



Impact of Remittances on Economic Growth in Africa: An Econometric Analysis

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ABSTRACT

We propose that remittances have severe impact on economic growth of African nations. We tested this proposition by employing panel data from 42 African nations from 2001 to 2020. The fixed effect model is representative of all models used in this study. The unemployment rate (UR) is used as an instrumental variable in the generalized momentum method (GMM) estimation to reduce the endogeneity problem. After conducting rigorous econometric analyses this study suggests that remittances have a significant positive impact on the economic growth of African nations.

Keywords: Remittances, Economic Growth, Africa, Migration, GDP

JEL Classifications: O110, J110, F24, O4, O55

1. INTRODUCTION

Labor migration from one country to another has been a great source of external finance, considered as remittance inflow, and has been increasing dramatically day by day. International remittances have been highlighted as having a considerable impact on the economics of the majority of developing countries worldwide (Ojha, 2019) considered an essential factor for reducing poverty, redistributing income, and fostering economic growth. There are two ways in which remittances are transmitted to the home country official and unofficial channels (Dolapo, 2015). Remittances made only through official channels affect the financial sector, which affects economic growth (Escribà-Folch et al., 2022).

Due to the unprecedented severe attack of the COVID-19 pandemic and the war between Russia and Ukraine, the world economy is expected to decrease the remittance inflow of developing and underdeveloped countries. Likewise, remittances to middle- and low-income countries estimated \$626 billion, which is lower

than 10.2% from the previous year 2021 (World Bank, 2022). Remittance can play a major role in household income, especially in developing and developed countries, because without this, people suffer from poverty, malnutrition, and illiteracy. Different studies show that remittance inflows can withhold stability and resilience in poor nation's families (World Bank, 2022).

A major portion of household income is obtained from remittances in developing and underdeveloped countries, which are mostly situated in South Asia and Africa. This study particularly endeavors to study 42 African nations because of their huge labor migration to other countries. These laborers directly or indirectly contribute to maintaining a stable balance of payments and foreign exchange currency rates, enhance national savings, and contribute to the development budget. To reduce the curse of poverty, remittance inflow could be a great prescription, but it has some demerits, as countries lose their skilled labor as a means of brain drain (Topxhiu and Krasniqi, 2017) which affects economic growth. Remittances can hamper economic growth by affecting the exchange rates of other countries. Some illegal channels such as Hundi and Howala

are used to send remittances that are prohibited according to laws and regulations.

Because of data unavailability and reliability, this study focuses on 42 African nations (Figure 1) with economic contributions from labor migration and remittances inflow. In this study, we use the remittance to GDP ratio, treated as a variable reflecting the contribution of remittances to the economic growth of the selected African nations. The data were collected from 2001 to 2021. From the above graph, it can be seen that labor migration in Burkina Fasso, Burundi, Cabo Verde, Comoros, Congo, Gambia, and Madagascar plays a significant role in economic growth. Lesotho and Liberian economy are highly dependent on remittances inflows around 50% contributions on GDP is from remittances. In addition, this study is unique in nature, as it covers the highest number of African nations regarding this topic, which used advanced econometric methods. This study used 42 African nations as samples, based on the availability and reliability of data. Data were collected using the world development index (WDI). The main findings of this study clearly match the objective of this study as remittances, inflation, human development index, trade openness, net migration rate, and government size have a significant impact on the economic growth of African nations.

Recent evidence of the positive impacts of remittances on the economic growth of African nations has prompted researchers to conduct research on vast nations in the African region (Nsiah and Fayissa, 2011). In this paper firstly an introductory view has been developed to notify the aim of this paper that is the impact of remittances on economic growth of African nations. Second, a detailed relevant literature review was developed. After detailing the literature, selecting variables, model identification, hypothesis development, and methods of this study were decided in the methodology segment. Most importantly, the data analysis and

