

Original Article

Accounting for the Role of Financial Development in the Nexus between Remittances and Economic Growth in Nigeria

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Abstract: *Remittances and financial development, according to academics, have an impact on economic growth by making money available to an economy's deficit side. As a result, this study calculates the minimal financial development level needed for remittances to encourage the expansion of the Nigerian economy. In addition, this study looks at the direct impact of remittances as well as the interaction between remittances and financial development on the growth of Nigeria's economy. The New Structural Economics theory has been modified to serve as the foundation for empirical analysis. In order to conduct an empirical study, annual secondary time series data are used for the years 1981 through 2021. World Development Indicators are the source of information on economic growth as assessed by GDP per capita, remittances, financial development, and physical capital. The Statistical Bulletin of the Central Bank of Nigeria is the source of human data. The study employs the Fully Modified Ordinary Least Squares approach for the econometric analysis. Remittances have a negative and negligible impact on Nigeria's economic growth, according to the study's findings. On the other hand, it is discovered that the relationship between remittances and financial development has a positive and considerable impact on economic growth. The results also show the level of financial development beyond which remittances encourage economic growth in Nigeria. The study concludes that the financial sector's growth is necessary for the impact of remittances on economic growth.*

Keywords: *Economic growth, Financial development, FMOLS, Remittances.*

1. INTRODUCTION

The growing debates over what drives economic growth in underdeveloped nations have dominated the economics literature for over 50 years. Some of the factors that have been linked to economic growth include labour force, physical capital investment, foreign capital flows, human capital, and research and development. Other factors that are considered to also play important roles in a country's growth process are institutional elements such as political freedom, political instability, as well as voice and accountability (Fayissa & Nsiah, 2010). However, the research on economic growth has recently become interested in the macroeconomic impacts of foreign remittances. This recent shift of attention could be due to the fact that, next to foreign direct investment (FDI), remittances now account for about half of poor nations' foreign aid receipts (Kapur 2003).

Moreover, remittances have developed into a significant and expanding source of foreign revenue for many developing nations, particularly those in Sub-Saharan Africa (SSA). Remittances from migrant workers to their families back home consist of money and other goods. Remittances have long been regarded as a crucial component of developing nations, providing many of them with a significant amount of financial inflow. They can promote financial market activity, operate as a source of funding for company ventures, provide shock insurance, finance household expenses, create capital for households, and act as a way to close the savings and external funding gaps (Matuzeviciute & Butkus, 2016).

The World Bank (2021a) estimates that global remittances were US\$585.1 billion in 2016, with US\$442 billion going to developing nations. In 2017, it climbed by 7% to US\$613 billion, with an estimated US\$450 billion dollars going to underdeveloped countries. In 2018, the global figure was \$ 616 billion dollars, and in 2019, the figure was \$ 719 billion dollars, with \$ 548 billion going to poor countries. In 2020, there was a drop in global remittances as a result of COVID-19, the global remittances falling to \$702 billion with an estimated value of \$540 billion going to developing countries. Remittances are particularly significant because of their economic role in capital-deficient countries like Nigeria. Their primary benefit to recipient households is an increase in their overall welfare. Seventy percent of remittance monies are spent on consumption, while thirty percent are invested. They help people in developing nations meet their basic needs, invest in both cash and non-cash assets, fund education, support start-up businesses, settle debt, and promote economic growth (Ratha *et al.*, 2011).



In most SSA nations, remittances enter unofficially, decreasing the impact of such funds or types on the banking sector. In the case of Nigeria, the inflow of remittances from 1980 to 2020 amounted to \$446.119 billion (World Bank, 2021a). These data only include remittances received through official routes, while it is thought that there are sizable inflows through unofficial routes as well. The International Monetary Fund (IMF, 2011) has attributed this development, which has serious growth implications, to inadequate financial institutions in developing countries. For example, Falade *et al.* (2018) asserted that Nigeria's poor financial services contribute to the economy's underproductive real sector. Additionally, Omankhanlen *et al.* (2022) made the case that Nigeria's finance system needs to be improved for resource exports to have a substantial impact on economic growth.

A body of scholarship that recognized the degree of financial development in the recipient nation as a crucial link between remittances and growth emerged as a result of this discourse. Researchers in this field have claimed that remittances would enable financially constrained businesses to fund growth-enhancing initiatives if effectively intermediated. Additionally, this frees up cash flow problems and improves the relatives of the migrants' access to loans (Adesoye *et al.*, 2019). In recognition of these facts, the World Bank (2013) emphasized the importance of establishing effective institutions capable of promoting financial development, particularly in developing countries, to boost economic growth. According to Hamma (2016), financial development and remittance inflows influence economic growth by allowing funds to be made accessible to the economy's deficit side, which will have a multiplier effect on macroeconomic indicators. In addition, the economy needs finances as well as a well-developed financial institution to mobilize surplus funds and channel them to the deficit side.

