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INTERACTIVE EFFECTS OF MIGRANT REMITTANCES AND GROSS FIXED CAPITAL FORMATION ON ECONOMIC GROWTH IN NIGERIA

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Abstract:
The previous studies in the relationship between inflows of migrant remittances, gross fixed capital formation, and economic growth in the literature have increased the mixed empirical outcomes in the field of economics. However, very little attention has been given to the interactive effect of migrant remittances and gross fixed capital formation on economic growth, especially in the case of Nigeria. As such, this study mainly examined the long-run interactive effect of migrant remittances and gross fixed capital formation on the economic growth in Nigeria over the period of 1990 to 2023 in a multivariate framework. To avoid spurious results, the study tested the stationarity properties of the variables with the Autoregressive Dickey Fuller (ADF) and Phillips Perron (PP) methods that allow for more complex models in the regression equation. Next, the Autoregressive Distributed Lags Model (ARDL) bounds co-integration test was used to examine the extent of the long-run relationship among the variables used in the study. Also, the econometric technique of Fully Modified Ordinary Least Squares (FMOLS) was used to investigate the coefficients of the explanatory variables on economic growth. Findings show that both migrant remittances and gross fixed capital formation promote the economic growth of Nigeria.

JEL: O40, O49, F30

Keywords: FMOLS, migrant remittances, gross fixed capital formation, economic growth

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1. Introduction

Attaining economic recovery and boosting growth has been the main target of the global economy after the menace of COVID-19 (Aren, 2024; Kiyala & Dianzenza, 2024). Across Africa, promoting growth and building stability have been considered vital for mitigating against the vices of poverty and for pro-poor growth (Griffith-Jones, 2016; Xu *et al.*, 2021). The Nigerian economy slowed growth after COVID-19, amidst fundamental challenges with the annual gross domestic product rate falling from 3.6% in 2021 to 3.3% in 2022, with a projection of a static level of 3.3% in 2023-2024. (AFDB, 2023). For economic growth, savings and investment rates have been considered as key macroeconomic performance indicators vital for a nation (Ehigiamusoe & Samsurijan, 2021). Domestic savings, which are considered a major source of capital formation, have been considered to be closely associated with the remittance inflow from abroad (Benhamou & Cassin, 2021; Qamruzzaman & Kler, 2021).

Over the past decades, remittances have emerged as a critical source of foreign exchange earnings for developing countries. Evidence indicates that remittances positively affect household welfare and may contribute to stimulating economic growth via their beneficial effect on consumption, savings, accumulation of capital formation and investment in developing economies (Khan, 2024; Xia, Qamruzzaman & Adow, 2022). Many empirical studies have been conducted on the effect of remittances on economic development and growth in developing countries (Cazachevici, Havranek & Horvath, 2020; Nyasha & Odhiambo, 2022). Although arguments abound as many research works on remittance consider its role majorly at the household level with little attention considered at the investment level, by and large, remittances' contributions to savings and investment have been largely acknowledged in previous researches (Benhamou & Cassin, 2021; Bird & Choi, 2020).

Nigeria is one of the top remittance-recipient countries in the world (Edeh, Nwannediuto & Njeze, 2023), out of the 96.9 billion USD inflows into Africa in 2022, about 33.6 billion were recorded to flow into West Africa with Nigeria having a large share of about 20.1 billion USD (World Bank, 2023). The percentage of remittances to GDP in Nigeria has been relatively unstable over the years (Nwodo, Omeje & Okereke, 2023). It was below 1% in the 1980-1990 and rose to 2.0 % in 2000, peaked at 8.3% in 2005 and declined to 3.4% in 2014. A 5.8% recorded in 2018 was disrupted to 4% in 2021-2022 due to the effect of the COVID-19 pandemic, with stalled growth made to 4.3% in 2022 (World Bank, 2024).

A notable effect of remittance has been identified as its ability to boost gross capital formation (GCF), especially for developing countries that rely heavily on remittances because remittances may boost GCF by giving investors another source of money for investment (Qamruzzaman, 2023). Gross capital formation raises income levels and productivity and has been determined as a crucial element of economic growth (Opadeji, *et al.*, 2023; Tan, Qamruzzaman & Karim, 2023). An increasing gross capital formation is a sign of economic expansion and investment in possible future growth. Developing

nations have been found to have lower gross capital formation over time than industrialised nations, which is indicative of their lower levels of wealth and income (Azam *et al.*, 2023). As gross capital formation is linked with savings and consumption level, savings from remittances inflow help provide funds, which may stimulate economic growth through their support for technological innovation and the realization of large-scale production (Chijioke, 2024).