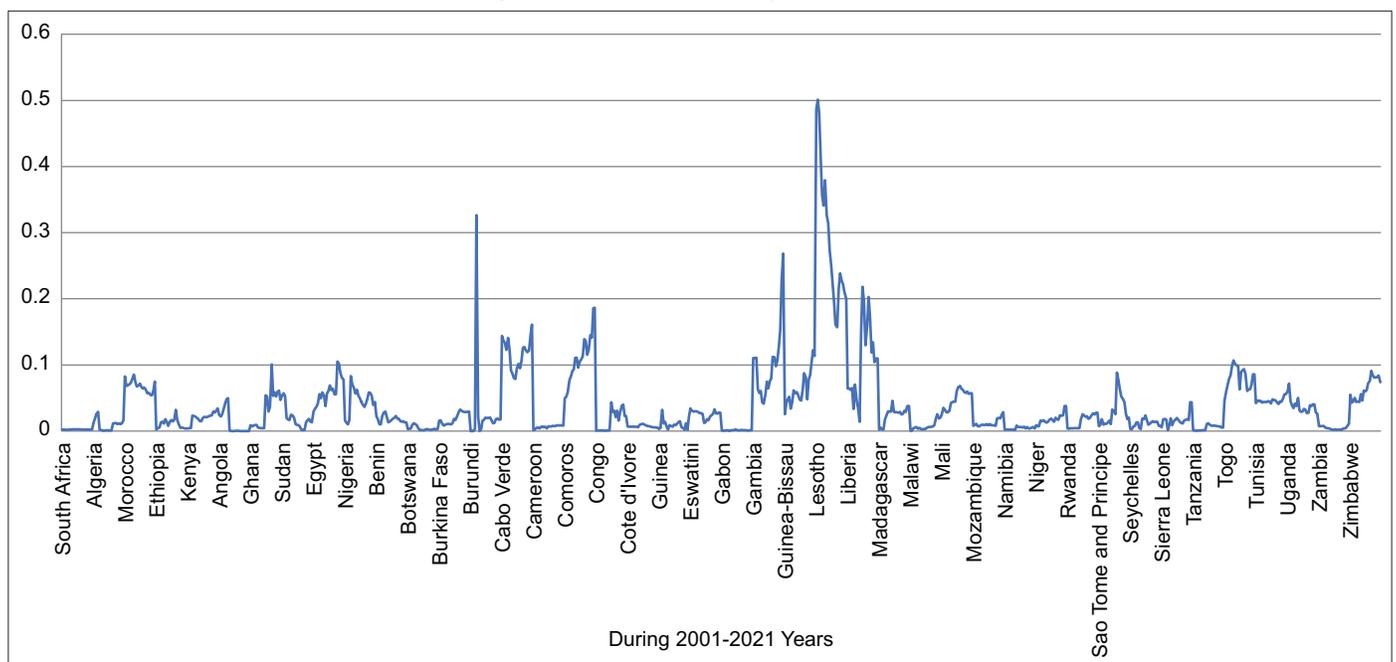
findings are relevant to the aim of this study, which supports remittances that have a significant impact on the economic growth of African nations.

2. LITERATURE REVIEW

Remittances, or the transfer of money from individuals working abroad to their home countries, have been a significant source of income for many developing nations, particularly South Asia and Africa. There has been a growing interest in understanding the impact of remittances on economic growth and poverty reduction in these regions. Studies in this area use econometric models. The results of these studies have been mixed, with some studies finding a positive impact of remittances on economic growth and poverty reduction, whereas others have found no significant relationship or even a negative impact. One reason for the mixed results is the complex nature of the relationship between remittances, economic growth, and poverty reduction. On the one hand, remittances can provide a stable source of income for households and contribute to economic growth by increasing demand for goods and services. On the other hand, remittances can lead to the “Dutch disease” effect, whereby an influx of foreign currency leads to an appreciation of the domestic currency and a reduction in competitiveness in the export sector (Ratha and Moghaddam, 2020). This can lead to decreased economic growth and poverty reduction. The objective of this study is to investigate the influence of remittances on the growth of African nations’ economies. Although there are several research studies exploring the impact of remittances, this paper will only review relevant and applicable research to gain a deeper understanding of the chosen subject matter, given that the focus of this paper is on economic growth.

