INVESTIGATING THE CAUSAL ASSOCIATION BETWEEN REMITTANCES AND ECONOMIC GROWTH IN NIGERIA

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ABSTRACT

This study examined the nexus between remittances and economic growth in Nigeria from 1985 to 2023. The data employed in the study were gotten from the World Development Indicators (WDI) and the Central Bank of Nigeria (CBN) Statistical Bulletin. The data were analysed using the Auto-Regressive Distributed Lag (ARDL) model as well as the Error Correction Model (ECM). The results of the models show that remittances had an inverse association with economic growth both in the long and short runs. In the long and short runs, trade openness had a positive significant association with economic growth. While exchange rates had an inverse relationship with economic growth in the long run only, gross fixed capital formation exerted a positive effect on growth in the short run only. It is concluded that remittances, exchange rates, trade openness, and gross fixed capital formation caused economic growth in Nigeria.

Keywords: Remittances, Causal Association, Economic Growth, Nigeria

JEL classification: O40

1. Introduction

Economic growth is the engine that enables nations to improve the well-being of their citizens, including the poorest of the poor. It is the most effective method for helping people achieve their larger goals for a better standard of living (Adams, 2002; Operationalizing Pro-Poor Growth Programme (OPPG), 2005; Rodrik, 2002). It is the reason why Sustainable Development Goal (SDG) 1 on poverty reduction was established. One of every government's

crucial policy goals is economic growth. Pertinently, economic growth is just a necessity for economic development; it is not a sufficient one. For economic growth to attain the ideal position, it must be continuous and inclusive, such that the populace, irrespective of their poverty status, must participate in the growth process (Cockburn, et al., 2013).

In line with SDG 1, and consistent with economic theories such as Solow (1956), Romer (1990), and Aghion and Howitt (1992), the desire of world leaders is to achieve stable global, continental, and national economic growth rates. According to Kong et al. (2021), high-quality economic growth should be stable and continuous. However, this has not been achieved to date, as continental and national discrepancies exist. For instance, while the global average real gross domestic product (GDP) (a measure of economic growth) in 1990-2015 was 1.42%, it was 1.1% in sub-Saharan Africa and 2.48% in Nigeria (Peterson, 2017).

Nigeria's growth rate grew unsteadily from 1985 to 1990 before tumbling to 2.5% in 1986 and -0.2% in 1987. The 1990s witnessed unstable positive economic growth, aside from 1991 when a growth rate of -0.8% was reported. Howbeit, the growth rate has been relatively high since 2001 until 2014 when a growth rate of 6.54% was recorded (CBN, 2014). Thereafter, the growth rate stood at -1.58% in 2016 during the business downturn. The nation witnessed a mild positive growth rate (0.82% - 2.27%) between 2017 and 2019 before hitting a -1.91% low in 2020 due to the COVID-19 pandemic. The country bounced back in 2021 when it recorded a growth rate of 3.40%, but again declined by 0.3% in 2022 (Agbanobi, 2017; Adama et al., 2022; National Bureau of Statistics, 2023). The aftermath of instability in economic growth is difficulty in economic planning.

In many nations, remittances are becoming increasingly important to the economies and have become a more significant source of financing for underdeveloped and developing countries. It has been shown, from both theoretical and empirical perspectives, to impact the economy through its effects on growth and development (Odishika et al., 2022). Due to their sizeable contributions, overseas remittances are now a key factor in a nation's economic development (Lime, 2016). As a result, the World Bank (2012) has revealed that remittance inflows contribute to a country's economic growth by enhancing and balancing consumption, savings, and investment. By providing

beneficiaries with start-up capital at home, international remittances have also diminished the problem of credit constraints (Wahba, 2021). Theoretically and empirically, remittances have been shown to impact the economy through growth and development.

According to Hnatkovska and Loayza (2003), regular remittance inflows minimize macroeconomic shocks, particularly production instability, which stimulates the economy's rapid enlargement and aids poverty alleviation. The steadiness of remittance flows notwithstanding, financial crunches and economic recessions make them an unfailing financial means for less-developed countries. Remittances from migrants can be continuous since they are sent cumulatively in the long run and not just by recent arrivals. Some of the concerns that the less-developed countries face, such as unsteady income, poverty, income inequality, and opportunities, and credit market failures, may be reduced by remittances (Karagöz, 2009). Further, remittances have also been found to be crucial in augmenting human capital by increasing school enrolments and decreasing mortality rates Azizi (2018), Sahoo and Sethi, (2020), which then also clearly helps growth (Cooray et al., 2016).

Evidence shows that remittances flow to less-developed nations grew by 5.3% to $401 billion in 2012. There was a 10% increase in remittances inflow to sub-Saharan Africa (SSA), which resulted in US$46 billion in remittances in the region in 2018 (World Bank Group & Global Knowledge Partnership on Migration and Development (KNOMAD), 2018). Likewise, faster-than-anticipated economic growth of 3.6% in 2017 to 4.1% in 2018 and 2019 was reported in the region (African Development Bank, 2018). Remittances directed to developing countries rose by 9.6% from 2017 to 2018, reaching the highest ever of US$529 billion. Historically, remittances have witnessed annual growth since inception, except for the post-global financial crisis of 2008 and 2009, as well as the COVID-19 pandemic of 2020, when the lowest growth rates were obtained.