Additionally, according to Dabwor (2020), a growing economy puts additional pressure on the financial sector to mobilize the funds required to generate the profits necessary to promote manufacturing and consequently create jobs. Nigeria has undergone financial development, and as a result, the growth of the money market, operations on the equity and capital markets, bank branches, and the use of debit and credit cards have all increased over time. Point of Sale (POS), Automatic Teller Machine (ATM), electronic deposit transfer, more online banking services, automated banking, and an overall increase in banking deposits are all signs that the Nigerian economy is using payment systems more effectively. Therefore, the purpose of this study was to determine the extent to which Nigeria's level of financial development has effectively handled the influx of remittances, spurring economic growth.

The individual impacts of remittances and financial development on economic growth in Nigeria have been the subject of numerous studies in the past. There has not been enough focus on empirical research on the impact of remittances on economic growth using financial development as a transmission route. Additionally, the hypothesis that there is a financial development threshold at which the arrival of remittances fosters growth has not been sufficiently investigated in the Nigerian context. This is due to the fact that practically all of the few research on threshold analysis that is currently available are panel studies that did not take into account individual differences between nations. Therefore, this study was carried out to fill in these gaps in the literature.

II. EMPIRICAL REVIEW

Based on its primary goals, the empirical research on the relationship between Nigeria's remittances, financial development, and economic growth can be divided into four strands. The first strand consists of studies that looked at how remittances affect economic growth directly. A minority of these studies reported negative, mixed, or inconsequential impacts, despite the fact that the bulk of them found a significant favourable benefit. Studies that found positive and significant effects of remittances on economic growth in Nigeria include Iheke (2012), Akinpelu *et al.* (2013), Akonji and Wakili (2013), Ukeje and Obiechina (2013), Adarkwa (2015), Adeyi (2015), Azuh *et al.* (2015), Muriel (2015), Olusuyi *et al.* (2017), Garba *et al.* (2020), Mohammed (2021), as well as Okorie *et al.* (2022). On the other hand, studies that reported negative, mixed or insignificant effects of remittances on economic growth include Okodua *et al.* (2015), Loto and Alao (2016), Ibukun (2017), as well as Olayungbo *et al.* (2020). Some academics have looked at why remittances may have various effects on economic growth in Nigeria because of the evidence's inherent ambiguity in this initial strand of studies.

A second body of scholarship that focuses on analyzing the impact of financial development on economic growth is emerging concurrently with the first. The research in this second strand used a variety of financial development indicators, such as money supply, banking sector credits, and domestic credit from banks to the private sector. Similar to the first strand, the second strand's evidence is inconclusive. On the one hand, many of these research discovered that the country's financial development positively impacts Nigeria's economic growth. These studies include Akinlo and Egbetunde (2010), Odeniran and Udejaja (2010), Osuji and Chigbu (2012), Nkoro and Uko (2013), Balago (2014), Oriavwote and Eshenake (2014), Taofeek and Olumuyiwa (2016), Agbo and Nwankwo (2018), Azubuike (2019), Imoagwu and Ezeanyej (2019), Mohammed *et al.* (2019), Akintola *et al.* (2020), Osakwe and Ananwude (2020), Albert *et al.* (2021), Michael *et al.* (2021), Odugbesan *et al.* (2021), as well as Sambo *et al.* (2021). However, few other studies found a negative effect of financial development on economic growth, and they include Maduka and Onwuka (2013), Chude and Chude (2016) as well as Iheanacho (2016).

Studies focusing on financial development's function in reducing remittances' impact on economic growth make up the third strand. The attempts to understand the variables that might account for the varying effects of remittances and economic growth, particularly in Nigeria, led to the emergence of this strand. These attempts used the interactive term between remittances and financial development in their growth models. Olayungbo and Quadri (2019), Olaniyan et al. (2020), and Falade et al. (2021) are a few of the works that fall under this category. The results of this body of literature are also inconclusive. This is so because, in contrast to the first study, which found that remittances and financial development are substitutes in the growth process, the other two found that remittances and financial development interact positively and significantly to affect economic growth. These studies have, however, come under fire for failing to pinpoint the precise financial development stage required to maximize the growth advantages of remittances.

The fourth section of the literature consists of a few research that investigated if there might be a financial development threshold above which remittances encourage growth. In an effort to remedy the third strand of the literature's shortcomings, this strand of the literature emerged. Studies in this area include Adetou and Fiondenji's (2019) use of dynamic panel threshold modelling with data on 13 ECOWAS members, including Nigeria, from the years 1985 to 2014. The study looked at how a country's ability to benefit from remittances' growth effects is influenced by its financial development, which was evaluated by banks' domestic lending to the private sector. The study's results showed that although the effect is not statistically significant, remittances positively impact economic growth when exceeding the threshold level of 4.95.