The achievement of long-term macroeconomic performance is not possible without substantial capital investment, which is critical for poverty reduction and the enhancement of economic growth (Abdulkarim, 2023). Adequate savings, foreign direct investment, financial development and exchange rate are some of the factors that influence capital formation. Gross capital formation also has the tendency to attract more remittances by creating a favourable investment climate and improving the economic prospects of a nation, as it encourages migrants to send in more capital home and also invest their funds in projects and in the creation of new businesses (Opadeji *et al.*, 2023). Despite the understanding of the role of gross capital formation in growth improvement, most African countries, including Nigeria, have struggled to provide the required capital, resulting in lower national output (Jahanger *et al.*, 2022; Opadeji *et al.*, 2023). The developmental strides attained by contemporary industrialised nations have been largely attributable to stock and growth of human capital, which are components of gross capital formation, thus signifying the acknowledgement of gross capital formation as a catalyst for development.

While the debate on the role of gross capital formation on economic growth and the impact of remittances on growth has continued across the developing countries, little attention has been placed on the long-run interactive effect of migrant remittances and gross capital formation on their overarching relationship with growth. However, given the aforementioned motivations and the lack of studies on the joint role of remittances and gross capital formation on Nigerian economic growth, as well as the conflicting opinions in the literature, it is pertinent to state that these relationships require further investigation. Thus, this study examines the transmission mechanism of migrant remittances and gross capital formation on economic growth in Nigeria. Our choice of Nigeria is based on the slow macroeconomic performance of the country with an attempt to consider how the high remittance inflows can help improve the nation's gross capital formation and their effect on growth performance.

Therefore, the aim of this paper is to examine the interactive effect of migrant remittance inflows and gross capital formation on economic growth in Nigeria over the period 1990 to 2023. The rest of the study is as follows: the second section reviews the previous literature related to remittance inflows, gross capital formation and economic growth relationships. The third section deals with the methodology employed in the study. Section four discusses the empirical results. Lastly, the conclusions and policy recommendations are discussed in session five.

2. Stylized Facts on Economic Growth, Remittances and Gross Capital Formation in Nigeria

From 2000 to 2010, Nigeria's economy recorded impressive growth, with the GDP growth rate rising from 5.0% to 8.0%. The global oil shock had an impact on macroeconomic performance, slowing down the growth rate to 0.8% in 2017 with a slight recovery in 2018-2019, which raised the growth rate to 2.2% in 2019. The menace of COVID-19 drastically affected economic growth globally, with a massive impact felt by developing countries with no social welfare protection. Nigeria recorded a -1.7% growth rate in 2020 amidst the pandemic and with various efforts to recover, attained a growth rate of 3.6% in 2021, which declined to 3.3 % in 2022-2023 due to contraction in public consumption and net exports due to a decline in oil production. The removal of oil subsidies made a huge impact on the Nigerian economy, playing a crucial role in the road to recovery. Economic recovery is expected to be hampered by the persistence of high levels of unemployment, multidimensional poverty, rising inflation associated with food insecurity and high food prices. Figure 1 presents the trend of GDP growth rate from 2000 to 2023.

Figure 1 revealed that the growth rate in 2002 (15%), which was the highest, dropped to 8.0% in 2003. With economic fluctuations, market disturbances and issues of insurgencies, the rate dropped to -1.6% in 2016 and improved to an unsustainable rate of 2.2% in 2019, which was affected by the shock from the COVID-19 pandemic.