According to the World Bank Group and KNOMAD (2018), there was a 12% increase in global migrant remittances ($633 billion) in 2017 to about $689 billion in 2018. Remittances to developing countries were expected to have grown by 7.3% to hit $589 billion in 2021. Within the same period, remittances increased by 21.6%, 9.7%, 8%, 6.2%, and 5.3% in Latin America and the Caribbean, the Middle East and North Africa, South Asia, SSA, and

Europe and Central Asia respectively. There was a 4% reduction in remittances to East Asia and the Pacific, excluding China. Remittances to SSA resumed growth in 2021, increasing by 6.2% to $45 billion. There was a moderate surge in remittance flow to Nigeria, the highest recipient in the SSA region. This was made possible by policies intended to channel inflows through the banking sector.

Contrary to the 10% increase in remittances to developing nations in 2021, 2022 witnessed just a 5% increase, which stood at $626 billion. Remittances to low- and middle-income countries withstood global headwinds in 2022 and increased by about 5.2%, which was $53 billion. This was, however, lower compared to the 16.4% increase in 2021 and higher than other regions with growth rates which ranged between 0.7% and 10.3% as a result of high inflows to Kenya and Nigeria. The region is open to the influence of worldwide financial crises (World Bank Group, 2022**)**.

After attaining the highest figures in 2021 and 2022, remittances increased at a lower rate in 2023. The latest report by the World Bank shows that remittances to developing countries slowed to 3.8% in 2023, lower than the 9% average recorded in 2021 and 2022. However, Latin America and the Caribbean reported an 8% remittance growth in 2023. This was attributed to the general reduction in employment rate in the United States and South Asia, which stood at 7.2%, mainly due to a continuous growth of remittance inflow to India. The upsurge of inflow of remittances in 2023 was somewhat modest in the Pacific and East Asia (3.0%), excluding China, with a growth rate of 7%. In SSA, the growth rate stood at 1.9%, which was the same rate as in Nigeria (World Bank Group, 2023).

The highest recipient of remittances in the last decades on the African continent is Nigeria. Remittance inflow to Nigeria has remained high. Almost 67% of the remittance inflow into the region went to Nigeria, Senegal, and Kenya in that order in 2012 (World Bank, 2013). The remittances inflow into Nigeria was $1.35 billion in 2006, and this rose sharply to $15 billion in 2007, $19 billion in 2016, $21 billion in 2017, $22 billion in 2018, and $23.8 billion in 2019. In 2020, remittance inflow to Nigeria declined to US$17.2 billion, but the country still maintains its lead as the top recipient in SSA and the 8th largest recipient globally. Person-to-person transfers account for the vast bulk of remittances sent to Nigeria; these transfers primarily come from

the US, the UK, Italy, and other Western European nations. The World Bank (2015) notes that informal avenues for money transfers include family, local unions, and other persons who enter Nigeria from their foreign countries of residence, while a majority of payments go through money transfer organizations.

Worthy of note is the fact that Nigeria remains an outstanding remittance recipient on the continent and worldwide. Undoubtedly, higher levels of economic growth and socioeconomic indicators are anticipated for a country such as Nigeria, with its high remittance inflow. In the same vein, it is anticipated that the incidence of poverty would be low, but this is not the case at the moment. The unstable and sluggish economic growth in Nigeria motivates the current study.

In addition, Yesufu (1996) opined that the trade policy in Nigeria since independence in 1960 has witnessed fluctuation of policies, ranging from liberalism to extreme protectionism. The trade policies were aimed at influencing the trade procedure to stimulate sustainable growth. Also, it is a known fact that the country's economic atmosphere has not been able to attract foreign direct investment to its fullest capacity. This has been attributed to the unsteady operating atmosphere due to ineffective capital markets, high inflation rate, unsteady polity, rigid policies, delicate financial system, etc.

The recession the country experienced in 2016 was mainly due to a surge in oil pipeline destruction, which triggered complications in the energy sector (fuel shortages and reduced electricity generation) and reduced foreign reserves, which also decreased the country's currency concurrently (Akinkunmi, 2017). Another main impediment to economic growth in Nigeria, as revealed by Uwakaeme (2015), is the government's excessive fiscal deficit and inflation. Other factors responsible for sluggish and unstable economic growth in Nigeria are dwindling oil revenue and a high level of corruption. Nigeria ranked 136 in the corruption perception index in 2016 out of 176 countries. Connolly and Li (2016) show that a rise in public social expenditure significantly negatively influences the nation's economic growth Babalola, (2015), and that government expenditure has a significant effect on economic development. Recently, the sluggishness and undulating growth in the nation have been attributed to a crash in crude oil prices in the

international market, insecurity, terrorist activities, an astronomical increase in the naira to the dollar exchange rate, and above all, the COVID-19 pandemic (Ebiwonjumi et al., 2023).