Another study in the final strand is Bangake et al. (2020), which used data from 1975 to 2013 to analyze the connection between remittances, financial development, and economic growth in 76 developing nations, including Nigeria. The study used the four financial development indicators of money and quasi-money, private sector credit, liquid liabilities, and commercial banking assets. Their Panel Threshold Regression (PTR) model's findings showed a positive correlation between remittances and growth for financial development levels between 20% and 50%. On the other hand, the study discovered that for countries with higher levels of financial development, the effect of remittances on growth was negligible. In addition, Ofori *et al.* (2022) assessed the impact of remittances and financial development on income equalization in 48 African countries, including Nigeria, from 1996 to 2020. Using income inequality measures such as the Palma ratio and net Gini index, the researchers found that directing resources towards enhancing Africa's financial sector could result in a more equitable income distribution. Specifically, the findings found that achieving a minimum threshold of 23.05 for financial access and 3.02 for financial institutions' effectiveness is crucial in leveraging the potential of remittances to promote income equalization in Africa. The consensus in the findings of these studies is the existence of a minimum threshold level of financial development required for maximizing the positive impact of remittances on the economy.

The information above can be used to draw some key conclusions. In order to resolve the debate around Nexus, it is first necessary to shed more light on the direct impact of remittances on economic growth. Second, the importance of financial development in the relationship between remittances and economic growth in Nigeria has only been briefly examined in research. Last but not least, the Nigerian environment has not sufficiently addressed the hypothesis that there is a financial development threshold level above which the influx of remittances boosts growth. The few existing studies are panel studies that did not take into consideration the peculiarities of the individual countries, with the exception of Ofori *et al.* (2022). The limitation of the study by Ofori *et al.* (2022) is that it failed to account for the endogeneity problem that may likely arise when examining a relationship that includes remittances and financial development. Another limitation of that study is that it used income equalization instead of economic growth. In order to fill these gaps in the literature, the current study looked at the minimal degree of financial development needed in Nigeria between 1981 and 2021 to maximize the growth advantages of remittances. This was in addition to researching the interaction between remittances and financial development on economic growth in Nigeria and the direct impact of remittances on economic growth.

III. METHODOLOGY

A) Theoretical Framework

In order to develop its theoretical framework, this study updated the NSE theory within the expanded Solow (1956) paradigm. According to the notion, a nation's endowments, including capital (in this example, remittances) and institutions (in this case, financial institutions), serve as growth-promoting factors. Remittances and financial development are therefore seen as complementary components in the process of economic progress. It contends that a robust and effective financial system is essential for allocating resources in a way that maximizes productivity, enabling a more effective distribution of resources and promoting overall growth. Moreover, it recognizes an improved financial system as contributing to enhancing competition, particularly through start-up initiatives. It stimulates innovation due to the presence of a highly skilled workforce. This is in addition to promoting an increase in the aggregate savings rate, ultimately leading to higher output levels.

B) Model Specification

In modelling the ideas stated above, this study adapted the Cobb-Douglas production function specification of Kumar et al. (2017) based on Solow's (1956) methodology. The function is stated generally as follows:

$$Y_t = A_t K_t^\alpha L_t^\beta \quad \text{-----}(1)$$

Where Y is output, A is total factor productivity, K is capital L is labour and t is time-series observation. α and β represent the output elasticities with respect to capital and labour, respectively. Put differently; the two parameters represent, respectively, shares of capital and labour in total income. Assuming the production function in equation (1) exhibits constant returns to scale, such that $\alpha + \beta = 1$ dividing the equation by L yields:

$$y_t = A_t k_t^\alpha \quad \text{-----}(2)$$

where y and k denote output per capita and capital per capita, respectively. Disaggregating capital per capita by type yields the following:

$$k_t^\alpha = k_{h_t}^\gamma * k_{p_t}^\delta \quad \text{-----}(3)$$

where k_h denotes human capital per capita and k_p is physical capital per capita, while $\gamma + \delta = \alpha$.

Substituting equation (3) into (2) yields:

$$y_t = A_t k_{h_t}^\gamma * k_{p_t}^\delta \quad \text{-----}(4)$$

Expressing equation (4) in log form yields equation (5) as follows:

$$\ln y_t = \ln A_t + \gamma \ln k_{h_t} + \delta \ln k_{p_t} \quad \text{-----}(5)$$

This study models total factor productivity (A) in a way that is similar to the approach of Dinh Su and Phuc Nguyen (2020). The authors specified aggregate productivity as a function of foreign financial flows, as shown below:

$$A_t = A_0 (Fcap)^\mu \quad \text{-----}(6)$$

Where A_0 denotes initial total factor productivity, $Fcap$ represents foreign financial flows, and μ denotes elasticity which measures the effects of foreign financial flows on growth. In line with this, this study expresses as a function of remittances, which is a component of foreign financial flows, as shown thus:

$$A_t = A_0 (REM_t)^\mu \quad \text{-----}(7)$$

where A_0 is, as earlier stated, REM denotes remittances and μ denotes elasticity which measures the impact of remittances on economic growth by considering the role of human capital.

