations. Park and Shine (2012), studying 12 Asian economies, predicted a substantial decline in regional growth attributed to ageing, coining the term 'demographic tax' to describe the phenomenon.

Despite these predominantly negative findings, some studies identified neutral or positive effects of ageing on economic performance. Li and Zhang (2015), using Solow's growth model, found a positive impact of ageing on China’s per capita GDP from 1978 to 2012. Li et al. (2012) also discovered that ageing populations in Chinese provinces encouraged savings and investment, which could foster economic growth. Similarly, Göbel and Zwick (2012) used GMM on German manufacturing and service sector data (1997–2005) and found no significant effect of a 55–60-year-old demographic on productivity. Hajamini (2015), with a cross-country panel of 81 nations over 50 years, found a linear but weak and contradictory relationship between 'old dependency' ratios and per capita GDP. Uddin et al. (2016) found a negative relationship between dependency ratios and GDP growth in Australia, while Walder and Döring (2012) argued that aging populations reduce overall consumption, thereby suppressing growth.

In Africa, studies reveal nuanced demographic-growth dynamics. Wako (2012) found a long-run negative relationship between per capita income and population growth in Ethiopia but a positive link with worker growth, with bidirectional causality. Brunow and Hirte (2006) discovered that population age structure positively influenced regional GDP per capita growth in Germany, with labor force ages 45–74 outperforming younger cohorts. Soyibo et al. (2010) noted Nigeria’s significant demographic potential but identified unemployment and low human capital as key barriers to harnessing demographic dividends. Tartous, Dauda, and Peter (2015) found positive relationships between economic growth and population, fertility, and exports, but negative relationships with life expectancy and crude death rates in Nigeria.

Wogonin and Phiromswad (2017) highlighted differences in demographic impacts between developed and developing countries: middle-aged workforce shares positively affected growth in developed economies via institutions and education, while increased senior populations had negative effects. In developing countries, a higher share of young workers was negatively associated with growth due to limited investment and financial development. In Nigeria, Ngwudiobu et al. (2016) showed inverse relationships between fertility, mortality, net migration, and economic growth, while Nwosu et al. (2014) reported one-way causality from population growth to economic growth. Akokuwebe and Okunola (2015) and Adenola and Saibu (2017) emphasised demographic dividends' potential for rural development, though their study found the population-growth relationship with economic growth to be positive but statistically insignificant.

More recently, Forouheshfar et al. (2020) found that faster demographic transition correlates with higher GDP per capita, and Jakob et al. (2020) confirmed fertility transition as a key driver of per capita income growth. Rizk (2018) demonstrated that increases in working-age populations have a stronger positive impact on economic growth than gross savings in emerging economies. Ultimately, the demographic-economic growth relationship is often reciprocal. The increase in working-age population share the "support ratio" generates the "first demographic dividend," which has been documented extensively in emerging Asia (Bloom & Williamson, 1998; Lee et al., 2000). Mason and Lee (2006, 2007) proposed a "second demographic dividend," through which population ageing encourages the accumulation of human and physical capital. In summary, while the demographic transition presents clear growth opportunities, the benefits are contingent on investments in human capital, health, employment, and institutional frameworks.

Theoretical Framework

From the theoretical review above, this study is grounded in the Demographic Transition Theory (DTT) and the Solow Growth Model, providing a framework to analyse the effects of demographic changes on economic growth. The Demographic transition theory posits that economic growth is influenced by changes in population structure as countries progress from high to low fertility and mortality rates (Notestein, 1945; Kirk, 1996). The theory emphasizes the "demographic dividend," whereby an increasing working-age population relative to dependents can enhance savings, investment, and labour supply, thereby fostering growth (Bloom & Williamson, 1998; Lee & Mason, 2011). Empirical applications of DTT highlight both positive and negative growth impacts, depending on demographic context and policy environment (Bloom et al., 2010; Li et al., 2012; Soyibo et al., 2010). As for the Solow Growth Model, it attributes long-run economic growth to capital accumulation, labour force growth, and technological progress (Solow, 1956). Trade liberalization facilitates technology transfer and market efficiency, while financial development improves capital mobilization and allocation (Dollar & Kraay, 2004; Levine, 2005). Integrating demographic factors into the Solow framework, studies have assessed how changes in labour supply and capital deepening jointly affect productivity and growth (Cardoso et al., 2011; Hu et al., 2012), examining how demographic transition interacts with trade and financial sector reforms to shape economic growth trajectories.