In recent decades, the aspect of remittances that has been most thoroughly examined is their effect on economic growth. This is

Figure 1: Remittance to GDP growth rate ratio



Source: World Bank reports

not only because of their political importance, but also because remittances can have a wide range of effects on economic growth. There are studies that support a positive perspective on the impact of remittances on growth. First, Pradhan et al. (2008) analyze the impact of remittances on economic growth in 39 developing countries using panel data from 1980 to 2004. Their findings reveal that remittances have a positive effect on economic growth, although the effect is not particularly substantial in magnitude. Cooray (2012) used panel data spanning 1970-2008 to examine the association between remittances and economic growth in South Asia, where his study revealed a significant and favorable connection between remittances and economic growth. Uddin et al. (2020) analyzed the impact of remittances on the economic growth of five selected South Asian countries for the period 1975-2017 which and found a positive relationship between remittances and economic growth, with remittances playing a catalyst role in promoting economic growth. They concluded that remittances have a significant positive effect on economic growth, possibly due to the consumption multiplier effect resulting from the large population of South Asia. In another study, Jawaid and Raza (2016) examined the impact of remittances on economic growth in five South Asian countries using long-term time series data from 1975 to 2009 and found that remittances had a positive and significant effect on economic growth in Bangladesh, India, Sri Lanka, and Nepal over the long term, but a significant negative effect on economic growth in Pakistan. Azam (2015) investigated how remittances affect economic growth in Bangladesh, India, Pakistan, and Sri Lanka, finding, at remittances had a positive impact on economic growth in all four countries. Datta and Sarkar (2014) used an autoregressive distributed lag to investigate the impact of remittances on economic growth in Bangladesh and found that, although there may be a long-run relationship between the two, there is no predictive causal relationship in either the short or long run.

Meyer and Shera (2016) studied the effect of remittances on economic growth using a panel data set of six high-remittance-receiving countries during the years 1999-2013, and found that remittances positively affect economic growth, particularly when remittances are a larger portion of GDP, highlighting the importance of the effective use of remittances to ensure continued economic growth. Catrinescu et al. (2009) examined the impact of remittances on the economic growth of 162 countries over a 34-year period and found that remittances can only contribute to long-term economic growth in countries with high-quality political and economic policies, good governance, and good socioeconomic conditions.

Comes et al. (2018) studied the connection between remittances, foreign direct investment (FDI), and economic growth in Central and Eastern Europe using panel data from seven countries for the period 2010-2016. Nsiah and Fayissa (2011) conducted a panel data analysis to investigate the influence of remittances and other control variables on the economic growth of African, Asian, and Latin American-Caribbean countries from 1985 to 2007, and discovered that remittances, economic openness, and capital-labor ratio had a positive and significant effect on economic growth across all regions, with the greatest impact in the Asian region due to the differences in transaction costs and the utilization of

remittances. This study found that both remittances and FDI had a positive effect on economic growth in all seven countries. Akinpelu et al. (2013) studied the relationship between remittance inflows and economic growth in Nigeria and found a long-run equilibrium between GDP and remittance inflows, the exchange rate, foreign direct investment, openness, and capital formation. Assaf and Maliki (2014) investigated the macroeconomic factors that affect worker remittances to Jordan, utilizing both auto-regressive distributed lag and Vector error correction model approaches based on data from 1972 to 2009, and observed that external factors, notably exchange rates and income levels, had a more powerful effect on remittance flows to Jordan than internal factors such as interest rates and inflation.

Conversely, Chami et al. (2005) found that remittances had a negative impact on GDP growth in a study of 113 countries over a 29-year period from 1970 to 1998, suggesting that the role of remittances is more altruistic than profit-driven. The International Monetary Fund (2005) found no significant direct correlation between real per capita output growth and migrant remittances in 101 countries from 1970 to 2003. Using a panel dataset of 33 developing countries over the period 2003-2014, Ferdaous (2016) found that remittances had a significant negative impact on economic growth, likely because only a small proportion of remittances received in developing countries are utilized for productive purposes. In addition, using a panel dataset spanning 1970 to 2004 across 84 countries, Barajas et al. (2009) also determined that there is no significant impact of workers' remittances on economic growth in developing countries. Pradhan (2016) observed a positive relationship between remittances and economic growth in China; a negative effect in Brazil, India, and Russia; and an insignificant effect in South Africa when examining a balanced panel of data from 1994 to 2013 for five emerging economies. Sutradhar (2020) found that remittances have a negative relationship with economic growth in Bangladesh, Pakistan, and Sri Lanka, but a positive impact in India, possibly due to the more productive use of remittances in profit-generating activities compared to other countries. Hasan and Shakur (2017) found that, while remittances had a negative effect on Bangladesh's per capita GDP growth at first, the effect eventually became positive over the years 1976-2012. Shaikh et al. (2016) found that personal remittances had no effect on Pakistan's economic growth over a 35-year period from 1980 to 2014.