Dinh Su and Phuc Nguyen (2020) further proposed that foreign financial flows have both direct and indirect effects on growth, with the latter depending on the economy's ability to absorb the advanced technologies that these flows provide. According to the authors, this capacity is measured by the economy's human capital stock. Hence, they specified μ as a function of human capital stock as follows:

$$\mu = \mu_0 + \mu_1 f(sh) \quad \text{-----}(8)$$

where μ_0 denotes initial total factor productivity and sh is human capital stock. However, this study modifies this specification by replacing human capital with financial development. As a result, it evaluates how remittances affect growth in relation to financial development. This is due to the fact that financial development in a receiving country has been noted as a key mechanism through which remittances affect the growth process (Giuliano & Ruiz-Arranz, 2009; Nyamongo et al., 2012). For instance, effectively utilizing remittance inflows will allow financially strapped businesspeople to finance growth-

enhancing activities, ease their liquidity concerns, and increase migrant families' access to credit. Remittances received through official channels also serve as a spur for financial development in addition to giving banks access to funds. The government can then use loan fees to access money as a result. Encouragement of formal channels for remittance transfers has a good knock-on impact on the financial industry. It makes it easier for money to flow to different areas of the economy. This consequently helps overall economic development and progress. Hence, μ is used to capture how productivity is influenced directly and indirectly by remittances as follows:

$$\mu = \mu_0 + \mu_1 f(FND_t) \quad \text{-----(9)}$$

where FND denotes financial development. For ease of analysis and in the light of Dinh Su and Phuc Nguyen (2020), equation (9) is simplified as follows:

$$\mu = \mu_0 + \mu_1 (\ln FND) \quad \text{-----(10)}$$

Substituting equation (10) into (7) yields the following:

$$A_t = A_0 (REM_t)^{\mu_0 + \mu_1 \ln FND_t} \quad \text{-----(11)}$$

Taking the natural logarithm of both sides of equation (11):

$$\ln A_t = \ln A_0 + \mu_0 \ln REM_t + \mu_1 (\ln REM_t * \ln FND_t) \quad \text{-----(12)}$$

Substituting equation (12) into (3.5) yields:

$$\ln y_t = \ln A_0 + \mu_0 \ln REM_t + \mu_1 (\ln REM_t * \ln FND_t) + \gamma \ln k_{h_t} + \delta \ln k_{p_t} \quad \text{-----(13)}$$

Setting $\ln A_0 = \alpha$, $\mu_0 = \beta$, and $\mu_1 = \sigma$ in equation (13) leads to:

$$\ln y_t = \alpha + \beta \ln REM_t + \sigma (\ln REM_t * \ln FND_t) + \gamma \ln k_{h_t} + \delta \ln k_{p_t} \quad \text{-----(14)}$$

Adding the disturbance term, ε_t , to equation (14) to transform it into an econometric model yields:

$$\ln y_t = \alpha + \beta \ln REM_t + \sigma (\ln REM_t * \ln FND_t) + \gamma \ln k_{h_t} + \delta \ln k_{p_t} + \varepsilon_t \quad \text{-----(15)}$$

The interactive term in equation (15) $\ln REM_t * \ln FND_t$, allows for examining how the role of remittances in the growth process is moderated by the level of financial development. Based on the equation, the interpretations of the role of financial development in mediating the remittances and growth nexus depend on the values of β and σ . There exist four possible interpretations with regard to the values that β as well as σ can take, and they are as follows:

- i) β and σ are both positive. In this case, remittances impact growth positively, while financial development acts as a stimulus in boosting the positive contribution of remittances in the growth process.
- ii) β is positive while σ is negative. In this case, remittances are growth-promoting, but financial development acts as a drag through which the contribution of remittances in the growth process is leaked.
- iii) β is negative while σ is positive. In this case, remittances are growth-inhibiting, while financial development reduces the rate at which remittances inhibit growth by diverting remittances to higher-yielding investments.
- iv) β and σ are both negative. In this case, remittances act as a drag in the growth process by impacting growth negatively, while financial development worsens the rate at which remittances leak outgrowth.

In addition, it has been argued that the statistical significance of β and σ indicates that a threshold value of financial development exists and that beyond this threshold, financial development stimulates remittances positively to contribute strongly to the growth process. The marginal impact of remittances on economic growth is calculated and set to zero to arrive

at this threshold figure. Finding the partial derivative of equation (15) with respect to remittances yields the marginal effect, as shown below:

$$\frac{\partial \ln y_t}{\partial \ln REM_t} = \beta + \sigma \ln FND_t \quad \text{-----} (16)$$

Hence, setting equation (16) to zero and making $\ln FND_t$ the subject of the outcome yields the threshold value as follows:

$$\ln FND_t = \left(\frac{-\beta}{\sigma} \right) \quad \text{-----} (17)$$

It is necessary to remove the logarithmic effect by taking the exponential of the value of $\ln FND$ in equation (17) to find the value of FND as follows:

$$FND_t = e^{\left(\frac{-\beta}{\sigma} \right)} \quad \text{-----} (18)$$

Thus, the condition to be fulfilled for financial development to stimulate remittances positively for the latter to contribute strongly to the growth process is given as:

$$FND_t > e^{\left(\frac{-\beta}{\sigma} \right)} \quad \text{-----} (19)$$

C) A Priori Expectations

The a priori expectations for this study are as follows:

- $\beta > 0$, which implies that an increase in remittances will promote the growth process of the economy;
- $\sigma > 0$, which implies that an increase in the interaction of remittances and financial development will boost the growth of the economy;
- $\gamma > 0$, which implies that an increase in human capital per capita will spur economic growth; and
- $\delta > 0$; which implies that an increase in physical capital per capita will promote economic growth.