DATA AND METHODOLOGY

Data

This study investigates the impact of demographic transition on economic growth in Nigeria over the period 1981–2021. The study relies exclusively on secondary data sourced from the World Development Indicators (WDI) published by the World Bank. Demographic transition is proxied using the disaggregation of the population into three age cohorts: the dependent population (children aged 0–14 years and the elderly aged 65 and above) and the working-age population (15–64 years). This disaggregation allows for a nuanced examination of the differential impact of age structure on economic growth. The model is specified within the framework of a standard growth regression augmented to include demographic indicators:

$$GDPPC_t = \beta_0 + \beta^1 DEM_t + \beta^2 ECO_t + \varepsilon_t$$

Where $GDPPC_t$ denotes real GDP per capita, used as a proxy for economic growth at time t; DEM_t represents demographic variables, including the fertility rate, working-age population share, youth dependency ratio, and old-age dependency ratio; ECO_t denotes control variables related to economic factors such as gross fixed capital formation (investment proxy), life expectancy, and human capital indicators; β_0 is the intercept; β_1, β_2 are the coefficients of demographic and economic variables respectively, ε_t is the stochastic error term.

Estimation Technique

Given the time series nature of the dataset and potential for mixed stationarity properties, the Autoregressive Distributed Lag (ARDL) bounds testing approach is employed. This approach, proposed by Pesaran et al. (2001), is suitable for small-sample estimation and allows for a mix of I(0) and I(1) regressors, but not I(2). To ensure the reliability of regression results, unit root tests are performed using both ADF and PP procedures. These tests assess whether each variable is stationary at level [I(0)] or requires differencing to achieve stationarity [I(1)]. Based on the null hypothesis that the variable has a unit root (H_0: $\alpha = 1$). The test is implemented with trend and intercept components as appropriate. Alternatively, a non-parametric alternative to ADF corrects for serial correlation and heteroscedasticity in the error term, was also used.

EMPIRICAL ANALYSIS AND INTERPRETATION OF RESULTS

Descriptive Statistics

Table 4. 1: Descriptive Statistics of Variables

	LGDPPC	LGFCF	LLABF	LLEXP	LADPT	FERT	LYDPT
Mean	3.263133	10.76635	7.819592	1.68568	6.612154	6.088301	7.442654
Median	3.226652	10.75629	7.826963	1.667546	6.54811	6.083	7.717467
Maximum	3.429472	11.03841	8.032034	1.740505	8.056968	6.779	7.943475
Minimum	3.142557	10.59353	7.600375	1.659317	6.326404	5.248	1.737821
Std. Dev.	0.105648	0.093116	0.131209	0.028634	0.349891	0.443187	1.31318
Skewness	0.323114	0.48411	-0.10085	0.730491	3.437786	-0.14423	-4.1308
Kurtosis	1.437801	3.426105	1.744779	1.926286	14.71025	2.083108	18.24251
Jarque-Bera	4.882545	1.911652	2.761111	5.615852	315.0227	1.578321	513.5049
Probability	0.08705	0.384494	0.251439	0.06033	0	0.454226	0
Sum	133.7884	441.4203	320.6033	69.1129	271.0983	249.6203	305.1488
Sum Sq. Dev.	0.446462	0.34682	0.68863	0.032797	4.896938	7.856578	68.97763
Observations	41	41	41	41	41	41	41

