



Moderating role of population growth rate on remittance-growth nexus in Nigeria

Afamefuna Angus EZE^{1✉} 
Stephen Okechukwu ANYAMADU²
Emmanuel CHINANUIFE³
Chiedozie ESOMNOFU⁴
Esther Chioma Anakwue⁵




(✉ Corresponding Author)

^{1,2}Department of Economics, University of Nigeria, Nsukka, Nigeria.
¹Email: angus.eze@unn.edu.ng
²Email: stephenanya@gmail.com
³Department of Economics, Topfaith University, Mkpatak, Akwa Ibom. Nigeria.
³Email: chinanuifeemma@gmail.com
⁴Department of Economics, Nwafor Orizu College of Education, Anambra State, Nigeria.
⁴Email: esomnofuchiedozie@gmail.com
⁵Airforce Institute of Technology, Kaduna, Nigeria.
⁵Email: anakwuee@gmail.com

Abstract

There has been debate about whether the population growth rate and remittance impacts are beneficial or detrimental to economic growth and whether population growth has any moderating role in the remittance-growth nexus. The purpose of this study is to empirically investigate the moderating role of population growth in the remittance-growth nexus, as well as to evaluate the direction of causality between these elements. The Autoregressive Distributed Lag (ARDL) model and the Granger causality test were employed to analyze the study's objectives. The analysis used data from the World Bank's World Development Indicators for the years 1990-2022. The findings of this study reveal that both population growth and remittances have a positive and significant impact on economic growth in the long run, whereas the population growth rate negatively and significantly moderates the impact of remittances on economic growth in the long run but is insignificant in the short run. The Granger causality test demonstrates unidirectional causation flowing from population expansion to economic growth. It consequently proposes that the government and individuals who receive these remittances invest them in more productive sectors such as health, education, and training so that they have a positive impact on the country's economic progress.

Keywords: ARDL technique, economic growth, population growth, remittances, ECM, Granger causality.

Citation | EZE, A. A., ANYAMADU, S. O., CHINANUIFE, E., ESOMNOFU, C., & Anakwue, E. C. (2025). Moderating role of population growth rate on remittance-growth nexus in Nigeria. *Economy*, 12(2), 130–138. 10.20448/economy.v12i2.7422
History:
Received: 8 August 2025
Revised: 27 August 2025
Accepted: 4 September 2025
Published: 16 September 2025
Licensed: This work is licensed under a [Creative Commons Attribution 4.0 License](#) 
Publisher: Asian Online Journal Publishing Group

Funding: This study received no specific financial support.
Institutional Review Board Statement: Not applicable.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Data Availability Statement: The corresponding author may provide study data upon reasonable request.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

Contents

1. Introduction	131
2. Literature Review	132
3. Methodology	132
4. Presentation of Results and Findings	134
5. Discussion of Findings	135
6. Conclusion and Recommendation	136
References	137

Contribution of this paper to the literature

This study contributes to the existing literature by examining the interaction between population growth and remittances on economic growth in Nigeria. It aims to determine whether increasing population significantly moderates the impact of international remittances on Nigeria's economic growth.

1. Introduction

Economic growth and sustainability serve as key indicators of a nation’s overall development and prosperity. They involve the increase of gross product and the overall advancement of the standard of living of its citizens (Hossain, 2019; Korsah, 2022). Economic sustainability, therefore, is one of the major objectives of any government, encompassing advancements in infrastructure, technology, education, and social well-being (Odhiambo, 2019). Its great importance causes the government to employ different strategies to boost its economy while ensuring sustainability in other sectors, such as reducing poverty, creating employment opportunities, and enhancing the quality of life. A major economic indicator used in measuring economic growth is the Real GDP (RGDP). Over the past decades, it has seen an accelerating increase from \$12.55 billion in 1970 to \$440.84 billion in 2021 (World Bank, 2022). This sustained growth is likely associated with factors such as increased productivity, investments, population dynamics, and overall economic expansion (Asiamah, Ofori, & Afful, 2019).

The global population has seen a consistent increase attributed to growing populations in various countries; however, this population growth rate varies across regions and countries, with developing nations experiencing more significant increases compared to developed nations. Nigeria, in particular, has witnessed a significant surge in population, initially having a population of just 45.2 million people as of 1960, tripling the figure to over 200 million Nigerians within the last 56 years, with a projection of 262,580,426 in the year 2030, thereby positioning Nigeria as the third most populous country globally (World Bank, 2022). This divergence introduces a dimension of global inequality, with implications for international trade, migration patterns, remittances, and the distribution of resources. A larger population can contribute to increased labor supply and consumer demand, potentially fostering economic growth (Peterson, 2017). However, rapid population growth can also cause limitations in resource allocation, infrastructure, and social services, potentially hindering economic progress (Headey & Hodge, 2009). The third school of thought holds that population increase is a neutral component in economic growth that is determined outside of typical growth models. Thus, even with declining returns to the population in the production of consumer goods, zero population growth is not required for a long-term rise in per capita consumption.

Nigeria faces challenges in managing its population dynamics and harnessing the potential benefits of its demographic dividend. Remittances, defined as the transfer of funds by migrant workers to their home countries, have been recognized as a significant contributor to economic growth, particularly in developing economies (Abdulai, 2023; Jackman, Moore, & Craigwell, 2011; Ratha, 2003). Remittances can stimulate domestic consumption, investment, and access to education and healthcare, thereby fostering economic development (Fayissa & Nsiah, 2010; Ratha, Mohapatra, & Silwal, 2011). In Nigeria, remittances have been a crucial source of external financing, with inflows reaching \$19.2 billion in 2021, accounting for 3.8% of the country's GDP (World Bank, 2022), which increased to \$19.5 billion in 2023, making remittances the second-largest source of foreign exchange and international inflows (Alechenu, 2021).