D) Technique of Analysis

Calculating equation (15) is necessary to examine both the direct impact of remittances and the combined impact of remittances and financial development on economic growth in Nigeria. If there is no simultaneity bias or endogeneity issue, this equation can be approximated using the Ordinary Least Square (OLS) method. However, the literature is replete with proof that remittances, financial advancement, and economic expansion are all related in both directions. (see, for example, Bangake *et al.*, 2020; Uddin *et al.*, 2020; Islam, 2021). Hence, failure to account for a feedback effect when examining the link among the three will introduce simultaneity bias, possibly leading to the endogeneity problem (Bangake *et al.*, 2020; Shelton, 2021). In addition, the possibility of the explanatory variables on the right-hand side of equation (15) being endogenous also raises the simultaneity bias concern. Another reason why the equation may not be free from the endogeneity problem is the omitted variables bias (Hagan & Amoah, 2019; Shelton, 2021). This is because of the existence of other variables capable of influencing the effects of remittances on economic growth, but which are not within the scope of this study.

The reasons highlighted above call for using an estimation technique capable of capturing and dealing with the endogeneity problem. The efficiency of the FMOLS approach in dealing with the endogeneity problem is well documented in the literature (see, for example, Adusei, 2012; Peia & Roszbach, 2015). The technique gives room for estimating long-run parameters subject to the existence of cointegration among the variables of interest. If this condition is met in this study, then the FMOLS would be used as the appropriate estimation technique. To estimate the threshold level of financial development above which remittances promote growth, the study used equations (16) to (18).

E) Measurement of Variables and Sources of Data

The analysis used annual time series data on Nigeria from secondary sources for the years 1981 through 2021. GDP per capita in current local currency (LCU) was used to measure economic growth, the dependent variable. Personal remittances received in current US dollars were used to calculate remittances. The ratio of domestic bank loans to the private sector to GDP was used to gauge financial progress. But to ensure that all the variables are expressed in comparable units for the sake of empirical analysis, the data on financial development were converted by banks to domestic credit to the private sector in constant LCU. In order to do this, domestic bank lending to the private sector was divided as a share of GDP, with GDP set at a constant LCU. In LCU, the sum of public spending on health and education was used to calculate human capital. Gross fixed capital formation (GFCF) was used in the present LCU to calculate physical capital. Except for government spending on

education and health, collected from the Statistical Bulletin of the Central Bank of Nigeria (CBN, 2021), other data were taken from the World Bank's World Development Indicators (WDI, 2021b).

IV. RESULTS AND DISCUSSION OF FINDINGS

A) Descriptive Statistics

Results of the descriptive statistics, one of the statistical tests carried out in the study, are reported in Table 1. The country's average economic growth (represented by average GDP per capita) for the period under study is ₦208,730.30, while the average remittances and financial development recorded for the period are ₦8.50 billion and ₦4.05 trillion, respectively. The positive mean value recorded for remittances shows that the country recorded more personal remittances over the period of the study. The average human capital recorded for the period under study is ₦238 billion, which is higher than the median of ₦73.20 billion. This indicates that the human capital data is skewed to the right. The mean value for the physical capital is ₦7.96 trillion, while the median is ₦2.47 trillion, indicating that the data are close to normal distribution. The minimum level of GDP per capita recorded for the period is about ₦1,853.14, which shows that economic growth was steady for most of the study period. The low standard deviation values obtained for remittances, financial development and physical capital indicate the absence of outliers. Hence, the mean values for the respective variables accurately represent the population.

The skewness values obtained show that all the variables are positively skewed since the values are greater than zero. The kurtosis values of 2.68, 1.27 and 1.72 for GDP, remittances and financial development, respectively, indicate that the three variables are platykurtic since the values are less than three. However, the kurtosis values of the other variables are greater than 3, showing that they are leptokurtic (fat tail) data. The probability values of the Jarque-Bera statistic of 0.03, 0.04, 0.00 and 0.00 for GDP, remittances, human capital and physical capital, respectively, indicate that the four variables are not normally distributed. These results suggest that the OLS method may not be appropriate for estimating equations (15). This is because an important assumption underlying the use of the method is that all the variables in the model are normally distributed.

Table 1: Descriptive Statistics

	GDP	REM	FND	K_h	K_p
Mean	208730.30	8.50	4.05	237.96	7.96
Median	65274.03	1.21	2.51	73.20	2.47
Maximum	825091.00	24.30	10.00	1070.00	58.30
Minimum	1853.14	0.002	0.98	0.25	0.09
Std. Dev.	251372.90	9.78	3.22	3.17	1.23
Skewness	1.01	0.41	0.63	1.27	2.49
Kurtosis	2.68	1.27	1.72	3.45	9.35
Jarque-Bera Probability	7.12	6.26	5.46	11.42	111.23
	0.03	0.04	0.07	0.00	0.00

Notes: GDP denotes Gross Domestic Product per capita, and the first four figures are in Naira, *REM* denotes remittances, and the first four figures are in billion Naira, *FND* denotes financial development, and first four figures are in trillion Naira, K_h denotes human capital, and figures are in billion Naira, while K_p denotes physical capital, and figures are in trillion Naira.