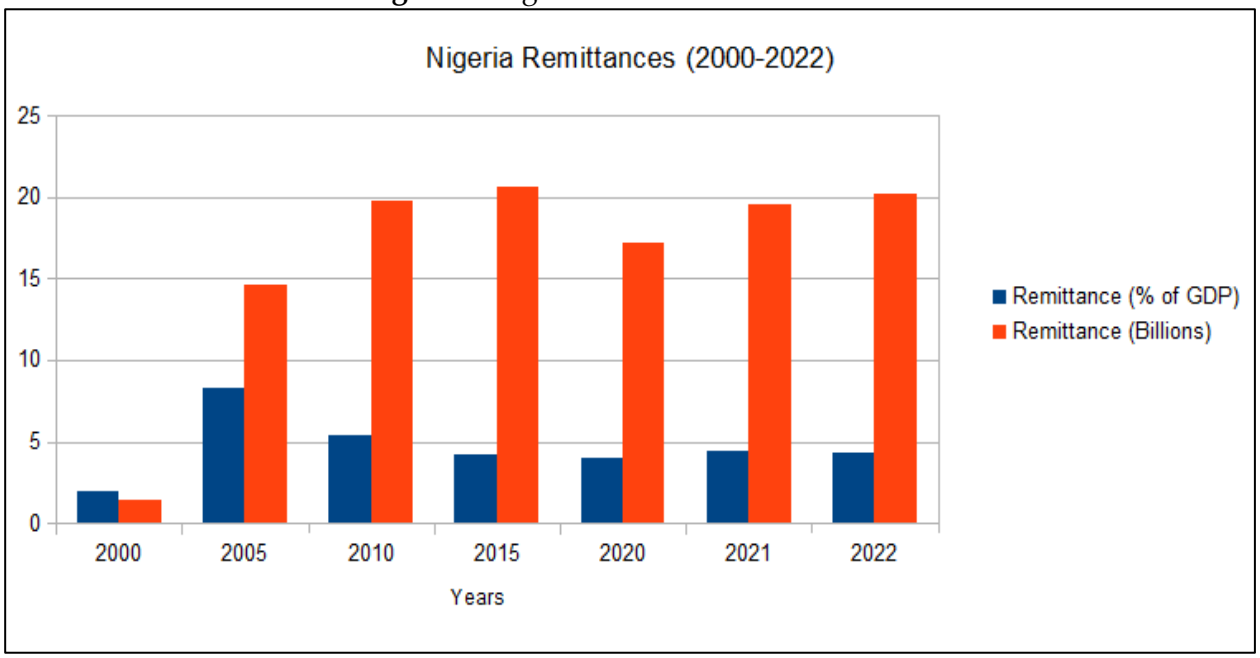
Figure 1: Nigeria GDP growth rate 2000-2024

Source: Authors using WDI data.

During the period 2000-2005, with a high growth rate, migration was at a minimal rate, with most migration associated with educational acquisition from developed countries. As the economic downsides, the rising trend of poverty and unemployment influenced youth migration abroad in search of greener pastures rapidly from 2010 to date. Migrations, which often yield remittances from abroad, have recently been a global

issue with the persistent rise. Figure 2 reveals the trend of remittances received and the contribution of remittances to GDP during the period 2000-2022 in Nigeria. The high level of remittance received during the period 2010-2020 was found not to be in correlation with the percentage of remittances contribution to GDP during the period.