Remittances are garnering increased attention due to substantial outflows to developing nations, both in terms of volume and their impact on recipient economies. Between 2010 and 2017, remittances to Sub-Saharan Africa increased by 9.6%, reaching approximately US \$33 billion, while overall growth in developing countries was 26.2%. According to the World Bank's "Migration and Development Brief 35" (see Figure 1), the top ten remittance recipients in SSA in 2021 are Nigeria, Ghana, Kenya, Senegal, Zimbabwe, Democratic Republic of the Congo, Uganda, Mali, South Africa, and The Gambia, with the highest and lowest receiving US\$19.2 billion and US\$0.7 billion, respectively. Ghana and Mali had remittance inflows exceeding 5% of GDP, Zimbabwe and Senegal exceeded 10%, and The Gambia surpassed 20% (World Bank, 2022).

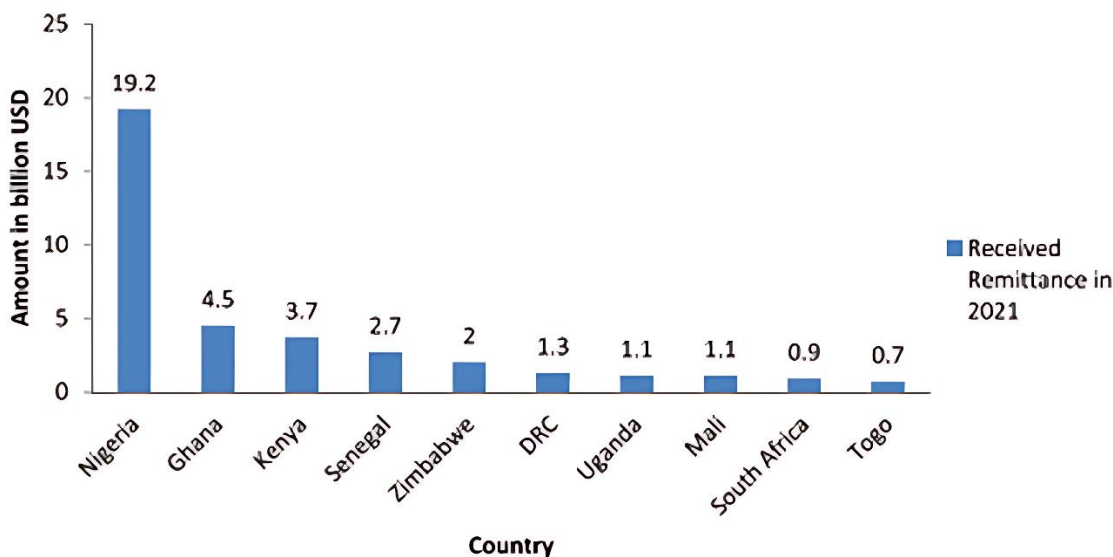


Figure 1. 10 top remittance receiving countries in Sub-Saharan Africa.
Source: World Bank (2022).

The interplay between population growth, remittances, and economic growth has been the subject of ongoing research and debate. Studies have explored the potential moderating effects of population growth on the remittance-economic growth relationship, with varying findings across different contexts. For instance, Jayaraman, Choong,

and Chand (2016) found that population growth strengthened the positive impact of remittances on economic growth in Pacific Island countries, while Azam (2015) reported a negative moderating effect in high-remittance countries. However, there has not been any study on the moderating role of population growth rate on remittances-growth nexus in Nigeria.

2. Literature Review

The theoretical framework of this study is hinged on the Neo-classical theory view of the impact of population dynamics and foreign remittances on economic growth. It emphasizes market forces leading to an analysis of how households allocate remittances based on local market conditions and the availability of goods and services. Furthermore, the theory suggests that remittances are used as investments in human capital, contributing to education, healthcare, and skill development, ultimately enhancing productivity and economic growth. Neoclassical economics also highlights the role of savings in capital formation and long-term economic growth, prompting an examination of how remittances influence household savings behavior and contribute to capital within communities. Additionally, the impact of remittances on labor market dynamics is explored, considering how increased resources may affect wage rates, employment patterns, and overall labor market structure, thereby influencing economic growth.

2.1. Review on Population Growth, Remittances and Economic Growth in Nigeria

There are several studies on either the impact of population growth on economic growth or the impact of remittances on economic growth, or both, but not on the moderating role of population growth on the remittances-growth nexus in Nigeria. However, their findings are quite inconclusive. While some studies found positive and significant impacts of population growth and remittances on economic growth, others found negative and significant impacts, whereas some had mixed findings. This section will be partitioned in this manner for coherence purposes.

First, studies that found a positive and significant correlation between population growth and economic growth, as well as remittances and economic growth, using different estimation techniques and variable proxies include (Adeseye, 2021; Efuntade & Efuntade, 2020; Kudaisi, Ojeyinka, & Osinubi, 2022; Kuhe, 2019; Muhammad, Özdeşer, & Adedeji, 2024; Ogbaro, Sanni, Adeoye, Akintaro, & Eseyin, 2023; Osei-Gyebi, Opoku, Lipede, & Kountchou, 2023; Ribadu, 2023). Second, studies that found a negative and significant correlation between population growth and economic growth and remittances and economic growth in Nigeria are: Okorie, Nwabufoh, and Oriaku (2022); Ogbaro et al. (2023); Raphael, Peter, and Kenneth (2024); Adeleye, Ologunwa, and Ogunjobi (2021); Oyegoke and Ebele (2023), and Effiong (2022). Other studies had mixed findings of either a positive and significant impact of population growth on economic growth or remittances on economic growth in the short run or in the long run and vice versa. Such studies include Didia and Tahir (2022), who found that remittances hurt economic growth in the short run while having no impact in the long run. Similarly, studies by Omoniyi and Owoeye (2024) shows that remittance inflow has an insignificant negative impact on economic growth in the short run; however, in the long run, remittance inflows have a significant impact on the GDP growth rate. Others include Oyegoke and Ebele (2023) and Didia and Tahir (2022).