An analysis of the global scene of developing nations, the governments of many developing nations, including Nigeria, have implemented a range of policies and initiatives to develop their economies and achieve sustainable growth. In economics, these initiatives are called "instruments of national policy." They include the creation of public organizations with distinct managerial styles, organizational and legal frameworks, and interactions with governments to comprehend and assess the various approaches they can take to attain sustainable development in their nations, given the limited resources at their disposal (Chimhowua et al., 2019).

Also, successive governments in Nigeria have concentrated efforts on policies aimed at ensuring steady and robust economic growth in the nation's post-independence era. The sluggish and unstable economic growth in the nation casts doubt on the effect of the previous programmes and policies on the growth of the nation's economy. The failure of previous policies could be due to a scarcity of studies on the effect of remittances on the economic growth of the country. Hence, there is a need for a more detailed analysis of the effect of remittances on the economic growth of the country. Thus, this study aims to examine the causal link between remittances and economic growth in Nigeria. This objective led us to test the hypothesis that there is no causal association between remittances and economic growth in Nigeria in the long run and short run.

2. Literature Review

2.1 Theoretical review

This study is underpinned by the theory of self-interest, the classical growth theory, the Harrod-Domar growth, and Rowstow's stages of growth theories. The theory of self-interest states that remittances are sent to the migrants' home country to compensate relatives and for investment purposes. The advocates of the classical theory of growth are Adam Smith, Thomas Malthus, and David Ricardo. The theory states that labour, trade, and capital accumulation are the drivers of economic growth, especially in an agrarian

economy like Nigeria. The Harrod-Domar theory was developed by Sir Roy Harrod and Evsey Domar Harrod (1939) and Domar (1946), and it states that capital formation derived from savings is the driving force of economic growth. Rowstow formulated five stages of growth, which are the conservative society, the presumption for the take-off stage, the take-off stage, the drive to maturity, and the stage of increased mass consumption. The emphasis of the present study is on the second and third stages, which are based on an increase in real output per capita (Akintunde et al., 2024; Umo, 2024).

2.2 Empirical review

In order to establish the link between remittances and economic growth in 22 Asia-Pacific middle-income nations, Yoshino et al. (2020) utilized data collected from 2002 to 2015. The data were analysed with the generalized method of moments (GMM) technique. The authors discovered that gross secondary school enrolment and trade openness are directly significantly linked to economic growth, whereas net foreign direct investment (FDI) inflows are indirectly associated with economic growth.

Oshota and Badejo (2014) determined the association between remittances and economic growth in Nigeria using data collected in 1981-2011 and analysed with an error correction model (ECM). The results reveal that remittances are negatively and positively associated with economic growth in the short run and long run, respectively. The variables with a positive effect on development in the short and long-runs are foreign aid, foreign direct investment, and trade.

Adamu et al. (2015) explored the influence of remittances on economic growth in Nigeria and employed time series data from 1977-2014. The data were analysed using the autoregressive distributed lag (ARDL) technique. They found that remittances and aid are indirectly associated with economic growth in the short run, whereas foreign direct investment is directly related to it.

Olayungbo et al. (2020) examined the relationship between remittances and economic growth in Nigeria, employing a dataset spanning 1981-2018 and analysed the data using a nonlinear autoregressive distributed lag

(NARDL) model. The study shows that changes in remittances retard economic growth in the long run, but the reverse is the case in the short run.

Likewise, Onyike et al. (2020) investigated the impact of international remittances on the economic growth of Nigeria using data collected between 1986 and 2017. The ARDL approach and vector error correction model (VECM) were used in analysing the data and revealed that in the long run, remittances, human capital, and inflation impacted economic growth positively, while interest rates negatively affected growth. In the short run, human capital, inflation rate, and remittances influenced economic growth positively, but interest rates had a negative influence.

The nexus between remittances and economic growth in Nigeria was examined by Nejo (2021). Time series data from 1986-2019 were used for the study and analysed with a VECM. The results show that remittance and trade openness were directly associated with economic growth, while the exchange rate was negatively related.

Ogbaro et al. (2023), using data collected between 1981 and 2021, studied the correlation between remittances and economic growth in Nigeria, applying the fully modified ordinary least squares model. The results indicate that remittances have a negative association with economic growth, while the level of financial development is directly associated with it.

Eke and Eke (2023) conducted a study on the influence of remittances on economic growth in Nigeria over four decades (1980-2020). The data were analysed using ECM. The authors found that remittances and investment in physical capital had direct and significant impacts on the GDP in Nigeria, while investment in human capital development and institutional factors both had inverse and significant effects on growth.

Furthermore, Amir and Amir (2024) researched the influence of remittances on economic growth in African countries with panel data collected from 42 African countries from the period of 2001 – 2020. The data were analysed using the generalized momentum technique. The authors affirmed that remittances impacted the economy of African countries positively.

Islam et al. (2024) studied the relationship between research and development, remittances, and economic growth among middle-income

nations. The study utilized data collected between 1996 and 2021 from 25 developing countries. The data were analysed with second-generation unit root and panel ARDL techniques. The authors concluded that remittances and economic growth are significantly and positively associated.