Oshota and Badejo (2014) observed that remittances had a positive effect on Nigeria's economic growth in the long run, but a negative effect in the short run, when examining the impact of remittances on Nigeria's economic growth from 1981 to 2011. Tolcha and Rao (2016) found that remittances had a negative effect on Ethiopia's economic growth in the long run and a positive effect in the short run, when examining the impact of remittances on Ethiopia's economic growth from 1981 to 2012. In a study spanning 1970-2005, Karagoz (2009) investigated how workers' remittances impacted economic growth in Turkey, and the results indicated a negative correlation between the two.

Some studies find no relationship between remittances and economic growth. Siddique et al. (2012) conducted an analysis

utilizing Granger causality tests to analyze the connection between remittances and economic growth in Bangladesh, India, and Sri Lanka, based on time-series data for a 25-year period, they discovered that remittances had an effect on economic growth in Bangladesh and a two-way directional causality between growth and remittances was detected in Sri Lanka, whereas in India, there was no link between remittances and economic growth.

Studies have suggested that remittances can play a role in reducing poverty levels, as they can drive economic growth and human development. In most cases, remittances have been shown to have a positive effect on poverty reduction; however, some studies have found an insignificant relationship between the two. Thus, the impact of remittances on poverty reduction is complex and nuanced.

Azam et al. (2016) found that foreign remittances had a significant positive influence on poverty alleviation in upper- middle-income countries, as demonstrated by their study of 39 countries across various income groups from 1990 to 2014. Abduvaliev and Bustillo’s (2020) study found that remittances had a slightly positive and, significant effect on economic growth, but an inverse relationship with poverty, and concluded that its promotion should not be relied upon as the sole development strategy because of potential drawbacks, such as reduced government spending on welfare, a lack of institutional reform, moral hazard, and brain drain. Adams (2005) demonstrated that international migration and remittances had a statistically significant impact on reducing poverty levels in the developing world, with changes in the proportion of migrants working abroad and the number of official remittances sent home influencing poverty levels in these countries. Gupta et al. (2009) find that remittances have a direct poverty-mitigating effect and a positive impact on financial development in sub-Saharan Africa, with migrant transfers easing households’ immediate budget constraints and providing small savers with the opportunity to gain access to the formal financial sector. Javid et al. (2012) used an autoregressive distributed lag approach to analyze the impact of remittances on economic growth and poverty in Pakistan from 1973 to 2010, and found that remittances have a positive and significant relationship with economic growth, as well as a strong and significant impact on poverty reduction. Thus, remittance inflows can positively affect the social and economic conditions of the recipient country.

In contrast, in 2005, the International Monetary Fund disclosed that the use of remittances to finance essential consumption could significantly reduce poverty, despite having a limited impact on economic growth. Petreski and Jovanovic (2013) analyzed the impact of remittances on poverty, inequality, and self-employment in three Balkan nations: Bosnia-Herzegovina, Kosovo, and Macedonia. Their study revealed that remittances played a constructive role in decreasing poverty in Kosovo and Macedonia, but not in Bosnia. Serino and Kim (2011) study the impact of international remittances on poverty in 66 developing countries from 1981 to 2005, and found that their effects are not uniform across poverty quantiles, as revealed by their quantile regression analysis.

Considering the literature reviewed and to meet the research aims, three hypotheses were developed to analyze the impact of remittances in economic growth in South-Asian and African countries. These are as follows:

H₁= Remittances have significant impact on economic growth (GDP) of African nations

3. METHODOLOGY

To analyze the impact of remittances on economic growth in Africa, the dollar value of the Gross Domestic Product (GDP) was used as a measure of economic growth, indicated as the dependent variable. The independent variables included remittance, foreign direct investment, inflation, health expenditure, secondary education enrollment, human development, migration, trade openness, and government size. Remittance was the main independent variable, and the other variables were used as control variables (Table 1). Corresponding econometric models were developed to examine the relationship between remittances and economic growth, based on the hypotheses developing the literature review section.