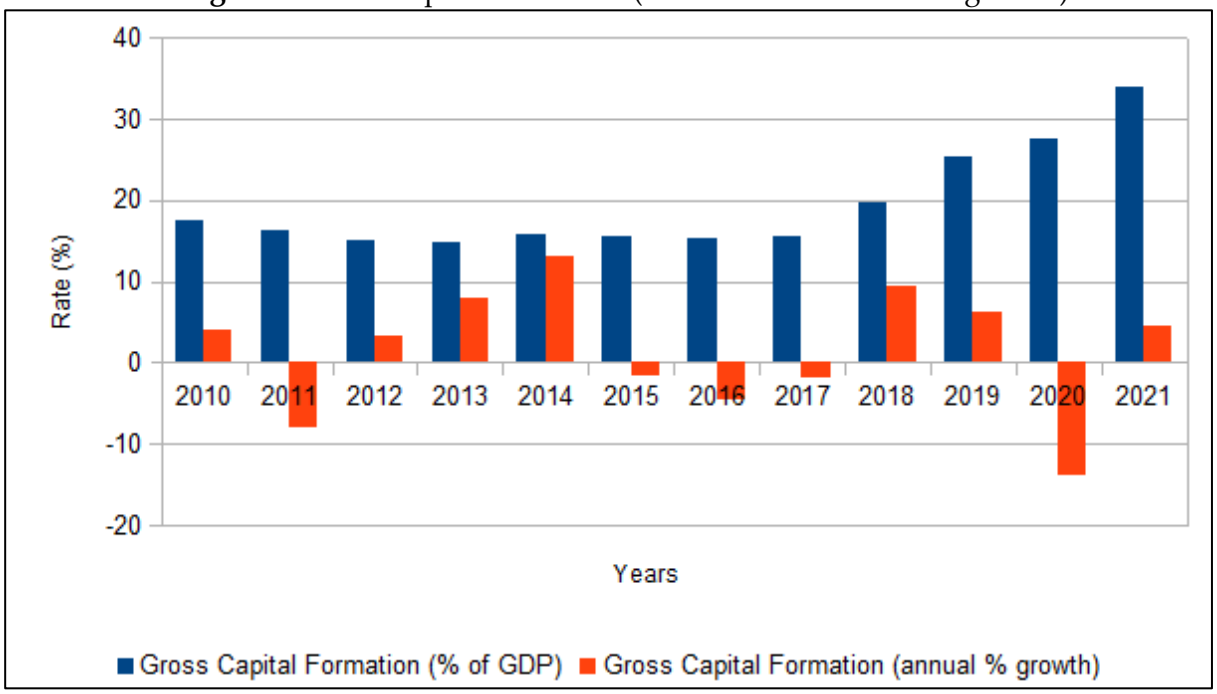
Figure 2: Nigeria Remittances 2000-2022



Source: Authors using WDI data

Gross capital formation represents a key component of GDP spending that shows the level of investment made with capital acquired rather than spending on consumption in an economy. It is the overall change in the value of the economy's fixed assets in relation to the increase in the capital formed. Its potential drivers include foreign direct investment (FDI), interest rates, savings, money supply, exchange rate, country population size and institutions. In Nigeria, the gross capital formation contributions to GDP have increased from 2018 to 2021, with a record of 33.8% in 2021. Its annual growth rate has, however, been fluctuating with negative values recorded in 2015-2017 and also during the 2020 COVID-19 pandemic. Figure 3 presents the trend of gross capital formation (percentage of GDP) and the annual percentage growth rate from 2010 to 2021 in Nigeria.

Figure 3: Gross Capital Formation (% of GDP and annual % growth)



3. Literature Review

The strength of gross capital formation on economic growth has been identified to be closely associated with its driving factors, which vary across developing and developed nations. The effect of migrant remittance inflows and foreign direct investment as a means of capital accumulation in promoting economic growth and development has been largely considered in the literature. On this note, it is important to empirically review some of these previous research works in order to add innovative research to the existing literature.

Human capital formation is considered a channel of remittances in financial development functions. It has been determined that the influence of gross capital formation on economic growth is strongly correlated with its driving forces, which differ for developed and developing countries. Previous studies have mostly focused on the role that savings and foreign direct investment play in capital accumulation; Islam and Biswas (2023) found that foreign grants and gross fixed capital formation both contribute positively to GDP development in Bangladesh. Remittances have a mixed impact on growth; in the Balkan region, they were not important for sustainable growth, but prior GDP, trade, and foreign direct investment (FDI) levels seemed to be related to growth (Jushi *et al.*, 2021). Recent research has demonstrated the importance of foreign remittances and investments for the economic development of underdeveloped nations. While Golder *et al.* (2023) confirmed the effects of financial advances and remittances on economic growth and showed a long-run association between the variables in Bangladesh, Bird and Choi (2020) suggested that FDI has a significant positive effect on economic growth, whereas remittances have a significant and negative effect. Based on

yearly time series data for both countries for the years 1980–2016, Das and Sethi (2020) show that remittances and foreign direct investment have a major influence on economic growth in India, while foreign aid and remittances are crucial for boosting economic growth in Sri Lanka.

Similarly, Dinh Su and Phuc Nguyen (2022) used data from 2002 to 2017 to discover that FDI inflows have varying effects on economic growth in 38 African countries. First, the effects of foreign direct investment (FDI) inflows on economic growth vary, and the effect of the hosting nations' human capital modifies these effects. Additionally, ODA and remittances had a detrimental influence on economic growth; however, these effects are mitigated when receiving countries accumulate more human capital. The study found that there are differences in the correlation between foreign financial flows and human capital when it comes to how these factors affect economic growth in African nations. It also recommended that these nations prioritize investing in their human capital and that more workable policies are desperately needed to improve their ability to absorb foreign capital flows.