Annisa and Jayadi (2024) examined the relationship between remittances and economic growth in Indonesia using data collected from 1990 to 2019 and analysed with the vector autoregression (VAR) method and vector error correction model (VECM). They found no causal link between remittances and economic growth in Indonesia. Also, in the short and long runs, remittances did not influence economic growth.

In sum, it is obvious that the literature is vast on the nexus between remittances and economic growth. Nonetheless, discrepancies exist in the results obtained by the authors. While some reported a positive association between remittances and economic growth, others obtained contrary results. Also, as far as we know, all the authors on the subject matter utilized data collected up to 2022 in Nigeria. Furthermore, other scholars utilized real GDP as a proxy for economic growth, contrary to the economic growth theory that emphasizes real GDP per capita. To this end, this study will fill the identified research gaps by utilizing data collected between 1985 and 2023 and employing real GDP per capita as a proxy for economic growth.

2.3 Conceptual issues

2.3.1 *Concept of Remittances*

Ofeh and Muandzevara (2017) define remittance as the money sent by overseas workers to their home countries. Remittances refer simply to financial donations and transfers and do not include other transfers vis-a-vis knowledge and information (Eversole, 2005). In the words of Al-Assaf and Al-malki (2014), remittance means a not-for-profit fund transfer to relatives in their home country by an overseas worker. As opined by Lime (2016), foreign remittances refer to money sent by international migrants to their loved ones in their home country. It includes but is not limited to transfers of money, which are expected to improve welfare, largely intended to support their relatives or dependents for consumption or investment purposes (Lime,

2016). Hence, despite differences in people's geographical locations, remittances allow, uphold, and promote social bonds (Carling, 2020).

Remittance flows can be grouped based on the transaction technique. As a result, the transaction can be categorized into binary such as official against unofficial, formal against informal, controlled against loose, and documented against non-documented. Remittances can be transferred in the form of cash, commodities like jewellery, gadgets, automobiles, and clothing that travellers typically carry, or through unofficial means that reflect the social network system typical of the African continent. Remittances sent through unofficial routes have the benefit of lower fees, if any, for dispatchers and better exchange rates for receivers who use the parallel market (Agu, 2009). These informal routes make it problematic for the precise valuation of remittance entry, which makes capturing their impact difficult for policymaking (Orozco, 2007). This study relied on the official, formal remittances that have been recorded systematically and made available to the public.

2.3.2 *Concept of Economic Growth*

Denison (1962) defined economic growth as a rise in GDP or the national output computed in constant prices. A strictly economic component and a purely demographic component are always present in economic growth. Economic growth is defined as the product of population growth and GDP growth, expressed in percentage changes. The GDP, which is defined as aggregate output net of capital depreciation plus net income from abroad, is a measure of the monetary value of economic outputs as well as an indicator of a country's income (Piketty, 2014).

Economic growth can be said to be a rise in what an economy can produce by employing its limited means. The growth of an economy's productive capacity will result in an outward change of its production possibility boundary. Also, economic growth is known as the enlargement in the monetary value of goods and services over a given time within a particular country. Economic growth can be computed either in real or nominal terms. While the former accounts for the inflationary trend in the economy, the latter does not. This study will employ per capita real GDP as a

proxy for economic growth, following Onabote et al. (2020**)** and Shelton (2021), and following economic theory.

3. Methodology

3.1 Data source and number of observations

Secondary data from the WDI, following Mesagan et al. (2024), and the CBN statistical bulletin were used for this study. The annual time series data used spanned 1985 and 2023 (39 years). Information on real GDP, remittances, population, imports, exports, inflation rate, gross fixed capital formation, and exchange rate were extracted from the data sets. The information for gross capital formation was limited to the year 2022 because 2023 data could not be obtained.

3.2 Analytical techniques

Following Gebeyehu (2014), this study employed the ARDL and ECM techniques to test the association between remittances and economic growth. The model is stated as:

$$ECOG_t = F(REM_t, GFCF_t, TRDO_t, EXC_t, IFR\varepsilon_t) \quad (1)$$

The model was transformed into its natural log-linear form as indicated:

$$lnECOG_t = \beta_0 + \beta_1 lnREM_t + \beta_2 lnGFCF_t + \beta_3 TRDO_t + \beta_4 EXC_t + \beta_5 IFR_t + \varepsilon_t \quad (2)$$

where:

$ECOG$ is economic growth

β_0 is the intercept

$\beta_1 - \beta_5$ are the parameters to be estimated

REM is remittances

$GFCF$ is gross fixed capital formation

$TRDO$ trade openness

EXC is exchange rate

IFR is inflation rate

ε is error term

t is the period 1- 39 years

To determine the presence of short-run and long-run associations, the common form of the ARDL (p, q) model stated above can be specified thus:

$$\begin{aligned} lnECOG_t = \alpha_0 &+ \rho_0 lnECOG_{t-1} + \cdots + \rho_p lnECOG_{t-p} + \gamma_{10} lnREM_t + \cdots \\ &+ \gamma_{1q} lnREM_{t-q} + \gamma_{20} lnGFCF + \cdots + \gamma_{2q} lnGFCF_{t-q} \\ &+ \gamma_{30} TRDO_t + \cdots + \gamma_{3q} TRDO_{t-q} + \gamma_{40} EXC_t + \cdots \\ &+ \gamma_{4q} EXC_{t-q} + \gamma_{50} IFR_t + \cdots + \gamma_{5q} IFR_{t-q} + u_t \end{aligned} \quad (3)$$