Source: Authors' compilation using EViews 10

The model includes variables such as the Log of gross domestic product per capita (LGDPPC), Log of gross fixed capital formation (LGFCF), Fertility rate (FERT), Log of life expectancy (LLEXP), Log of young population (LYDPT), Log of working age population (LLABF), and Log of aged population (LADPT). The mean values for all variables are positive, indicating an increasing trend, with LLABF (working-age population) having the highest mean, suggesting Nigeria's dependency ratio is less than 1, which could foster economic growth. Most variables show low to moderate deviation from their mean. FERT, LLABF, and LYDPT exhibit negative skewness, while the others have positive skewness. LGDPPC, FERT, LLABF, and LLEXP are platykurtic (kurtosis < 3), whereas LGFCF, LADPT, and LYDPT are leptokurtic (kurtosis > 3). Jarque-Bera statistics indicate that LADPT and LYDPT are not normally distributed.

Unit Root Test

This study applies the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to assess stationarity of

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macroeconomic variables. The ADF test finds most variables stationary at first difference [I(1)], except fertility rate, log of gross fixed capital formation, and log of life expectancy, which are stationary at level [I(0)]. The PP test indicates only log gross fixed capital formation is stationary at level, with others mostly I(1), except fertility rate. Overall, variables exhibit mixed integration orders [I(0) and I(1)], supporting the use of the ARDL Bounds test for long-run analysis. Notably, LGDPPC, LGFCF, and ADPT are I(1), FERT and LGFCF are I(0), while LLABF and LYDPT remain non-stationary at both levels and first difference.

Table 4. 2: Unit Root Test Results

	Augmented Dickey-Fuller (ADF)			Phillips Peron (PP)		
	Level	1st difference	I(d)	Level	1st difference	I(d)
LGDPPC	-	-3.52976**	I (1)	-	-3.52976**	I (1)
LLEXP	-3.52976**	-	I (0)	-	-	-
FERT	-3.52976**	-	I (0)	-	-	-
LGFCF	-4.205*	-3.5366**	I (0) / I (1)	-4.205*	-4.21187*	I (0) / I (1)
LLABF	-	-4.21187*	I (1)	-	-4.21187*	I (1)
LADPT	-	-4.21187*	I (1)	-	-4.21187*	I (1)
LYDPT	-	-4.21187*	I (1)	-	-4.21187*	I (1)

Source: Author’s Computation from Eviews10

Note: *, ** and *** represent statistical significance at 1%, 5% and 10% level respectively.

I (0) and I (1) indicate stationarity at level and first difference, respectively.

ARDL Bounds Test Approach to Cointegration

Following the unit root test results, a cointegration test is carried out using the ARDL Bounds Test approach. This is because this technique accommodates the series that are integrated of different orders [(I (0) and I (1)], unlike the Engle-Granger and Johansen Cointegration test, which accommodate only series that are stationary at first difference [I (1)]. It tests the null hypothesis of no long-run relationship, where the decision rule is that the null hypothesis is rejected should the value of the computed F-statistic exceed the upper bound and not rejected should it fall below the lower bound. However, the Bounds test will be inconclusive should the computed F-statistic fall between the lower and upper bounds.

Table 4. 3: ARDL Bounds test

Test statistic	Value	K
F- statistic	9.155241	6
Critical Value Bounds		
Significance	I (0) Bound	I (1) Bound
10%	2.53	3.59
5%	2.87	4
2.50%	3.19	4.38
1%	3.6	4.9

Source: Author’s compilation using EViews 10

Accordingly, Table 4.3 presents the result of the ARDL Bounds test and reveals that the computed F-statistic (9.16) is greater than the higher bound at 1%, 2.5%, 5% and 10%. Therefore, we reject the null hypothesis that no long-run relationship exists and conclude that there is a long-run relationship among the variables. Hence, it is needful to proceed to estimating the short-run and long-run ARDL model. Null hypothesis: No long-run relationship exists