2.2. Review on Population Growth, Remittance and Economic Growth Outside Nigeria

Similarly, research on the impact of remittances and population expansion on economic growth has produced conflicting results, depending on the methodology and scope used. Several studies, including Islam (2022), Bucevska (2022), Kajtazi and Fetai (2022), Depken, Nikšić Radić, and Paleka (2021), Sghaier (2021), Mohamed Aslam and Alibuhitto (2023), Gninigüè and Ali (2021), Dutta and Saikia (2024), Imran, Wu, Yu, Zhong, and Moon (2021), and Ramanayake and Wijetunga (2018), discovered a positive and significant impact of remittances on economic growth. However, several studies have revealed that remittances can have a negative and considerable impact on economic growth. These studies include Nyasha and Odhiambo (2022); Siifa, Teniola, and Zayyad (2023); Abdulai (2023), and Qutb (2022). Furthermore, other research showed contradictory findings, particularly when interacting with other macro factors. For example, Ur Rehman and Hysa (2021) discovered that remittances and financial development had a good impact on economic growth in Western Balkan nations (WBC), but when remittances were combined with financial development, they had a large and negative effect on economic growth. Some studies had mixed results when different approaches were used. Golder, Rumaly, Hossain, and Nigar (2023) employed both linear and non-linear ARDL models and concluded that remittances had a positive and negative impact on Bangladesh's economic growth, respectively. Similarly, Odugbesan, Sunday, and Olowu (2021) discovered that both financial development and economic growth in MINT countries stimulate economic growth positively when panel linear ARDL was used, but that both positive and negative shocks in financial development increase economic growth, while a positive and negative shock in remittance increases economic growth in the long run when panel Non ARDL was used. Furthermore, Yadeta and Hunegnaw (2022) discovered that remittances have a negative short-run influence on economic growth in Ethiopia, but a positive long-run effect. The study also discovered unidirectional causality between remittances and economic growth. In contrast, studies by Abdulai (2023) show that remittances have a long-term association with Ghana's economic growth but have a negative impact when combined with unemployment.

3. Methodology

3.1. Theoretical Framework

The theoretical framework of this study is based on the Neo-classical theory regarding the impact of population dynamics and foreign remittances on economic growth. It emphasizes market forces, leading to an analysis of how households allocate remittances based on local market conditions and the availability of goods and services. Furthermore, the theory suggests that remittances are used as investments in human capital, contributing to education, healthcare, and skill development, ultimately enhancing productivity and economic growth. Neoclassical economics also highlights the role of savings in capital formation and long-term economic growth, prompting an examination of how remittances influence household savings behavior and contribute to capital within communities.

3.2. Model Specification

The section covers the many statistical tools and packages used for data analysis. First, we performed a statistical descriptive analysis of the components. Second, the study used the Augmented Dickey-Fuller (ADF) test to determine stationarity for all series. After determining that there were no unit roots, the bound cointegration test was employed to evaluate the series' cointegration. The bound F-statistic was used to compare the null hypothesis of no level cointegration to the alternative of level cointegration. If the computed F-statistic exceeds the upper bound's critical F-statistic, we reject the null hypothesis and accept the alternative that the series have long-term cointegration. Once the long-term link between the series has been confirmed, we can estimate the conditional ARDL long-run model. Our empirical model takes the following functional form.

$$LRGDP = F(POPR, NM, LGFCF, LREM, L(REM * POPR)) \quad (1)$$

Where;

LRGDP = Log of real gross domestic product (Proxy for economic growth).

POPR = Population growth rate.

NM = Net migration.

LGFCF = Log of gross fixed capital formation.

LREM = Log of remittances.

L(rem*popr) = Log of the interactive term of remittances and population growth rate.

The following is a linear form of Equation 1, which can be expressed as:

$$LRGDPT = \theta_0 + \theta_1 POPR_t + \theta_2 NM_t + \theta_3 LGFCF_t + \theta_4 LREM_t + \theta_5 L(REM * POPR)_t + \omega_t \quad (2)$$

Because it can handle various levels of integration, the ARDL model is used. It also appears to be more effective than traditional cointegration models, such as the Phillips-Ouliaris test, the Johansen test, and the Engle-Granger method (Engle & Granger, 1987). This is because it can simultaneously estimate both the short-run and long-run estimates (Isik, 2013). Last but not least, adding lags to the model also solves the endogeneity issue (Amin, Shahbaz, & Mahalik, 2020; Menegaki, 2019; Sam, Nyongesa, & Ouma, 2019). It also yields trustworthy results for small sample sizes (Wang, Ali, Khan, Tiwari, & Bhat, 2021). The following describes the Autoregressive Distributed Lag model that needs to be estimated:

$$\Delta LRGDP = \alpha_0 + \sum_{i=1}^p \phi_i \Delta LRGDP_{t-i} + \sum_{i=0}^p \theta_i \Delta POPR_{t-i} + \sum_{i=0}^p \mu_i \Delta NM_{t-i} + \sum_{i=0}^p \phi_i \Delta LGFCF_{t-i} + \sum_{i=0}^p \psi_i \Delta LREM_{t-i} + \sum_{i=0}^p \omega_i \Delta L(REM * POPR)_{t-i} + \delta_1 POPR_{t-1} + \delta_2 NM_{t-1} + \delta_3 LGFCF_{t-1} + \delta_4 REM_{t-1} + \delta_5 (REM * POPR)_{t-1} + \varpi_t \quad (3)$$

Where;

Δ = first difference operator.

The parameters $\alpha_1 - \alpha_5$ = Short-run relationship parameters.

The parameters $\beta_1 - \beta_5$ = Long-run relationship parameters.

(t - i) = Lagged term on respective variables.

$\sum \varpi_i$ = Summation operator and error term of the equation.

Where:

L(REM*POPR), POPR, NM, LGFCF, LREM and t remains as defined in equation 3 above.

ε_t = The random, error, or stochastic term.

θ_0 = Intercept term or constant parameter.

$\theta_1, \theta_2, \theta_3, \theta_4$, and θ_5 = The regression parameters and slopes of the respective explanatory variables.

3.3. Justification of Variables

3.3.1. Real Gross Domestic Product (RGDP)

Real GDP is a measure that looks at the rate at which all goods and services are produced in a country for a given year, accounting for inflation. According to economic theory, the expansion of the workforce, market size, and consumption habits are only a few of the ways that population growth can impact economic growth.

3.3.2. Population Growth Rate (POPR)

The average annual rate of change in population size during a given time period is known as population growth. One of the main factors influencing economic growth is population expansion. According to Orji, Ogbuabor, Iwuagwu, and Anthony-Orji (2020), a higher population growth rate may result in stronger demand for products and services, consumption, and labour force involvement, all of which could have a beneficial impact on economic growth.