Equation (3) is said to be both "autoregressive" and "distributed lag" due to the inclusion of p lags dependent variable and q lags independent variables, respectively. The model can then be specified as shown:

$$\begin{aligned} \Delta lnECOG_t = \alpha_0 &+ \sum_{i=1}^{p} \rho_i \Delta\, lnECOG_{t-i} + \sum_{i=0}^{q} \lambda_{1i}\, \Delta lnREM_{t-i} \\ &+ \sum_{i=0}^{q} \lambda_{2i} \Delta lnGFCF_{t-i} + \sum_{i=0}^{q} \lambda_{3i}\, \Delta TRDO_{t-i} + \sum_{i=0}^{q} \lambda_{4i}\, \Delta EXC_{t-i} \\ &+ \sum_{i=0}^{q} \lambda_{5i}\, \Delta IFR_{t-i} + \beta_1 lnECOG_{t-1} + \beta_2 lnREM_{t-1} \\ &+ \beta_3 lnGCF_{t-1} + \beta_4 TRDO_{t-1} + \beta_5 EXC_{t-1} + \beta_6 IFR_{t-1} \\ &+ u_t \end{aligned} \quad (4)$$

From Equation (4), the terms with summation signs indicate the error correction dynamics; α_0, ρ_i, $\lambda_1 - \lambda_5$ are coefficients that quantify the short-run association; $\beta_1 - \beta_6$ are coefficients that quantify the long-run association. In testing the relationship, three stages are involved, which are:

Stage 1 – Test for the absence of explanatory variables integrated at order two (I(2)) or higher, and test for the presence of a long-run association

Stage 2 – Examine the long-run association

Stage 3 – ECM valuation

Although integrating the same order for all explanatory variables in the equation is not necessary in the ARDL technique, it is a precondition for a

test of the absence of all the independent variables with the integration of order I(2), or higher to circumvent the likelihood of false model and unsound F-statistics calculated (Pesaran et al., 2001). If the variables are found to be I(0), I(1), or jointly integrated, the first stage in the ARDL technique is to examine if a long-run association exists amongst the variables. Thus, a bounds test for co-integration was conducted.

Alternatively, Narayan (2005) also computed other critical values by revealing that the critical values proposed by Pesaran et al. (2001) apply to reasonably great sample sizes. It was argued that utilizing such critical values for a small sample size may yield spurious findings. Hence, a new set of critical values that range between 30 and 80 was generated for small sample sizes by Narayan (2005), and this is related to the GAUSS model, which was utilized by (Pesaran et al., 2001). Their efforts yielded an upper-bound critical value and a lower-bound critical value. If the F-test statistic is greater than the upper critical value, the null hypothesis can be rejected irrespective of the original orders of integration of the variables I(0) or I(1)). Equally, if the F-test statistic is less than the lower critical value, the null hypothesis is not rejected. Nonetheless, if the F-test statistic is found to be between the upper and the lower bounds, the outcome is inconclusive. The decision on whether or not to reject the null hypothesis is made based on the upper bound when the order of integration of the variables is known and the variables are all I(1). Likewise, if the variables are all I(0), the lower bound forms the basis for decision-making. Once the co-integration is established, the second stage in the ARDL is an estimate of long-run coefficients and the restricted ARDL long-run regression, which is specified as:

$$lnECOG_t = \alpha_0 + \sum_{i=1}^{p} \rho_i \, lnECOG_{t-i} + \sum_{i=0}^{q} \lambda_{1i} \, lnREM_{t-i} + \sum_{i=0}^{q} \lambda_{2i} lnGFCF_{t-i} + \sum_{i=0}^{q} \lambda_{3i} \, TRDO_{t-i} + \sum_{i=0}^{q} \lambda_{4i} \, EXC_{t-i} + \sum_{i=0}^{q} \lambda_{5i} \, IFR_{t-i} + u_t \quad (5)$$

The last stage requires the estimation of ECM, employing the discrepancies of the variables and the lagged long-run answer, and decides on the speed of adjustment of returns to equilibrium.

$$\Delta lnECOG_t = \alpha_0 + \sum_{i=1}^{p} \rho_i \Delta\, lnECOG_{t-i} + \sum_{i=0}^{q} \lambda_{1i}\, \Delta lnREM_{t-i} + \sum_{i=0}^{q} \lambda_{2i} \Delta lnGFCF_{t-i} + \sum_{i=0}^{q} \lambda_{3i}\, \Delta TRDO_{t-i} + \sum_{i=0}^{q} \lambda_{4i}\, \Delta EXC_{t-i} + \sum_{i=0}^{q} \lambda_{5i}\, \Delta IFR_{t-i} + \beta_1 lnECOG_{t-1} + \partial ECM_{t-1} + u_t \quad (6)$$

where: ∂ refers to the speediness of the alteration parameter, and ECM_{t-1} represents the error correction term lagged by one period. Note that ECM is obtained as the error term from the ensuing long-run equation whose coefficients are acquired by standardizing the model.