Source: Researchers' Compilation (2023)

B) Correlation Matrix

A high association between GDP and remittances, financial development, human capital, and physical capital is shown in the correlation matrix in Table 2. This is due to the fact that, on average, each correlation coefficient is higher than 0.8. These findings support the study's hypothesis that endogeneity may be problematic in the relationship under consideration.

Table 2. Correlation Matrix

	GDP	REM	FND	K_h	K_p
GDP	1.000000				
REM	0.895196	1.000000			
FND	0.895487	0.928780	1.000000		
K_h	0.984513	0.844021	0.832358	1.000000	
K_p	0.903406	0.683476	0.703426	0.920585	1.000000

Source: Researchers' Compilation (2023)

C) Unit Roots Test Results

The Augmented Dickey-Fuller (ADF) test, based on the null hypothesis that the series under investigation has a unit root, was used to examine the unit root property of each variable. In order to prevent any of the variables from being integrated into the second order, or I (2), this was done. The outcomes from using intercept simply as well as intercept and trend in the

test equation are shown in Table 3. The table shows that all variables are stationary at the first difference, or I (1), at a significance level of 5%. This shows that the FMOLS technique is appropriate for the empirical analysis.

Table 3: ADF Unit Root Test Results

Variable	Level		First Difference		Order of Integration
	Intercept	Intercept and Trend	Intercept	Intercept and Trend	
$\ln GDP$	-1.38	0.17	-3.44*	-3.66*	I(1)
$\ln REM$	-0.91	-1.70	-6.45*	-6.39*	I(1)
$\ln FND$	-0.45	-2.47	-5.72*	-5.64*	I(1)
$\ln REM * \ln FND$	-0.74	-1.63	-5.80	-5.73	I(1)
$\ln K_h$	-2.27	-3.00	-8.50*	-6.14*	I(1)
$\ln k_p$	0.67	-2.23	-3.93*	-3.93*	I(1)

Notes: $\ln$ denotes natural logarithm, while $\ln REM * \ln FND$ denotes the interactive term between the natural logarithms of remittances and financial development. The critical value at the 5% significance level for intercept only is -2.94, while that of intercept and trend is -3.53. * denotes rejecting the null hypothesis at a 5% significance level.

Source: Researcher's Compilation (2023)

D) Direct Effect of Remittances on Economic Growth

The regression results of the association between remittances and economic growth in Nigeria from 1981 to 2020 are shown in Table 4. The table demonstrates that, with a coefficient of roughly -0.23, remittances have a detrimental impact on economic growth. This suggests that, when controlling for all other factors, a one percent rise in remittances will, on average, cause a 0.23 percent decline in growth, and vice versa. However, as the probability value is demonstrated to be 0.08, the effect is insignificant at the 5% level. The findings also demonstrate a positive and substantial relationship between human capital and economic growth, with a coefficient of roughly 0.25 and a probability value of 0.00. This suggests that, with all other factors held constant, an increase in the human capital of one percent will, on average, improve growth by around 0.25 percent, and vice versa at a significance level of five percent. The results also show that physical capital, with a coefficient of roughly 0.46 and a probability value of 0.00, has a strong beneficial impact on economic growth. This suggests that, with all other factors held constant, an increase in physical capital of 1% will, on average, boost growth by 0.46 % and vice versa at a significance level of 5%.

Table 4: FMOLS Regression Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-10.35*	1.40	-7.39	0.00
$\ln REM$	-0.23	0.13	-1.80	0.08
$\ln REM * \ln FND$	0.01*	0.00	2.85	0.00
$\ln K_h$	0.25*	0.05	4.81	0.00
$\ln k_p$	0.46*	0.09	5.30	0.00
R-squared	0.99			
Adjusted R-squared	0.99			

Note: * denotes significance at the 5% level.

Source: Researchers' Compilation (2023)

E) Interactive Effect of Remittances and Financial Development on Economic Growth

Table 4 also includes the findings of the joint or interaction impact of remittances and financial development on economic growth. With a coefficient of roughly 0.01 and a probability value of 0.00, the findings demonstrate that the interacting term has a positive and substantial effect. This suggests that, with all independent variables held constant, an increase of 1% in the interaction between remittances and financial development will, on average, boost growth by 0.01 % at a 5% level of significance and vice versa. These findings go against the ones made about the direct impact of remittances on economic growth and show that remittances only help growth when they interact with financial development.

The estimated values of the coefficient of determination (R-squared) and adjusted R-squared are roughly 0.99, which means that the model accounts for nearly 99% of the variation in economic growth. In other words, the estimated model has a very excellent fit because all the independent variables together account for almost 99% of the variation in Nigeria's economic development.