3.3.3. Remittances Received (REM)

Personal remittances refer to the amount of money sent home by individuals abroad. They may serve different purposes, either in the form of financial support to family or as an investment, in which the remitter could fall back on. Remittances play a crucial role in many developing economies, contributing to poverty alleviation, consumption, and investment, thereby stimulating economic growth.

3.3.4. Net Migration Rate (NM)

The difference between the number of immigrants (those entering a country) and emigrants (those departing) per 1,000 inhabitants is known as the net migration rate. Economic development, labor markets, remittance patterns, and population dynamics can all be strongly impacted by migration trends.

3.3.5. Gross Fixed Capital Formation (GFCF)

This is a stand-in for investment; it is the sum of changes in stocks (inventory) and fixed asset values. Future profits are the reason for investing. Over time, Nigeria's GFCF as a percentage of RGDP has been erratic.

4. Presentation of Results and Findings

4.1. Descriptive Statistics of the Variables

The data set used for this study will be described in this section using two major approaches: the tabular statistical measures, which showcase the central tendency and dispersion of the variables through mean, median, mode, variance, and standard deviation; and the graphical approach, which displays the movement of trends over time.

Table 1. Descriptive statistics of the variables.

Variables	LRGDP	LREM	LGFCF	LEXCHR	L(REM*POPR)	INF	NM	POPR
Mean	31.3	21.4	29.8	4.30	22.4	19.8	-0.28	2.63
Median	31.3	22.5	29.7	4.85	23.5	12.9	-0.29	2.62
Maximum	32.0	23.9	30.1	6.05	24.8	72.8	-0.17	2.80
Minimum	30.5	14.7	29.4	1.39	15.7	5.39	-0.51	2.41
Std. Dev.	0.51	2.82	0.17	1.35	2.83	17.4	0.09	0.10
Skewness	0.05	-0.97	-0.20	-0.71	-0.97	1.74	-0.42	-0.17
Kurtosis	1.39	2.80	2.41	2.26	2.88	4.71	2.50	2.16
Jarque-Bera	3.91	5.71	0.75	3.82	5.70	22.5	1.44	1.22
Probability	0.14	0.06	0.69	0.15	0.06	0.00	0.49	0.54
Sum	1125	770	107	155	805	713	-10.1	94.7
Sum Sq. Dev.	8.97	279	1.03	64.1	280	106	0.26	0.38
Observations	36	36	36	36	36	36	36	36

Table 1 shows the statistical description of the data based on its face value information only without any manipulation or in-depth analysis. That is to say, the table displays the measures of cluster, dispersion, and variability of the variables under consideration. From the results above, the mean value of logged remittance and population growth rate the major dependent variables for this study are 21.38985 and 2.631667, respectively. The mean indicates the average values or anticipated observations of the variables in question over the course of the study in Nigeria. In terms of their individual mean values, this interpretation is comparable to that of other variables. The range is the difference between the data set's maximum and minimum values. The table does not imply that there are any outliers in the data set, according to mathematical understanding. Additionally, the standard deviations show that there are some variances in the variables and that around two of the variables in the data set are favorably skewed.

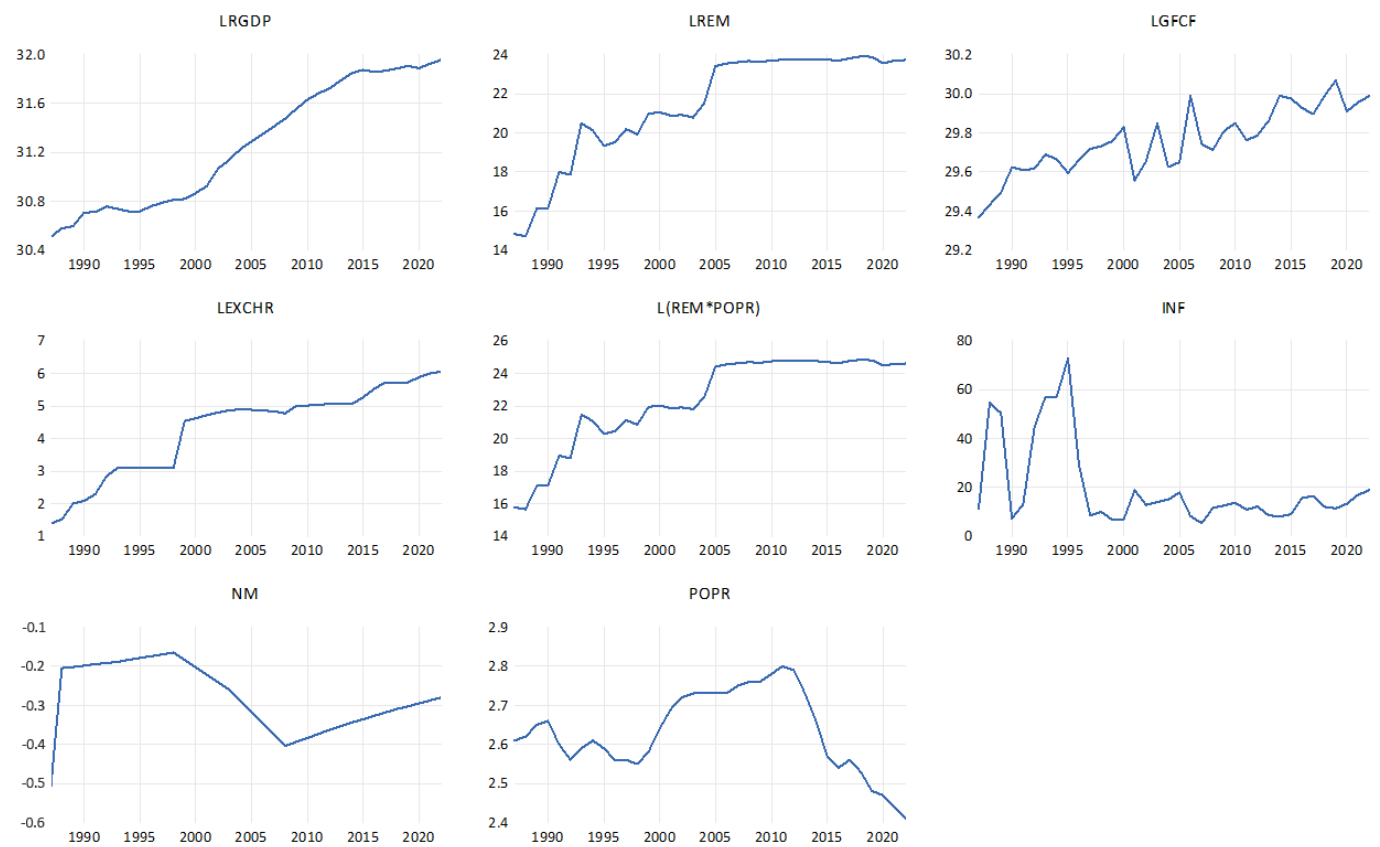


Figure 2. Descriptive graph of the variables.