The definitions of the variables included in the model and their a priori expectations are depicted in Table 1.

Table 1: Definitions and a priori Expectations of the Variables Used in the Model

Variable	Symbol	Definition	Expected Sign
Per capita real GDP	RGDP	GDP per capita is gross domestic product divided by population ($)	Explained variable
Remittances	REM	Amount of inflow of foreign remittances to Nigeria ($)	+
Gross Fixed Capital Formation	GFCF	The amount of fixed capital expenditure was utilized in this study (₦)	+
Trade Openness	TRADO	It the ratio of the addition of imports and exports to GDP	+
Exchange Rate	EXC	The annual value of domestic currency in terms of US dollars	-
Inflation Rate	IFR	Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole	-

Source: Authors' compilation, 2024.

4. Results and Discussion

4.1 Descriptive statistics of the dependent and independent variables

The descriptions of the variables employed in the model are shown in Table 2. As earlier stated, per capita real GDP was used as a proxy for economic growth and represents the dependent variable, while remittances, gross fixed

capital formation, trade openness, exchange rate, and inflation rate are the independent variables. Over 39 years, the per capita real GDP in the country stood at $1950.547±$477.4061 billion with minimum and maximum values of $1414.698 and $2679.554 billion, respectively. Over the same period, the average value of remittances received was $9978.134±$9909.516 million. The minimum value was $2.424527, and the maximum amount stood at $24311.02. Likewise, the mean gross fixed capital formation in the country was ₦10290.02 billion with a standard deviation of ₦15508.09 billion. While the mean trade openness stood at 0.2205±0.1199, the average exchange rate was ₦120.9033±₦78.93. The mean inflation rate was 16.46% with a standard deviation of 14.60%. The minimum and maximum values were 0.69% and 75.40%, respectively. The high standard deviations for the variables show the high divergences in the values of the variables over the years.

Table 2: Descriptive Statistics of the Variables used in the Model

Variable	No. of observations (n)	Mean	Std. dev.	Minimum	Maximum
Per capita Real GDP (billion $)	39	1950.547	477.4061	1414.698	2679.554
Remittances (million $)	39	9978.134	9909.516	2.4245	24311.02
Gross fixed capital formation (billion ₦)	38	10290.02	15508.09	87.14	65227.13
Trade Openness	39	0.2202	0.1199	0.0389	0.4755
Exchange rate	39	120.9033	78.9287	49.7796	482.7908
Inflation rate	39	16.4610	14.5970	0.6861	75.4017

Source: Authors' computation, 2024.

4.2 Unit root/stationarity test

The stationarity test was conducted to establish the features of the time series variables. It should be noted that the ARDL structure does not in any way involve the pre-estimation examination of each of the variables for a stationarity test. However, the results from the test may assist in deciding on

the use of the ARDL model to estimate the levels at which the variables are integrated, since the method, with certainty, will break down when I(2) series are present. The results are presented in Table 3 using the ADF test.

The results show that the variables exhibit a mixed order of integration, given the critical values and their t-statistic values. Two (exchange rate and inflation rate) of the six variables included in the model were stationary at the level, while the remaining (economic growth, remittances, gross fixed capital formation, and trade openness) stationarity was at first difference. The ADF statistics for the included variables and their 5% significance critical values were all negative. Also, the P-values were all less than 5% significance level, signifying the absence of a unit root for all the variables in the series. This is the ultimate condition for the ARDL bound testing method to co-integration.

Table 3: Unit Root Tests on all the Variables Included in the Model

Variable	ADF Test Statistics	5% critical value	P value	Order of integration
LnEconomic growth	-3.339	-2.966	0.0132	I(1)
LnRemittances	-6.750	-2.966	0.0000	I(1)
LnGross fixed capital formation	-4.694	-2.969	0.0001	I(1)
LnTrade openness	-7.103	-2.966	0.0000	I(1)
Exchange rate	-6.878	-2.964	0.0000	I(0)
Inflation rate	-3.217	-2.964	0.0190	I(0)

Source: Authors' computation, 2024.

4.3 Results of the ARDL bounds test

The results of the unit root test performed, which show that variables were integrated of mixed order, informed us to perform the ARDL bounds test. Hence, the ARDL bounds test for co-integration was performed to discover the presence or otherwise of a long-run association between the variables employed in the model. The results are provided in Table 4. As shown in the table, the coefficient of the F-statistic, which stood at 6.2877, is greater than the values of the upper bound (4.01) and lower bound (2.86) at the $P<0.05$ level of significance. This shows co-movement among the variables over

time. This is an indication that a long-run association exists among the model variables, which is highly desirable.