Table 4. 3: ARDL Short-run Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LGDPPC(-1)	0.180443	0.19214	0.939123	0.3579
LGDPPC(-2)	-0.236567	0.150262	-1.574366	0.1297
LADPT	-0.118078	2.850331	-0.041426	0.9673
FERT	-0.096387	1.874731	-0.051414	0.9595
FERT(-1)	4.009928	4.000633	1.002324	0.3271
FERT(-2)	-3.967725	2.713074	-1.462447	0.1578
LGFCF	0.069449	0.055254	1.256909	0.222
LLABF	-2.99501	10.63846	-0.281527	0.7809
LLABF(-1)	-10.50578	5.770022	-1.820752	0.0823
LLABF(-2)	20.15368	9.38466	2.147513	0.043
LLEXP	35.30517	10.89202	3.241381	0.0037
LLEXP(-1)	-36.40215	10.69609	-3.403314	0.0026
LYDPT	0.01716	0.469945	0.036516	0.9712
LYDPT(-1)	0.121434	0.098506	1.232756	0.2307
LYDPT(-2)	24.9568	8.505071	2.934344	0.0077
C	-233.0529	96.15447	-2.423734	0.024
@TREND	-0.339232	0.136623	-2.482978	0.0211
R-squared	0.995305	Mean dependent var		3.264288
Adjusted R-squared	0.99189	S.D. dependent var		0.108157
S.E. of regression	0.00974	Akaike info criterion		-6.12581
Sum squared resid	0.002087	Schwarz criterion		-5.40067
Log likelihood	136.4533	Hannan-Quinn criter.		-5.86564
F-statistic	291.4601	Durbin-Watson stat		2.364231
Prob(F-statistic)	0			

Source: Author's compilation using EViews 10

The short-run model for GDP per capita demonstrates high explanatory power ($R^2 = 0.995$, adjusted $R^2 = 0.99$) and overall significance (F-statistic = 291.46, p=0.000), with no autocorrelation (Durbin-Watson = 2.36). While the constant term is negative (-233.05), fertility rate (-0.096), log of aged population (-0.118), and log of working-age population (-2.995) negatively impact GDP per capita. Conversely, log of Gross Fixed Capital Formation (0.0694), log of Life Expectancy (35.305), and log of Young Population (0.017) show positive effects. Only the log of Life Expectancy is statistically significant, strongly explaining GDP per capita. The inverse relationship with the aged population aligns with theoretical expectations and previous studies, highlighting their economic burden. Interestingly, the young population shows a positive, though insignificant, relationship, possibly reflecting their informal economic contributions in Nigeria due to poverty. The negative and insignificant effect of the working-age population may be due to low labor quality and the economy's limited absorptive capacity. Life expectancy positively and significantly impacts growth, as a healthier populace is more productive. Fertility rate shows a negative and insignificant relationship, indicating strain on resources and increased dependency. Gross fixed capital formation has a positive and significant relationship, underscoring the importance of investment for Nigeria's economic growth.

Table 4. 4: ARDL Long Run Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LADPT	-0.1118	2.702446	-0.04137	0.9674
FERT	-0.0513	0.43045	-0.11919	0.9062
LGFCF	0.065758	0.048722	1.349671	0.1908
LLABF	6.299348	7.895218	0.797869	0.4335
LLEXP	-1.03868	1.506347	-0.68954	0.4977
LYDPT	23.76179	6.742674	3.524089	0.0019

Source: Author’s compilation using EViews 10

In the long run, the ARDL model estimates show a strong positive effect of child population on economic growth, with a 1% increase in child population leading to an approximate 23.76% rise in GDP per capita. This is contrary to theoretical expectations but reflects Nigeria's socioeconomic reality where children contribute to informal economic activities, and this long-run impact is more significant than in the short run. Conversely, the aged population negatively affects long-run economic growth; a 1% increase results in a 0.1118% decline in GDP per capita, which is consistent with theory and stronger than the short-run effect, as a growing dependent population reduces demographic dividends. The working-age population positively and significantly impacts long-run growth, with a 1% increase boosting GDP per capita by about 6.30%, affirming its role in sustaining economic growth and demographic dividends in Nigeria. The fertility rate maintains a negative and insignificant relationship with long-run growth, as high fertility can strain resources and reduce the skilled labor force. Life expectancy, surprisingly, shows a negative and insignificant long-run effect on Nigeria's economic growth, possibly due to poor healthcare quality and widespread poverty hindering productivity gains. Lastly, gross fixed capital formation has a positive and significant long-run effect, with a 1% increase leading to a 0.07% rise in GDP per capita, underscoring the critical role of investment in Nigeria's sustained economic growth.