Source: Author's computation using e-views.

Figure 2 illustrates multiple line graphs displaying various data trends over this study time span. The log of Gross Domestic Product and Exchange Rate shows a generally upward trend, while Log of Gross Capital Formation, Remittance Received, and Inflation Rate exhibit more volatile or fluctuating patterns. Net Migration and Population Growth Rate also display sharp peaks or dips at certain points in time.

4.2. Pre-Estimation Test Results

Pre-estimation tests are usually prerequisites for any econometric analysis because they help to avoid the occurrence of spurious regression results. Regarding this, the two major pre-estimation tests listed below were employed in this study:

- i. Stationarity/Unit Root Test.

ii. Cointegration Test.

Table 2. Unit root result.

Variables	ADF t-stat @ levels	ADF 5% critical @ levels	ADF t-stat @ 1st difference	ADF 5% critical @ 1st difference	Order of integration	Decision
INF	-3.48	-3.54	-6.01	-3.55	I (1)	Stationary
L(REM*POPR)	-2.59	-2.95	-6.68	-2.95	I (1)	Stationary
LEXCHR	-2.11	-3.54	-5.79	-3.56	I (1)	Stationary
LGFCF	-5.95	-3.55			I (0)	Stationary
LREM	-2.57	-2.95	-6.70	-2.95	I (1)	Stationary
LRGDP	-2.93	-3.56	-3.74	-3.55	I (1)	Stationary
NM	0.11	-3.55	-20.0	-3.55	I (1)	Stationary
POPR	-1.15	-3.55	-4.02	-3.55	I (1)	Stationary

Source: Author’s estimation using e-views.

Table 2 shows that the variables are stationary and lack a unit root, according to the ADF's unit root test results. In particular, the other variables became stationary after the first difference, but LGFCF remains stable at level. This most likely suggests both co-integration and a dynamic interplay between the variables. Pesaran, Shin, and Smith (2001) state that an admixture of orders of co-integration or stationarity is one of the fundamental requirements for the estimation of an ARDL model. Therefore, the above result's observation of the order of stationarity meets the need for conducting an ARDL model in this study.

Table 3. Bounds test for co-integration result.

Test Statistic	Value	Signif.	I(0)	I(1)	Result
F-statistic	5.50	10%	2.08	3	Co-integrated
		5%	2.39	3.38	
		2.5%	2.7	3.73	
		1%	3.06	4.15	

Source: Author’s estimation using e-views.

Table 3 shows that at 5% level of significance, the F-statistic is greater than both the upper and lower bounds; therefore, we conclude that there is a long-run relationship among the variables.

4.3. Empirical Analysis

Table 4. Long-run regression result.

Dependent Variable: LRGDP				
Variable	Coefficient	Std. Error	T-Statistic	Prob. Value
POPR	20.9	6.43	3.26	0.02
NM	-0.36	2.02	-0.18	0.86
LREM	3.84	1.51	2.55	0.05
LGFCF	2.16	0.61	3.53	0.02
L(REM*POPR)	-0.83	0.24	-3.51	0.02
C	-3.62	15.1	-0.24	0.82
R-squared	0.10		F-statistic	696.
Adjusted R-squared	1.00		Prob (F-statistic)	0.0000
Durbin-Watson stat	2.08			

Table 5. Short run and ECM regression result.

Variable	Coefficient	Std. Error	T-statistic	Prob. Value
D(POPR)	4.77	2.55	1.87	0.12
D(NM)	-0.45	2.23	-0.20	0.85
D(LREM)	0.56	0.31	1.82	0.13
D(LGFCF)	-0.36	0.16	-2.25	0.07
D(L(REM*POPR))	-0.22	0.12	-1.84	0.13
ECM(-1)	-0.55	0.08	7.36	0.00

Source: Author’s estimation using e-views.

5. Discussion of Findings

This study empirically explored the moderating function of population growth rate in remittances received and its impact on Nigeria's economic growth. According to the long-run results in Table 4, the coefficient of the log of the interacting term for population growth rate and remittances (LREM*POPR) is -0.83, which is statistically significant at the 5% level. This indicates that, all other variables being equal, a 1% increase in the interaction term leads to approximately an 83% decrease in the country's economic growth, and this result is statistically significant. This demonstrates that an increase in the population growth rate has a negative moderating effect on remittances received, which in turn negatively influences the country's economy. The findings have two major implications: first, the remittances received may not be invested in productive sectors such as health, education, and training; second, the country's high population may be overwhelming the inflow of remittances due to the unproductive nature of the majority of the population. Additionally, the study found that excessive consumption and investment in unproductive sectors of transferred money are negatively associated with economic progress. This finding is consistent with prior investigations by Nyasha and Odhiambo (2022) and Chowdhury, Dhar, and Gazi (2023). Other variables, such as population growth rate, remittances, and gross fixed capital formation, all had a positive and considerable long-term impact on economic growth. These findings conform to previous studies like Obere, Thuku, and Gachanja (2013);

Loiboo, Luvanda, and Osoro (2021); Bucevska (2022) Islam (2022); Saha (2021); Ur Rehman and Hysa (2021); Abdulai (2023) and Yadeta and Hunegnaw (2022). Also, the net migration showed a negative and insignificant impact on economic growth both in the short run and long run.

Table 5 presents the short-run results of the moderating role of population growth on the remittance-growth nexus in Nigeria. It shows that population growth negatively moderates the relationship between remittances and economic growth, though it is statistically insignificant.