42 countries were chosen based on data availability from 54 African countries. Data were collected from the World Bank Open Data and Country Economy over the 2001-2021 period, resulting in a sample size of 882 (42 countries multiplied by 21 years).

Total sample size	Sample size for this research	Percentage	Number of years	Sample size
54	42	77.78	2001-2021	882

The primary equations developed for the study is as follows

$$\ln GDP = \beta_0 + \beta_1 \ln REM_{it} + \beta_2 FDIGDP_{it} + \beta_3 IR_{it} + \beta_4 HEGDP_{it} + \beta_5 EE_{it} + \beta_6 HDI_{it} + \beta_7 NM_{it} + \beta_8 TO_{it} + \beta_9 GS_{it} + u_i \quad (1)$$

Equation (1) captures the effect of remittances on economic growth for African nations, using fixed effects, random effects, pooled OLS, and GLS methods. Furthermore, we chose the unemployment rate (Gupta et al. 2009) as an instrumental variable to address endogeneity issues by testing Generalized Momentum Method (GMM). Therefore, the modified equations are as follows:

$$\ln GDP_i = \beta_0 + \beta_1 \ln REM_{i(t-1)} + \beta_2 RGDP_i + \beta_3 FDIGDP_i + \beta_4 IR_a + \beta_5 HEGDP_i + \beta_6 EE_i + \beta_7 HDI_i + \beta_8 NM_i + \beta_9 TO_i + \beta_{10} GS_i + \beta_{11} UR_i + u_i \quad (2)$$

3.1. Dependent Variable

3.1.1. Gross domestic value

Gross Domestic Product (GDP) is a monetary indicator that represents the total value of all final goods and services produced within a country’s borders during a set timeframe, generally a quarter or year.

3.2. Independent Variables

3.2.1. Remittance received

A remittance is typically defined as the transfer of funds or money from an individual working abroad to their family members or another designated recipient located in their home country. The impact of remittances on economic growth can be positive or negative.

3.2.2. Foreign direct investment to GDP ratio

The foreign direct investment to GDP ratio is a measure of the total amount of money invested in a country by foreign investors as a percentage of the country's Gross Domestic Product (GDP). Studies show that foreign direct investment can lead to an increase in economic growth, demonstrating a strong correlation between the two. The equation for this ratio is as follows:

$$FDI \text{ to GDP ratio} = \frac{\text{Total value of foreign direct investment}}{\text{Total amount of GDP}}$$

3.2.3. Inflation rate

The rate of inflation is an indication of how quickly the prices for goods and services rise over a certain period. This is usually measured as the annual percentage change in the Consumer Price Index (CPI) or overall cost of goods and services. Lower inflation rates are associated with greater economic growth, creating an inverse relationship between the two. The inflation rate equation is as follows:

$$\text{Inflation rate} = \frac{P_1 - P_0}{P_0}$$

Here, P1 is the inflation rate of the current year and P0 is the inflation rate of the previous year.

3.2.4. Health expenditure to GDP ratio

The health expenditure to GDP ratio is a measure of how much money a country spends on health care relative to its overall economic output. This ratio indicates the importance of health spending in a country's economy, and is often used to compare the level of health spending between countries. Studies have shown that increased health expenditures correlate with better health outcomes and potentially higher economic growth. The equation for calculating this ratio is as follows:

$$\text{Health expenditure to GDP ratio} = \frac{\text{Total value of health expenditure}}{\text{Total amount of GDP}}$$

3.2.5. Education enrollment, secondary (% gross)

This ratio is a measure of the proportion of students enrolled in secondary education, regardless of their age, compared to the population of students in the appropriate age group. Higher levels of educational enrollment can lead to improved productivity, infrastructure, and access to resources, which can lead to increased economic growth. The formula for this ratio is as follows:

$$\text{Education enrollment} = \frac{\text{Number of students enrolled in secondary education, regardless of their age}}{\text{Population of the official school age}}$$

3.2.6. Human development index score

The Human Development Index (HDI) is a measure of average achievement in key aspects of human development, such as life expectancy, education, and income, which are used to rank countries into four tiers of development, with a higher score indicating a higher level of human development.