Table 4. 5: Granger Causality Test

Null Hypothesis:	Observation	F-Statistic	Prob.	Remark
LADPT does not Granger-cause LGDPPC	39	2.21287	0.1249	Accepted
LGDPPC does not Granger Cause LADPT		0.53526	0.5904	Accepted
FERT does not Granger Cause LGDPPC	39	2.82213	0.0735	Rejected
LGDPPC does not Granger Cause FERT		3.29776	0.0491	Rejected
LGFCF does not Granger Cause LGDPPC	39	2.17954	0.1286	Accepted
LGDPPC does not Granger Cause LGFCF		8.13377	0.0013	Rejected
LLABF does not Granger Cause LGDPPC	39	2.64759	0.0854	Rejected
LGDPPC does not Granger Cause LLABF		0.47517	0.6258	Accepted

LLEXP does not Granger Cause LGDPPC	39	4.92744	0.0132	Rejected
LGDPPC does not Granger Cause LLEXP		3.49078	0.0418	Rejected
LYDPT does not Granger Cause LGDPPC	39	2.48831	0.0981	Rejected
LGDPPC does not Granger Cause LYDPT		0.59472	0.5574	Accepted
FERT does not Granger Cause LADPT	39	6.49907	0.0041	Rejected
LADPT does not Granger Cause FERT		858.937	8.00E-30	Accepted
LGFCF does not Granger Cause LADPT	39	0.47936	0.6233	Accepted
LADPT does not Granger Cause LGFCF		10.832	0.0002	Rejected
LLABF does not Granger Cause LADPT	39	0.71529	0.4963	Accepted
LADPT does not Granger Cause LLABF		0.67212	0.5173	Accepted
LLEXP does not Granger Cause LADPT	39	2.0172	0.1486	Accepted
LADPT does not Granger Cause LLEXP		388.656	4.00E-24	Accepted
LYDPT does not Granger Cause LADPT	39	0.00236	0.9976	Accepted
LADPT does not Granger Cause LYDPT		0.00188	0.9981	Accepted
LGFCF does not Granger Cause FERT	39	1.33672	0.2762	Accepted
FERT does not Granger Cause LGFCF		10.7838	0.0002	Rejected
LLABF does not Granger Cause FERT	39	890.008	4.00E-30	Accepted
FERT does not Granger Cause LLABF		4.13871	0.0246	Rejected
LLEXP does not Granger Cause FERT	39	2.89961	0.0688	Rejected
FERT does not Granger Cause LLEXP		2.2934	0.1163	Accepted
LYDPT does not Granger Cause FERT	39	1595.83	2.00E-34	Accepted
FERT does not Granger Cause LYDPT		4.47966	0.0188	Rejected
LLABF does not Granger Cause LGFCF	39	10.5867	0.0003	Rejected
LGFCF does not Granger Cause LLABF		0.59253	0.5585	Accepted
LLEXP does not Granger Cause LGFCF	39	7.26401	0.0024	Rejected
LGFCF does not Granger Cause LLEXP		3.33009	0.0478	Rejected
LYDPT does not Granger Cause LGFCF	39	10.6051	0.0003	Rejected
LGFCF does not Granger Cause LYDPT		0.46207	0.6339	Accepted
LLEXP does not Granger Cause LLABF	39	1.69868	0.1981	Accepted
LLABF does not Granger Cause LLEXP		376.914	6.00E-24	Accepted
LYDPT does not Granger Cause LLABF	39	0.16619	0.8476	Accepted
LLABF does not Granger Cause LYDPT		0.33505	0.7176	Accepted
LYDPT does not Granger Cause LLEXP	39	388.404	4.00E-24	Accepted
LLEXP does not Granger Cause LYDPT		1.95603	0.157	Accepted

Source: Author’s compilation using EViews 10

The Granger-causality test results are presented in Table 4.6. Accordingly, the results show that there is a bidirectional relationship between the aged population and economic growth in Nigeria, indicating that the aged population influences economic growth and vice versa. On the other hand, the working age population, gross fixed capital formation and young population have a unidirectional causal relationship with economic growth in Nigeria. The nature of the relationship suggests causality runs from the working age population, gross fixed capital formation and young population to economic growth. In sum, these results give further credence to the results of the estimated ARDL model.