With a negative sign, the parameter of the error correction term, which co-integrates the long and short-run effects, shows conformity with economic expectations, suggesting the possibility of adjusting the lags or disequilibrium in the long run. The error correction model has a coefficient of -0.552260, and it is statistically significant. This indicates that approximately 55.2% of the disequilibrium in the model will be corrected within the short-run period in the long run.

5.1. Post Estimation Test
Stability Test (CUSUM Test) for the Model:

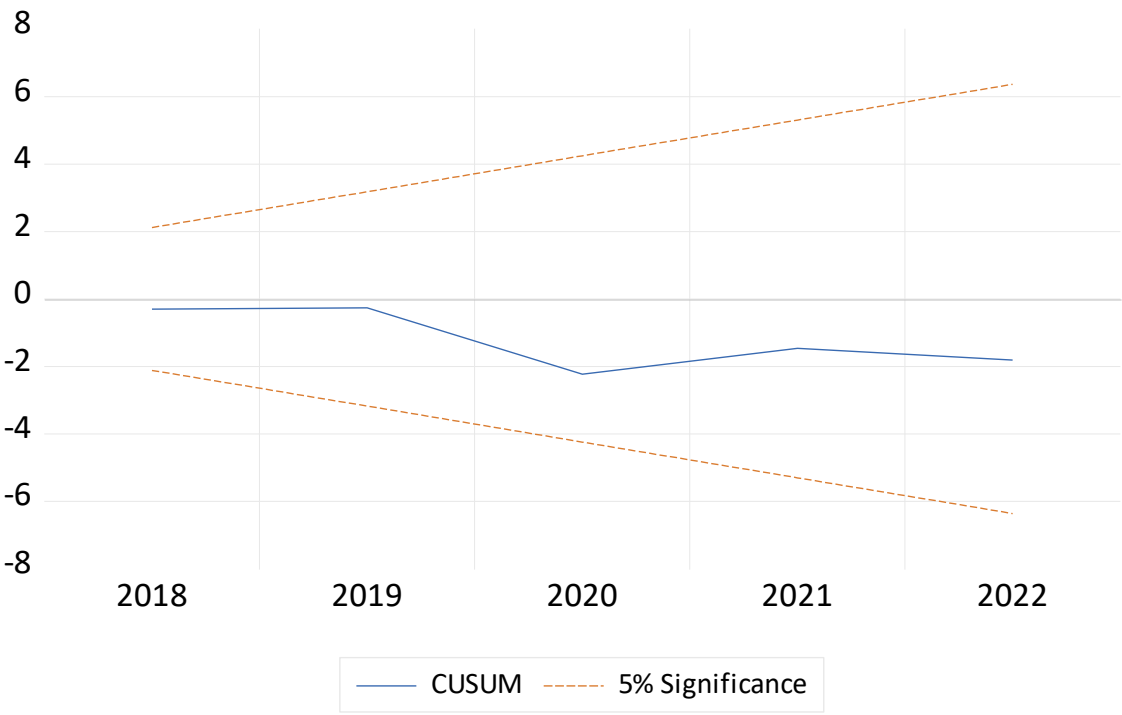


Figure 3. CUSUM plots for stability test.

Figure 3 illustrates that every coefficient in the calculated model remains constant over time within the crucial 5% range. This stability test allows us to accept the model's output.

5.2. Granger Causality Test Results

The Granger causality test is an estimation used to determine the direction of causality between population growth rate (POPR), foreign remittance (LREM), and economic growth (LRGDP) in Nigeria.

Hypothesis:

H_0 : No causal relationship.

H_1 : There is causal relationship.

Decision Rule:

Reject H_0 if P-Value ≤ 0.05 level of significance. Otherwise, fail to reject the null hypothesis.

Table 6. Granger causality test result.

Null Hypothesis:	Obs.	F-statistic	Prob. Value
LRGDP does not granger cause POPR	32	0.84	0.51
POPR does not granger cause LRGDP		5.77	0.00
LREM does not granger cause POPR	2	0.26	0.90
POPR does not granger cause LREM		1.42	0.26
LREM does not granger cause LRGDP	32	3.35	0.03
LRGDP does not granger cause LREM		8.74	0.00

Source: Author's estimation using e-views.

From Table 6 there is no causal relationship between LRGDP and POPR, LREM and POPR, and, POPR and LREM, because the probability value of their null hypothesis is higher than the 5% level of significance. Whereas, there is a unidirectional causality flowing from POPR to LRGDP and also a bidirectional causality running from LREM to LRGDP and from LRGDP to LREM. This conforms to the results earlier estimated.

6. Conclusion and Recommendation

According to the study's conclusions, the population growth rate has a negative long-term impact on remittances. The causation result revealed a one-way causality from population increase to economic growth, as well as a two-way causality between remittances and economic growth. It consequently proposes that the government and individuals who receive these remittances invest them in more productive sectors such as health, education, and training so that they have a positive impact on the country's economic progress. They should likewise establish

robust monitoring and evaluation mechanisms to track progress and make necessary adjustments to ensure long-term economic stability and growth.