3.2.7. Net migration rate

The net migration rate is the net change in the population of a given area owing to people entering and leaving the area in a given year. The rate is determined by the ratio of the population change over the course of 1 year, with the mid-year population providing the base figure. Net migration can positively contribute to economic growth by increasing productivity levels bringing in new skills and labor, and improving quality of life, resulting in increased consumer spending. The equation for this ratio is as follows:

$$\text{Net Migration Rate} = \frac{\text{Number of Immigrants Entering the area} - \text{Number of Emigrants leaving the area}}{\text{Total population of receiving country}}$$

3.2.8. Trade openness

The level of trade openness can be determined by calculating the percentage of a country's gross domestic product that comes from both exports and imports of goods and services. This can have a positive or negative relationship with economic growth. The formula for calculating trade openness is:

$$\text{Trade Openness} = \frac{\text{Sum of export and import of goods and services}}{\text{Total Gross Domestic Product}}$$

3.2.9. Government size

This is the share of the general government's final consumption expenditure as a percentage of the total gross domestic product of a country. Here, the general government's final consumption expenditure covers all the present expenses of the government on procuring goods and services, and it encompasses the compensation given to government employees. It also accounts for most of the expenses incurred by the government on national defense and security, except for the military expenditures that contribute to the government's capital formation. The formula for calculating the government size has a negative relationship with economic growth:

$$\text{Government Size} = \frac{\text{General government final consumption expenditure}}{\text{Total Gross Domestic Product}}$$

3.2.10. Unemployment rate

The unemployment rate is an indicator of the percentage of people in the labor force without a job. The relationship between unemployment rate and economic growth is inverse. When the economy is growing, businesses are more likely to expand their workforce, which can lead to a decrease in the unemployment rate and vice versa. The formula for calculating the unemployment rate is:

$$\text{Unemployment rate} = \frac{\text{Total number of people unemployed}}{\text{Total labor force}}$$

Table 1: Dependent and independent variables with their expected sign of coefficients

Variables	Notation	Description	Expected sign
Dependent variable			
Economic growth	lnGDP	Natural logarithm of gross domestic product	N/A
Independent Variables			
Main independent variable			
Remittance	lnREM	Natural logarithm of Remittance received	(±)
Control variables			
Foreign direct investment	FDIGDP	FDI to GDP ratio	(-)
Inflation	IR	Inflation rate	(-)
Health expenditure	HEGDP	Health expenditure to GDP ratio	(+)
Education enrollment	EE	Education enrollment, secondary (% gross)	(+)
Human development	HDI	Human development index score	(+)
Migration	NM	Net migration rate	(+)
Trade openness	TO	Trade (% of GDP)	(±)
Government size	GS	General government final consumption expenditure (% of GDP)	(-)
Instrumental variable			
Unemployment	UR	unemployment rate	(-)

Source: Author's estimation

Table 2: Descriptive statistics

Variable	Observation	Mean	Standard deviation	Min	Max
lnGDP	882	23.11248	1.719949	18.1456	27.07622
lnREM	882	18.94887	2.04909	9.347575	24.17284
FDIGDP	882	0.0418339	0.0770209	-0.1072495	1.033374
IR	882	2.75671	77.83054	-0.0961615	2311.509
HEGDP	882	0.0563177	0.0219839	0.0238509	0.2041341
EE	882	0.4742648	0.2251997	0.06487	1.094441
HDI	882	0.5167982	0.1146593	0.268	0.802
NM	882	-0.0029775	0.0245759	-0.533	0.0468986
TO	882	0.6672529	0.3419156	0.0014439	2.250231
GS	882	0.1686477	0.0897557	0.0095175	1.1256

Source: Authors' calculation

All of the above discussion regarding independent variables and dependent variables are summarized in the following tables.