According to Islam and Mawutor *et al.* (2023), from the standpoint of growth, imports, remittances, real exchange rates, and foreign direct investment are important. Long-term and short-term economic growth in Ghana is positively and significantly impacted by remittances. The study also showed that imports, real exchange rates, and foreign direct investment had a major and detrimental impact on Ghana's economy's growth process over the long and short terms. Remittances have a favorable effect on the dynamics of financial development in China and India, according to Pal (2024). The study found that while low-level human capital does not contribute to financial development, greater levels of skilled human capital do. Both China's financial institutions and India's financial market benefit from remittances.

Mamun and Kabir (2023) suggest that, in light of the effects of COVID-19 and the ongoing conflict between Russia and Ukraine on the country's economy, the government of Bangladesh should take the necessary actions to boost exports, FDI, and remittance inflows in order to achieve long-term economic growth. Ur Rehman and Hysa (2021) discovered that remittances and financial development had a favorable, unilateral effect on economic growth in the Western Balkans. On the other hand, remittances and financial development together have a major detrimental impact on economic growth. Xia, Qamruzzaman, and Adow (2022) discovered that in countries with high remittances, there is a positive and statistically significant correlation between FDI and gross capital formation as well as between remittances and the growth of human capital. According to the study, providing more incentives could encourage migrants to send more remittances into the economy, ultimately promoting sustainable economic growth. It also explained the unidirectional causality between gross capital formation and human capital development as well as the causal relationship between FDI, remittances, and human capital development.

Since empirical research typically indicates that an effective and productive financial sector may ensure maximum efficiency in the economy, countries should

concentrate on the development of functional interaction with remittances. A robust, effective financial sector in conjunction with remittances can act as a transmission mechanism to assure comprehensive economic growth. Furthermore, due to its mutually reinforcing effects, FDI is considered to be a growth driver in addition to facilitating the creation of human capital. The positive impacts of FDI on the economy are a vital source of funding for addressing account deficits. Furthermore, FDI helps mitigate the scarcity of domestic resources and acts as an instrument for a country's accumulation of capital.

4. Methodology

4.1 Theoretical Framework

Following the work of Rao (2010), Bhaskara Rao and Takirua (2010), Rao and Hassan (2012), the study adopts the augmented Solow growth model (Solow, 1956) within the framework of generalized Cobb-Douglas production function. The output per labour equation is represented as follows:

$$y_t = A_t K_t^{\beta} \quad (1)$$

Where y indicates the growth rate, A is represents the stock of technology and K is the capital per labour, and β is the share of profit. Solow model assumes that the development of technology is defined as:

$$y_t = A_0 \varphi^{dT} \quad (2)$$

where A_0 is the beginning stock of knowledge and T is the time period of the accumulation of knowledge. For the purpose of this study, we assume that:

$$y_t = f(T, REM, GCF, INF) \quad (3)$$

Where
y is the economic growth rate;
REM are the migrants' remittances as a percentage of GDP;
GCF represents the gross fixed capital formation proxy for investment;
INF is the inflation; and
T represents the trend.

The impact of $\mathrm{REM}, \mathrm{GCF}$ and INF on economic growth can be used as an explanatory variable in the production function (Rao, 2010). Therefore,

$$A_t = A_0 \varphi^{dT} REM_t^{\omega} GCF_t^{\gamma} INF_t^{\rho} \quad (4)$$

and

$$y_t = (A_0 \varphi^{dT} REM_t^{\omega} GCF_t^{\tau} INF_t^{\rho}) K_t^{\beta} \quad (5)$$

Equation (5) can be reformulated as follows:

$$\Delta logy = g + \omega \Delta logREM + \gamma \Delta logGCF + \rho INF \quad (6)$$

where the $\Delta logy$ indicates the first difference of logarithm of the dependent variable, g represents the Total Factor Productivity, while $\Delta logREM$ and $\Delta logGCF$ denote the first difference of logarithms of migrant remittances and gross fixed capital formation, and the symbols, ω, γ and ρ are the coefficients of the explanatory variables.