References

- Abdulai, A. M. (2023). The impact of remittances on economic growth in Ghana: An ARDL bound test approach. *Cogent Economics & Finance*, 11(2), 2243189. <https://doi.org/10.1080/23322039.2023.2243189>
- Adeleye, O. K., Ogunwa, O. P., & Ogunjobi, V. O. (2021). Foreign direct investment, remittances and economic growth in Nigeria: Do these inflows stimulate growth. *Global Journal of Arts, Humanities and Social Sciences*, 9(2), 72–82. <https://doi.org/10.13140/RG.2.2.28305.51048>
- Adeseye, A. (2021). The effect of migrants remittance on economy growth in Nigeria: An empirical study. *Open Journal of Political Science*, 11(01), 99–122. <https://doi.org/10.4236/ojps.2021.111007>
- Alechenu, B. E. (2021). Economic impact of diaspora remittance on Nigerian economy. *London Journal of Social Sciences*(1), 79–87. <https://doi.org/10.31039/ljss.2021.1.41>
- Amin, M., Shahbaz, M., & Mahalik, M. K. (2020). Financial development, remittances, and economic growth: Evidence from Asian economies. *Economic Modelling*, 91, 1–12.
- Asiamah, M., Ofori, D., & Afful, J. (2019). Analysis of the determinants of foreign direct investment in Ghana. *Journal of Asian Business and Economic Studies*, 26(3), 1–16.
- Azam, M. (2015). The role of migrant workers' remittances in fostering economic growth: The four Asian developing countries' experiences. *International Journal of Social Economics*, 42(8), 690–705. <https://doi.org/10.1108/IJSE-11-2013-0255>
- Bucevska, V. (2022). Impact of remittances on economic growth: Empirical evidence from South-East European countries. *South East European Journal of Economics and Business*, 17(1), 79–94. <https://doi.org/10.2478/jeb-2022-0006>
- Chowdhury, E. K., Dhar, B. K., & Gazi, M. A. I. (2023). Impact of remittance on economic progress: evidence from low-income Asian Frontier countries. *Journal of the Knowledge Economy*, 14(1), 382–407. <https://doi.org/10.1007/s13132-022-00898-y>
- Depken, C. A., Nikšić Radić, M., & Paleka, H. (2021). Causality between foreign remittance and economic growth: Empirical evidence from Croatia. *Sustainability*, 13(21), 12201. <https://doi.org/10.3390/su132112201>
- Didia, D., & Tahir, S. (2022). Enhancing economic growth and government revenue generation in Nigeria: The role of diaspora remittances. *The Review of Black Political Economy*, 49(2), 175–202. <https://doi.org/10.1177/00346446211025647>
- Dutta, U. P., & Saikia, B. (2024). Remittances and economic growth: empirical analysis from a panel of selected Asian Nations. *Millennial Asia*, 15(1), 5–23. <https://doi.org/10.1177/09763996221086745>
- Effiong, U. E. (2022). Population-economic growth nexus in Nigeria and Poland: Does quality or quantity matter? *International Journal of Academic Pedagogical Research*, 06(07), 44–70.
- Efuntade, O. O., & Efuntade, A. O. (2020). Effect of population growth on economic growth in Nigeria. *International Journal of Business and Finance Management Research*, 8(4), 48–55.
- Engle, R. F., & 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>
- Fayissa, B., & Nsiah, C. (2010). The impact of remittances on economic growth and development in Africa. *The American Economist*, 55(2), 92–103.
- Gninigüè, M., & Ali, E. (2021). Migrant remittances and economic growth in ECOWAS countries: Does digitalization matter? *The European Journal of Development Research*, 34(5), 2517–2542. <https://doi.org/10.1057/s41287-021-00461-6>
- Golder, U., Rumaly, N., Hossain, M. K., & Nigar, M. (2023). Financial progress, inward remittances, and economic growth in Bangladesh: Is the nexus asymmetric? *Heliyon*, 9(3), e14454. <https://doi.org/10.1016/j.heliyon.2023.e14454>
- Headey, D. D., & Hodge, A. (2009). The effect of population growth on economic growth: A meta-regression analysis of the macroeconomic literature. *Population and Development Review*, 2, 221–248. <https://doi.org/10.1111/j.1728-4457.2009.00274.x>
- Hossain, M. S. (2019). Investigating the connections between China's economic growth, use of renewable energy, and research and development concerning CO₂ emissions: An ARDL bound testing approach. *Environmental Science and Pollution Research*, 26(3), 2802–2814.
- Imran, M., Wu, M., Yu, R., Zhong, Y., & Moon, H. C. (2021). Nexus among foreign remittances and economic growth indicators in South Asian Countries: An empirical analysis. *Korea International Trade Research Institute*, 17(1), 263–275. <https://doi.org/10.16980/jitc.17.1.202102.263>
- Işık, C. (2013). The effects of foreign direct investment on economic growth: A case study of Turkey using ARDL approach. *International Journal of Economics and Financial Issues*, 3(3), 493–502.
- Islam, M. S. (2022). Do personal remittances influence economic growth in South Asia? A panel analysis. *Review of Development Economics*, 26(1), 242–258. <https://doi.org/10.1111/rode.12842>
- Jackman, M., Moore, W., & Craigwell, R. (2011). Remittances and economic growth in developing countries. *International Journal of Development Issues*, 10(2), 132–151.
- Jayaraman, T. K., Choong, C.-K., & Chand, P. (2016). Do foreign aid and remittance inflows hurt competitiveness of exports of Pacific Island countries? An empirical study of Fiji. *Journal of Economic Development*, 41(2), 111–125. <https://doi.org/10.35866/caujed.2016.41.2.005>
- Kajtazi, K., & Fetai, B. (2022). Does the remittance generate economic growth in the South east European countries? *Scientific Annals of Economics and Business*, 69(1), 57–67. <https://doi.org/10.47743/saeb-2022-0004>
- Korsah, M. A., Adjei-Mensah, M., & Osei-Bonsu, E. (2022). *LED policy to empower and create jobs to boost Ghana's growth*. Ghana: Ministry of Local Government, Rural Development and Decentralization.
- Kudaisi, B. V., Ojeyinka, T. A., & Osinubi, T. T. (2022). Financial liberalization, remittances and economic growth in Nigeria (1990–2018). *Journal of Economic and Administrative Sciences*, 38(4), 562–580. <https://doi.org/10.1108/JEAS-09-2020-0164>
- Kuhe, A. (2019). *The impact of population growth on economic growth and development in Nigeria: An econometric analysis*. Nigeria: ResearchGate.
- Loiboo, D., Luvanda, E., & Osoro, N. (2021). Population and economic growth in Tanzania. *Tanzania Journal for Population studies and Development*, 28(2), 20–42.
- Menegaki, A. N. (2019). Renewable energy, growth, and employment: The case of Europe. *Energy Economics*, 81, 1–15.
- Mohamed Aslam, A. L., & Alibuhito, M. C. (2023). Workers' remittances and economic growth: new evidence from an ARDL bounds cointegration approach for Sri Lanka. *Journal of Economic and Administrative Sciences*, 41(2), 825–843. <https://doi.org/10.1108/JEAS-05-2022-0132>
- Muhammad, F., Özdeşer, H., & Adedeji, A. N. (2024). Analysis of the Effects of FDI and remittance on economic growth: Empirical evidence from Nigeria. *Journal of Arid Zone Economy*, 3(1), 60–82.
- Nyasha, S., & Odhiambo, N. M. (2022). The impact of remittances on economic growth: Empirical evidence from South Africa. *International Journal of Trade and Global Markets*, 15(2), 254–272. <https://doi.org/10.1504/IJTGM.2022.121457>
- Obere, A., Thuku, G. K., & Gachanja, P. (2013). The impact of population change on economic growth in Kenya. *International Journal of Economics and Management Sciences*, 2(6), 43–60.
- Odhiambo, J. (2019). *Relationship between selected community capitals and level of parental participation in primary education in Migori County*. Kenya: DSpace Home.
- Odugbesan, J. A., Sunday, T. A., & Olowu, G. (2021). Asymmetric effect of financial development and remittance on economic growth in MINT economies: An application of panel NARDL. *Future Business Journal*, 7(1), 39. <https://doi.org/10.1186/s43093-021-00085-6>
- Ogbaro, E. O., Sanni, O., Adeoye, J. O., Akintaro, A. A., & Eseyin, O. S. (2023). Accounting for the role of financial development in the nexus between remittances and economic growth in Nigeria. *International Research Journal of Economics and Management Studies*, 2(3), 154–166. <https://doi.org/10.56472/25835238/IRJEMS-V2I3P121>
- Okorie, G. C., Nwabufoh, E., & Oriaku, E. C. (2022). Remittances and economic growth of Nigeria. *GOUUni Journal of Faculty of Management and Social Sciences*, 9(1), 168–175.