SUMMARY AND CONCLUSION

Summary of findings

This study, using the ARDL model, examined the relationship between demographic transition and economic growth in Nigeria from 1981 to 2021. The short-run model indicates that life expectancy significantly influences GDP per capita, while other demographic and economic variables like labor force, young population, aged population, fertility rate, and gross fixed capital formation are statistically insignificant. The model exhibits a strong fit, with an R^2 of 0.995 and an adjusted R^2 of 0.991, explaining over 99% of GDP per capita variation. A long-run relationship between demographic variables and economic growth in Nigeria is confirmed by the bounds test. In the long run, the aged population negatively impacts economic growth, while the labor force and young population have a positive impact, which is more pronounced over the long term compared to the short term. These findings suggest Nigeria is in a pre-demographic dividend phase, characterized by high fertility rates and a youthful population, with a gradually declining dependency ratio. The study emphasizes that the working-age population (15–64 years) has the greatest potential for economic growth. A growing labor force can increase output and savings, crucial for investment and productivity. However, the current suboptimal education, skills, and health of the workforce hinder the potential demographic dividend. Strategic investments in human capital development, particularly in education and healthcare, are crucial for Nigeria to unlock the growth-enhancing effects of its demographic structure. While demographic transition has contributed to economic growth by expanding the labor force, lowering dependency ratios, and changing consumption patterns, rapid population growth without improvements in human capital quality and resource planning may worsen inequality and poverty. Nigeria's success in achieving a demographic dividend hinge on forward-looking policies addressing the education, employment, and health needs of its growing working-age population.

Limitations of the study

This study acknowledges limitations, such as reliance on World Bank WDI data and the absence of certain robustness tests. It also suggests a deeper discussion of findings that contradict existing literature and a broader scope of variables for a more holistic understanding. These limitations are not weaknesses but guides for future research to enhance data precision, diversify methodological approaches, critically evaluate divergent findings, and broaden analytical scope, thereby building upon this study's contributions to understanding demographic-economic linkages in Nigeria.

CONCLUSION, POLICY IMPLICATIONS AND RECOMMENDATIONS

This study explores the impact of demographic transition on economic growth in Nigeria, motivated by persistent poverty and unemployment. Using the ARDL modelling approach, it finds that demographic factors, including the aged population, child population, labour force, fertility rate, life expectancy, and gross fixed capital formation, significantly shape economic growth dynamics. The study concludes that demographic transition is a key driver of economic performance, with a bidirectional relationship between the aged population and growth, unidirectional causality from the labour force to GDP per capita, and a growth-induced rise in investment.

The findings imply that Nigeria’s ageing population slows economic growth due to reduced productivity, suggesting the need for policies that integrate the elderly into productive activities and ensure adequate social support. Conversely, the positive contributions of the child population and labour force underline the importance of human capital development. Enhancing education and healthcare systems is vital for improving labour productivity and harnessing demographic potential. In addition, poverty reduction and inclusive economic policies can raise household incomes and stimulate aggregate demand. Infrastructure development especially in transport, energy, and digital connectivity will further support economic activities and regional integration. Finally, political stability and strong institutions are essential for attracting long-term investment and ensuring efficient resource allocation. In summary, the study recommends that Nigeria adopt forward-looking policies focused on human capital development, poverty alleviation, infrastructure investment, and institutional reform to mitigate demographic pressures and capitalize on its demographic dividend for inclusive and sustained growth.

Declarations

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Ethical approval: Not applicable

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