F) Residual Diagnostics

Several residual diagnostic tests were carried out to confirm further the validity and dependability of the data acquired by the FMOLS model. The test results are shown in the paragraphs below.

a. Histogram Normality Test Results

The Jarque-Bera (JB) normality test was used to determine if the residuals were normally distributed. The null hypothesis that the residuals are normally distributed serves as the foundation for the test. If the probability value is less than 0.05, the decision rule states that the null hypothesis must be rejected. Figure 1's representation of the test results reveals that the probability value is approximately 0.32, greater than 0.05. It follows that the null hypothesis cannot be ruled out and that the residuals must be regularly distributed.

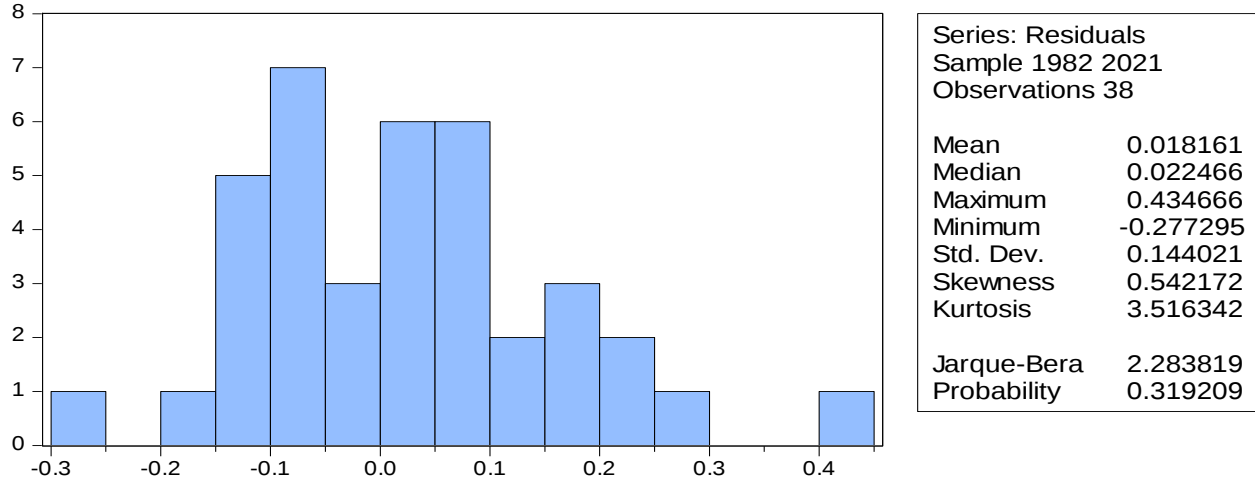


Figure 1: Jarque-Bera (JB) Normality Test Results

Source: Researchers' Computation (2023)

b. Serial Correlation Test Results

The Breusch-Godfrey Serial Correlation Lagrange Multiplier (LM) test was used to assess whether the residuals correlated. This test supports the notion that errors are random and is based on the null hypothesis that there is no autocorrelation. If the probability value is larger than 0.05, the test's decision rule states that the null hypothesis should be accepted. The test's findings, presented in Table 5, show that the likelihood is 0.07 percent. The fact that the value is higher than 0.05 makes it impossible to reject the null hypothesis, demonstrating the absence of serial correlation in the calculated model.

Table 5: Breusch-Godfrey Serial Correlation LM Test Results

F-statistic	2.63	Prob. F(2,34)	0.09
Obs*R-squared	5.37	Prob. Chi-Square(2)	0.07

Source: Researcher's Compilation (2023)

c. Heteroscedasticity Test

The heteroscedasticity test was also performed in this study to determine whether or not the variance of the regression's errors depends on the values of the independent variables (a phenomenon known as heteroscedasticity). The calculated model has homoscedasticity, which is the test's null hypothesis. If the probability value of the F-statistic is more than 0.05, the model is considered homoscedastic. The results shown in Table 6 demonstrate that the F-statistics probability value is greater than 0.05. The analysis concludes that the model is homoscedastic and that the null hypothesis is accepted.

Table 6: Breusch-Pagan-Godfrey Heteroskedasticity Test Results

F-statistic	1.65	Prob. F(4,36)	0.18
Obs*R-squared	6.37	Prob. Chi-Square(4)	0.17
Scaled explained SS	5.32	Prob. Chi-Square(4)	0.26

Source: Researchers' compilation (2023)

G) Threshold Effect of Financial Development in the Remittances-Growth Nexus

This sub-section estimates the threshold level of financial development beyond which remittances stimulate economic growth. However, before proceeding with the estimation, it is necessary to confirm the statistical significance of the coefficient of remittances (β) and the coefficient of the interaction of remittances and financial development (σ). This was

done using the Wald test, which is the test that is usually carried out to ascertain the statistical importance of explanatory variables in a model. A variable with a reported probability value of less than 0.05 obtained from the test is deemed to be statistically important in the model. The results of the Wald test, which are presented in Table 7, reveal that the probability values of both β and σ are significant at a 5 percent level of significance. This implies that the threshold value of financial development actually exists. Hence, the study proceeded with the estimation of that value.