4.2 Data Description and Sources

The empirical analysis focuses on the interactive effect of migrant remittance inflows and gross fixed capital formation on the economic growth of Nigeria. The time series data spanning from 1990 to 2023 was used for the study. The data used was extracted from the World Development Indicators (WDI) databank of the World Bank. The study also considered inflation as an important control variable in the economy, as measured by the consumer price index. The study's basic empirical model is based on the research studies of Oshota and Badejo (2015) within the framework of the Solow-Swan economic growth model. The model is slightly modified to integrate our variables of interest. Rather than considering only the effect of gross fixed capital formation as a proxy for investment alone, the interactive effect of migrant remittances and gross fixed capital formation on the real gross domestic product (RGDP) was also considered. This approach is in variance with previous literature that generally considered the effect of remittance inflows or gross fixed capital formation on economic growth.

Table 1: Data Description, Unit of Measurement and Sources

Series	Unit of Measurement	Source
Migrant remittances	Current US$	WDI
Real gross domestic product (RGDP)	Constant 2010 $ USD	WDI
Gross fixed capital formation	Constant 2015 $ USD	WDI
Inflation	Consumer Price Index	WDI

Source: Authors' compilation, 2024.

4.3 Econometrics Techniques

This paper employed the following empirical processes: First, in testing for the stationarity of the time series data, the Augmented Dickey-Fuller (ADF, 1981) and Philips Perron (PP, 1988) were used. Second, we tested the long-run association among the variables using the Autoregressive Distributed Lag Model (ARDL) bounds test method of Pesaran *et al.* (2001). Third, the long-run interactive effect of migrant remittances and gross fixed capital formation on economic growth was tested using the Fully Modified Ordinary Least Squares (FMOLS) model. Compared with the ordinary least squares estimator, FMOLS estimator removes asymptotic bias and increases efficiency by

correcting both the long run serial correlation in the error term and endogeneity in the explanatory variables caused Kheifets & Phillips (2023).

5. Data Analyses and Interpretation of Results

5.1 Unit Root Tests

From Table 3.2, the unit root test result indicates that at a 5 percent statistically significant level, all the series showed non-stationarity at level, *I*(0), in the case of the ADF unit root test, while inflation was stationary in the PP result. In the first difference, the I(1) test showed that both ADF and PP were stationary. This implies that the null hypothesis of no unit root cannot be rejected at the level. With the mixture of stationary results in both level and first difference, then the econometric technique of ARDL is suitable to examine the long-run association among the variables under study. Therefore, the study proceeds by using the ARDL bounds test method to examine the long-run association among the variables.

Table 3.2: Unit Root Test

	ADF		PP	
Variables	**Level**	**1st Difference**	**Level**	**1st Difference**
RGDP	-1.105 (0.713)	-4.579 (0.001)*	-1.167 (0.687)	-4.518 (0.002)*
REM	-0.803 (0.818)	-5.148 (0.002)*	-0.848 (0.804)	-5.116 (0.000)*
GFCF	0.976 (0.994)	-5.018 (0.001)*	0.968 (0.993)	-5.006 (0.001)*
INF	-2.900 (0.045)	-5.367 (0.001)*	-2.948 (0.040)*	-

Note: The asterisks p-values denote significant level at 5 percent statistical level.

5.2 Autoregressive Distributed Lags Bound Test

To establish a long-run association among RGDP, REM, GFCF, and INF, the autoregressive distributed lags model (ARDL) bounds test was employed. The ARDL bounds test is a specific test within the framework of the ARDL model that is used to determine the presence of co-integration between variables. The approach compares the F-statistics with both the upper and lower critical values. The guideline is that if the F-statistics exceed the upper critical value, it indicates that the null hypothesis of no co-integration is rejected. On the other hand, if the calculated F-statistic falls below the lower bound, it suggests no co-integration. However, in a case where the F-statistics lie within the respective bounds, the co-integration test would provide inconclusive results. From Table 4.5, the ARDL bounds test result shows that, at the 1%, 2.5%, 5%, and 10% significance levels, the F-statistic value of 7.01 is greater than both upper and lower values. Judging from the ARDL bounds test guidelines for rejecting or accepting a hypothesis of no co-integration. The result shows that the hypothesis of no cointegration is therefore rejected. Hence, there exists a long-run association among the series

examined in this study. When this process is concluded, the next calibration is to examine the long-run relationships among RGDP, REM, GFCF, and INF. This is achieved by employing the econometric technique of fully modified ordinary least squares, which is suitable for examining a long-run relationship among dependent and independent variables.