Table 4: Results of ARDL Bounds Tests for Co-integration

F statistic		7.6211
	Critical Value Bounds	
Significance level	Lower bound	Upper bound
1%	4.38	6.15
2.5%	3.92	5.82
5%	3.46	5.22
10%	2.88	4.63

Source: Authors' computation, 2024

4.4 Granger causality test

The Granger causality test was conducted at 5% level of significance. The null hypothesis of no Granger causality is rejected when the probability value of the variable is less than the selected level of significance. The results in Table 5 indicate that there is no significant bi-directional association, but rather, a unidirectional causal association between remittances and the real GDP. This indicates that a change in remittances will cause a resultant change in real GDP but not vice versa. Similarly, a unidirectional relationship exists between both gross fixed capital formation and trade openness and real GDP, implying that a change in each of the two variables results in a corresponding change in real GDP but not vice versa.

Table 5: Pairwise Granger Causality Tests

Null hypothesis	Observation	F-Statistic	Probability
LNRGDP does not Granger cause LNREM	39	1.2906	0.3061
LNREM does not Granger cause LNRGDP		3.0184	0.0288
LNRGDP does not Granger cause LNGCF	38	0.8170	0.6023
LNGCF does not Granger cause LNRGDP		2.6805	0.0306

Null hypothesis	Observation	F-Statistic	Probability
LNRGDP does not granger cause LNTRADO		2.2292	0.1241
LNTRADO does not granger cause LNRGDP	39	3.5397	0.0409
LNRGDP does not granger cause ECX		1.9661	0.1283
EXC does not granger cause LNRGDP	39	2.8826	0.05400
LNRGDP does not granger cause IFR		2.0898	0.1088
IFR does not Granger cause LNRGDP	39	3.0554	0.0583

Source: Authors' computation, 2024.

4.5 Long-run economic growth model

It is evident from the results presented earlier that the explanatory variables included in the model co-integrated with economic growth. Thus, an effort was made to compute the long-run parameters of the model, the outcomes of which are provided in Table 6.

Table 6: Results of the Long-run Economic Growth Model

Variable	Coefficient	Standard error	t-statistic	Probability
LnRem	-0.4825***	0.1100	-4.3863	0.0000
LnGCF	3.4021	2.2465	1.5144	0.1233
LnTRADO	1.0234***	0.3200	3.1981	0.0054
EXC	-0.0143**	0.0053	-2.6981	0.0157
IFR	-1.5960	1.1928	1.3380	0.2088
Constant	57.8733***	19.7977	2.9232	0.0095
R-squared	0.8895			
Adjusted R-squared	0.7468			
F-statistic	4.0987***			
Prob.(F-statistic)	0.0040			

Note: **, and *** indicate significance at 5% and 1% respectively.

Source: Authors' computation, 2024.

As shown in the table, the adjusted R-squared of the model representing the coefficient of determination was 0.7468, and it is significant at the 1%

level. It is a measure of the deterministic power of the model, and the value obtained means that about 75% of the variation in the economic growth in the country was determined by the changes in the included explanatory variables. It then follows that all the included variables in the equation were relevant in expressing the variations shown in the economic growth of the nation between 1985 and 2023. Based on this, the null hypothesis of no significant association between the explanatory variables and the explained variable in the long-run is rejected. In the same vein, the F-statistic, which measures the general appropriateness of the model to the data or the overall level of significance stood at 4.0987 and was significant at 1%. This indicates that all the independent variables as a unit significantly determined economic growth. It suggests that the model is well-specified and hence a good fit to the data.

From the table, there is a significant negative association between remittances and economic growth, with a coefficient of -0.4825. This implies that a dollar rise in remittances results in a decline in economic growth by about $0.48. The indirect association between remittances and economic growth could be because a substantial part of remittances is spent on consumption; a lesser part of remittances goes into investments; and remittances are usually invested in jewellery, land, and housing etc., which are not essentially dynamic to the Nigerian economy. The consumption may be dominated by foreign goods. The inverse association may also be due to the unstable political and economic environment in the country. This is, however, contrary to expectation. The findings contradict the submissions of (Onyike et al., 2020; Golder et al., 2023; Dutta & Saikia, 2024). In their various studies, all the authors reported a direct relationship between remittances and economic growth. Nevertheless, the results are in line with those of (Adarkwa, 2015; Olayungbo et al., 2020; Golder et al., 2023; Ogbaro et al., 2023; Biyase et al., 2024).

Also, in the long run, there exists a significant positive association between trade openness and economic growth in Nigeria, meaning that a unit change in trade openness leads to a change in economic growth by 1.0234%. The result is in agreement with a priori expectation and in agreement with Golder et al. (2023), who submitted that there is a positive and significant association between trade openness and economic growth in the long run.

Furthermore, the exchange rate and economic growth in Nigeria are significantly and negatively associated in the long run between 1985 and 2023, with a coefficient of -0.0143. The implication is that for every unit surge in the exchange rate, the nation's economic growth suffered a reduction of 0.0143%. This could be because the high exchange rate led to a fall in productive economic activities, which then led to a decrease in economic growth. In addition to agreeing with a priori expectations, the outcome conforms to the findings of (Olayungbo & Quadri, 2019; Ikwuakwu et al., 2024). The authors had shown earlier that exchange rate and economic growth move in opposite directions. Howbeit, the results deviate from those of Olayungbo et al. (2020) and Shelton (2021), revealing that exchange rate and economic growth co-move in the long run.