Table 7: Wald Test Results

Variables	F-statistic	Probability Value
lnREM	10.27	0.04
lnREM*lnFND	23.65	0.00

Source: Researchers' Compilation (2023)

The study utilized equations (16) to (18) to estimate the marginal effect of remittances on economic growth in Nigeria. This was done by taking the partial derivative of the fitted regression line with respect to remittances. The fitted regression line is given as follows:

$$\ln y_t = -10.35 - 0.23\ln REM_t + 0.01(\ln REM_t * \ln FND_t) + 0.25\ln k_{ht} + 0.45\ln k_{pt} \quad \text{-----(20)}$$

Differentiating equation (20) with respect to remittances yields:

$$\frac{\partial \ln Y_t}{\partial \ln REM_t} = -0.23 + 0.01\ln FND_t \quad \text{-----(21)}$$

Setting equation (21) to zero and solving for lnFND leads to the following:

$$-0.23 + 0.01\ln FND_t = 0 \quad \text{-----(22)}$$

Simplifying equation (22) gives:

$$0.01\ln FND_t = 0.23 \quad \text{-----(23)}$$

$$\text{Thus, } \ln FND_t = 23 \quad \text{-----(24)}$$

Taking the exponential of the value of $\ln FND$ in equation (24) to find the value of FND as follows:

$$FND = (e^{23}) = \text{₦}9,744,803,446.25 \approx \text{₦}9.75 \text{ billion}$$

The implication of the result above is that financial development, measured using domestic credit to the private sector by banks, must be above ₦9.75 billion to ensure that the inflow of remittances contributes positively to economic growth in Nigeria.

H) Discussion of Findings

Remittances had a negative and negligible direct impact on economic growth for the time period under consideration, according to the study's findings. The findings of Garba et al. (2020), Mohammed (2021), and Okorie et al. (2022), among others, as well as the a priori anticipation conflict with these results. However, in terms of the direction of the effect, the results agree with those of Okodua et al. (2015), Loto and Alao (2016), and Olayungbo et al. (2020). Some factors may have contributed to the findings about the direct impact of remittances on economic growth in Nigeria. First, it could be that a larger percentage of the inflow of remittances into Nigeria is spent on imported goods instead of locally produced goods. This habit is growth-inhibiting because it will discourage local production, reduce employment rates, and increase the country's dependence on foreign producers. Second, the inverse link may simply reflect the fact that remittances are countercyclical, with growth having a greater impact on them than the other way around.

The study's findings also demonstrated that remittances and financial development interacted to boost economic growth significantly. This result is consistent with the hypothesis that more economic growth will result from increased interaction between remittances and financial development. The findings support the findings of the research by Olaniyan et al. (2020) and Falade et al. (2021); however, they do not support the findings of Olayungbo and Quadri (2019). The negative sign of the direct effect of remittances, together with the positive coefficient on the interactive term, imply that remittances are growth-inhibiting. At the same time, financial development reduces the rate at which remittances inhibit growth by diverting remittances to higher-yielding investments. In other words, the argument is that remittances alone cannot drive economic

growth without the aid of a strong and effective financial system. In essence, the growth of Nigeria's financial sector and remittances are complementary to one another.

Results of the threshold analysis indicated that the value of financial development (measured in terms of domestic credit to the private sector by banks), beyond which remittances promote growth in Nigeria, is N9.75 billion. This finding is in line with the assertion by Bangake et al. (2020) that a country's financial sector must be at a certain level before remittances can significantly influence the direction of economic growth. This threshold value of about N9.75 billion is less than the mean value of financial development, which is reported as N4.05 trillion in Table 1. This implies that the country operated above the threshold for the majority of the period of study. This claim is supported by Table 4's regression results, which demonstrate how the relationship between financial development and remittances considerably fueled the expansion of the Nigerian economy over the research period. Since the earlier studies employed different markers of financial progress in their analysis, comparing the threshold results reached by this study with the existing evidence is extremely challenging.

V. CONCLUSION AND RECOMMENDATIONS

The study examined how financial development affected the relationship between remittances and economic growth in Nigeria between 1981 and 2021. It calculated the financial development threshold at which remittances boost growth to accomplish this wide goal. Along with looking at the direct impact of remittances and the interaction between remittances and financial development on economic growth, this was also done.

The study's empirical research revealed that remittances alone do not significantly contribute to Nigeria's economic growth. The results showed that remittances can contribute to economic growth when they are efficiently channelled through a sophisticated financial system. The study concludes that a threshold level of financial development needs to be reached for remittances to translate into significant economic growth. The impact of remittances on economic growth depends upon the financial sector's development, according to the study's findings.

Based on its findings, the study suggests that the government create and implement measures that will guarantee a decrease in the cost of transfers to promote a greater inflow of remittances into the Nigerian economy. In order to guarantee that remittances travel through the official financial system, the government must also improve the Nigerian financial system even further. This will boost economic growth by increasing the amount of credit accessible for investment reasons.

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