Table 4.5: Result of ARDL Bounds Test

	Value	Significance	Lower Bound	Upper Bound
F-statistic	7.01	10%	4.72	3.77
		5%	3.23	3.35
		2.5%	4.69	5.89
		1%	3.29	4.61

5.3 Fully Modified Ordinary Least Squares

In determining the long-run interactive effect of gross fixed capital formation and remittance inflows, the study first examines the relationship among real gross domestic product, inflation, remittance inflows, and gross fixed capital formation. Table 4.3 indicates that at a 5 percent statistically significant level, the logarithm form of remittance inflows is positive and significant in explaining the growth of the real gross domestic product of Nigeria. A 1 percent increase in the inflows of remittances to Nigeria increases economic growth by 0.047 percent. This has demonstrated the importance of remittances from the diaspora as a major source of funds in the country. This is evidence in the literature that remittance inflows are a good source of funds, in particular to developing countries that are in short supply of capital. The result is in support of the work of Meyer, D., & Shera, A. (2017) and Emeka *et al.* (2024), who also empirically discovered that remittance inflows promote economic growth. However, the recent paper by Ngong *et al.* (2024) concluded that remittance inflows retard economic growth. Also, gross fixed capital formation shows a positive and statistically significant effect in promoting economic growth in Nigeria. The finding shows that a 1 percent increase in the gross fixed capital formation increases the economic growth of Nigeria by 0.038 percent. This result is not surprising because gross fixed capital formation has proved to have a positive and significant influence on economic growth in the literature (Achar *et al.*, 2024)). However, there are mixed results in the literature about the effect of gross fixed capital formation on economic growth. For instance, Aslan and Altinoz (2021) found a negative effect, while Koskei, Buigut, and Kibet's (2013) empirical results displayed no significant effect of gross fixed capital formation on economic growth. From these premises, it is worth noting that good investment management and control can only result in economic growth.

The result of the interaction of migrant remittances and gross fixed capital formation on economic growth produced a positive and significant effect on economic growth in Nigeria. This implies that a 1 percent increase in duo variables increases economic growth by 0.056 percent. Although, when combined, migrant remittances and gross fixed capital formation, a negative effect of inflation on economic growth was

discovered. This result is subject to the government proposing necessary macroeconomic policies to combat the little effect of inflation on economic growth when both remittance inflows interact with gross fixed capital formation.

Table 4.3: Fully Modified Ordinary Least Squares Test results

Without interactive			With interactive		
Variable	**Coefficient**	**Prob. Values**	**Variable**	**Coefficient**	**Prob. Values**
INF	-0.002	0.311	LREM_GCF	0.056	0.001*
LREM	0.047	0.006*	INF	-0.009	0.032*
LGCF	0.038	0.001*	–	–	–

Note: The p-values with an asterisk are significant at 5 percent level.

6. Conclusion

The COVID-19 pandemic has had negative effects on Nigeria and the global economies. The effects affected both the sender and the recipients of remittances. Although prior to the advent of the COVID-19 pandemic, the economy of the country had been relatively good. Improvement in the growth of any country is an important indicator for poverty reduction, employment creation, and improvement in the well-being of the people. Therefore, this study addressed the hypotheses of migrant remittances and gross fixed capital formation as a catalyst for economic growth in Nigeria from 1990 to 2023. Using the ARDL bounds test, cointegration and FMOLS techniques, the study concludes that there is a long-run association among the variables. The outcome further shows that there are long-run interactive positive and significant effects of migrant remittances and gross fixed capital formation on economic growth in Nigeria. Although when we interact with the two variables, inflation shows a negative effect on economic growth. The results further strengthen the empirical results in the literature, which confirmed that migrant remittances are sources of investment and a means of livelihood for families and friends at home. In Nigeria and many other developing countries, a shortage of capital is a great concern for investment and growth. To address this, necessary policies should be put in place to ease the inflow of migrant remittances into the country. The government should also empower financial institutions to ensure unnecessary bottlenecks are discouraged in the sending and receiving of migrant remittances.

Conflict of Interest Statement

The authors declare no conflicts of interest.

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