- Omoniyi, O. B., & Owioye, T. (2024). Effect of remittance inflow on economic growth of Nigeria. *Journal of Applied And Theoretical Social Sciences*, 6(1), 74-87. <https://doi.org/10.37241/jatss.2024.104>
- Orji, A., Ogbuabor, J. E., Iwuagwu, C., & Anthony-Orji, O. I. (2020). Empirical analysis of the impact of population increase on the economic growth of Africa's most populous country. *Socio-Economic Research Bulletin*, 2(73), 27-45. [https://doi.org/10.33987/vsed.2\(73\).2020.27-45](https://doi.org/10.33987/vsed.2(73).2020.27-45)
- Osei-Gyebi, S., Opoku, A., Lipede, M. O., & Kountchou, L. K. (2023). The effect of remittance inflow on savings in Nigeria: The role of financial inclusion. *Cogent Social Sciences*, 9(1), 2220599. <https://doi.org/10.1080/23311886.2023.2220599>
- Oyegoke, E. O., & Ebele, A. (2023). Labour emigration, remittances and economic development: An empirical analysis. *African Journal of Social Issues*, 5(1), 239-259. <https://doi.org/10.4314/ajosi.v5i1.16>
- Pesaran, H. M., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of long run relationships. *Journal of Applied Econometrics*, 16(3), 289-326. <https://doi.org/10.1002/jae.616>
- Peterson, E. W. F. (2017). The role of population in economic growth. *SAGE Open*, 7(4), 215824401773609. <https://doi.org/10.1177/2158244017736094>
- Qutb, R. (2022). Migrants' remittances and economic growth in Egypt: An empirical analysis from 1980 to 2017. *Review of Economics and Political Science*, 7(3), 154-176. <https://doi.org/10.1108/REPS-10-2018-0011>
- Ramanayake, S. S., & Wijetunga, C. S. (2018). Sri Lanka's labour migration trends, remittances and economic growth. *South Asia Research*, 38(3_suppl), 61S81S. <https://doi.org/10.1177/0262728018792088>
- Raphael, A., Peter, O. I., & Kenneth, I. (2024). The effect of population dynamics on economic growth performance in Nigeria. *GPH-International Journal of Social Science and Humanities Research*, 7(04), 75-88. <https://doi.org/10.5281/zenodo.11164027>
- Ratha, D. (2003). *Workers' remittances: An important and stable source of external development finance*. Washington, D.C: World Bank.
- Ratha, D., Mohapatra, S., & Silwal, A. (2011). *Migration and remittances factbook 2011*. Washington, D.C: World Bank.
- Ribadu, M. (2023). Remittance flows: Examining the frequency and relevance in Nigeria. *Sapientia Global Journal of Arts, Humanities and Development Studies*, 6, 2695-2327.
- Saha, S. K. (2021). The impact of remittance on economic growth in Bangladesh. *Scholars Journal of Arts, Humanities and Social Sciences*, 9(9), 462-470. <https://doi.org/10.36347/sjahss.2021.v09i09.013>
- Sam, C., Nyongesa, W., & Ouma, A. (2019). The relationship between foreign remittances, financial development, and economic growth in Sub-Saharan Africa. *African Development Review*, 31(4), 410-423.
- Sghaier, I. M. (2021). Remittances and economic growth in MENA countries: The role of financial development. *Economic Alternatives*, 1, 43-59. <https://doi.org/10.37075/EA.2021.1.03>
- Siifa, B., Teniola, B. B., & Zayyad, M. A. (2023). Statistical analysis of effect of population on economic growth in Uganda (2000-2020). *Technology and Investment*, 14(2), 101-118. <https://doi.org/10.4236/ti.2023.142006>
- Ur Rehman, N., & Hysa, E. (2021). The effect of financial development and remittances on economic growth. *Cogent Economics & Finance*, 9(1), 1932060. <https://doi.org/10.1080/23322039.2021.1932060>
- Wang, X., Ali, Z., Khan, S. T., Tiwari, C. K., & Bhat, M. A. (2021). Unveiling the drivers of climate change: The impact of economic indicators, renewable energy consumption, and human development through a panel ARDL approach. *Discover Sustainability*, 6(691), 1-15.
- World Bank. (2022). *World development indicators*. Washington, D.C: World Bank.
- Yadeta, D. B., & Hunegnaw, F. B. (2022). Effect of international remittance on economic growth: Empirical evidence from Ethiopia. *Journal of International Migration and Integration*, 23(3), 383-402. <https://doi.org/10.1007/s12134-021-00833-1>