4.6 Short-run economic growth model

Table 7 presents the results of the short-run analysis to the long-run association obtained through the ECM equation. The results show that the error correction term, which stood at -0.3998, is significant. This is desired as it aligns with expectations and it further ratifies the presence of a long-run relationship among the variables in the model. The result means that about 40% of disequilibrium in the model is corrected in a year. Also, the adjusted R-squared of 0.9971 implies that 99.7% of the changes in economic growth in Nigeria were influenced by the included explanatory variables in the short run. The F-statistic, which is significant at 1%, implies that all the fractional coefficients are not concurrently equal to zero, and thus, statistically significant, which led to the rejection of the null hypothesis that states that there is no significant link between the explanatory and explained variables in the short run.

Also evident in the table is the fact that an indirect significant relationship exists between remittances and economic growth in Nigeria, with a coefficient of -0.0384 in the short run, which is also contrary to expectation. This signifies that a unit change in remittances yields a reduction in the real GDP in Nigeria by 0.0384 units. The reason for this may be similar to what was adduced for the indirect log-run association. The result is in line with the findings of Oshota and Badejo (2014) and Ikwuakwu et al. (2024), who reported a negative association between remittances and economic growth.

However, the results contradict Gebeyehu (2014) and Onyike et al. (2020), who found that remittances and economic growth are directly related in the various countries where their studies were conducted.

Furthermore, the result reveals a significant positive influence of gross fixed capital formation on real GDP with a coefficient of 0.3084. This means that, with a unit change in gross capital formation, the economic growth in the country increases by 0.3084. Ogbaro et al. (2023) opined that gross capital formation and economic growth co-move. Contrary to this result, Golder et al. (2023) postulate a negative relationship. Also, trade openness and economic growth are significantly positively associated. With a coefficient of 2.4121 and in agreement with a priori expectation, it implies that a unit change in trade openness results in a change in economic growth by 2.4121%. The reason for this may be evident and is likely because the trade between Nigeria and other countries was favourable and surpassed the nation's GDP by over 100%. Several authors like Lawal et al. (2016), Egbulonu and Ajudua (2017), and Olayungbo et al. (2020) have also observed a direct association between trade openness and economic growth in the short run. The exchange rate hurts economic growth, but it is not significant.

Table 7: Short-run Error Correction Estimates of the Economic Growth Model

Variable	Coefficient	Standard Error	t-statistic	Probability
LnRem (-2)	-0.0384***	0.0110	-3.4909	0.0029
LnGCP (-2)	0.3084**	0.1108	2.7840	0.0126
LnTRADO (-1)	1.0001**	0.4002	2.4990	0.0269
EXC	-0.0044	0.0028	-1.4667	0.1021
IFR	0.0358	0.0300	1.2050	0.2535
Constant	5.1642	0.7539	6.8499	0.0000
LnECOG (-)	0.7514***	0.1336	5.6243	0.0001
ECT(-2)	-0.3998***	0.0812	-4.9236	0.0008
R-squared	0.9986			
Adjusted R-squared	0.9971			
F-statistic	1300.211			
Prob.(F-statistic)	0.0000			

Note: **, and *** indicate significance at 5% and 1% respectively.
Source: Authors' computation, 2024.

4.7 Post-estimation econometric tests

As suggested by Olayungbo et al. (2020), the long and short-run estimates obtained from the model were subjected to post-estimation tests to establish their reliability. The results of the normality, serial correlation, and heteroscedasticity tests are shown in Table 8. The results of the Jarque-Bera statistics show that the residuals are normally distributed. The Breusch-Godfrey serial correlation and Breusch-Pagan-Godfrey heteroscedasticity tests indicate that the error terms are not serially correlated and that they are homoscedastic. Thus, it can be concluded that the estimated parameters for the study are stable and useful for policy purposes.

Table 8: Post-Estimation Econometric Tests

Test	F statistic	Prob. value
Jarque-Bera- Normality test	0.15055	0.7322
Breusch-Godfrey-Autocorrelation test	7.0238	0.1346
Breusch-Pagan-Godfrey Heteroscedasticity	0.8924	0.1258

Source: Authors' computation, 2024.

5. Conclusion and Recommendations

This study investigates the causal association between remittances and economic growth in Nigeria over 39 years (1985-2023). Based on the results, an inverse significant association exists between remittances and economic growth both in the long and short runs. Other determinants of economic growth are gross fixed capital formation, trade openness, and exchange rate. Hence, it is recommended that policies that will reduce the percentage of consumption spending from remittances on imported goods should be put in place, and local industries should be supported. The policymakers should develop a policy framework that would raise gross capital formation, thereby making investments in the key sectors of the economy possible. Also, a monetary policy that will ensure a fair and stable exchange rate should be enacted. Finally, authorities in charge of economic and fiscal policies should work together on policies that will strengthen favourable international trade.

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