4. EMPIRICAL RESULTS

4.1. Descriptive Statistics

Table 2 displays summary statistics of the regression variables used in this study. The table shows the mean value of economic growth (lnGDP) is 23.11248, the mean value of remittance (lnREM) is 18.94887, and the mean value of foreign direct investment (FDIGDP) is 0.0418339. In addition, the mean values of the inflation rate (IR) and human development index score (HDI) are 2.75671 and 0.0563177, respectively, indicating that they exert a significant impact on the economic growth of African countries.

4.2. Test of Multicollinearity

Table 3 displays that the average Variance Inflation Factor (VIF) is 2.19, which is below the benchmark value of 5. Therefore, it can be inferred that there was no multicollinearity issue in these models.

4.3. Hausman Test

According to Table 4, the P-value for the Chi-square test was below the acceptable threshold of 5%. Therefore, the null hypothesis is rejected, and it can be concluded that the fixed-effects approach is superior to the random-effects technique.

Table 3: Variance inflation factor (VIF)

Variable	VIF	1/VIF
lnREM	1.42	0.706598
FDIGDP	1.18	0.846265
IR	1.02	0.978712
HEGDP	1.25	0.799098
EE	5.09	0.196593
HDI	5.17	0.193463
NM	1.93	0.971308
TO	1.93	0.518148
GS	1.60	0.625291
Mean VIF		2.19

Source: Authors' calculation

Table 4: Output of hausman test

Chi-square	P-value
54.68	0.0000

Source: Authors' calculation

Table 5: Output of B/P LM test

Chi-square	P-value
6070.64	0.0000

Source: Authors' calculation

H0= Random effect is better than fixed effect method.

H1= Random effect is not better than fixed effect method.

Table 6: Output of coefficients-FE, RE, Pooled OLS and GLS method

Variable	FE	RE	Pooled OLS	GLS
LNREM	0.09336178***	0.10056394***	0.38350879***	0.38350879***
FDIGDP	0.04631961	0.03676557	-0.50818183	-0.050818183
IR	-0.00034575**	-0.00034879**	-0.00044278	-0.00044278
HEGDP	0.2973581	0.30629018	-6.6622487***	-6.6622487***
EE	0.19072018	0.18213009	-1.5207736***	-1.5207736***
HDI	9.3822655***	9.2023684***	7.9007845***	7.9007845***
NM	0.10662442	-0.12724404	2.6498609	2.6498609
TO	-0.00831167	-0.03346518	-1.1469944***	-1.1469944***
GS	-0.52830942**	-0.61150602***	-3.4461529***	-3.4461529***
Constant	16.481417***	16.47277***	14.23565***	14.23565***
Summary				
N	882	882	882	882
R square	0.8020		0.5811	
Chi-square		3172.5528		1223.446
F	373.97569		134.39719	
sigma_u	1.6221362	1.0521169		
sigma_e	0.2335014	0.2335014		
rho	0.97969994	0.9530571		

*P<0.05; **P<0.01; ***P<0.001. Source: Authors' calculation

4.4. Breusch-Pagan Lagrange Multiplier Test

Table 5, demonstrates that the P-value is below the acceptable threshold of 5%, leading to the rejection of the null hypothesis. Therefore, it can be concluded that the random effect method is superior to the pooled OLS approach.

H_0 = Pooled OLS method is better than Random effect method.

H_1 = Pooled OLS method is not better than Random effect method.

4.5. Regression Results

After running these three regressions (Table 6), the Hausman test is conducted, and it is observed that the fixed effects model is a better choice than the random effects model. Then, the Breusch-Pagan LM test is conducted, and it is found that pooled OLS is the better choice over the random effects model. These results are similar to those research work of (Topxhiu and Krasniqi, 2017). Finally, the presence of unobserved heterogeneity and the fixed-effects model are preferable to a pooled OLS model. In the fixed effects mode, R^2 values were 0.8020 and 0.5811 for the FE and Pooled OLS methods, respectively. R^2 88.20 means 88.20% variations in lnGDP growth is explained by the explanatory variables. Therefore, the fixed effects and pooled OLS models are appropriate among the three models. In this study, according to the Hausman test fixed effect model, is better than the other models. The results of the fixed effects model indicate that a 1% increase in remittance growth leads to 0.0934% increase in GDP growth in African emerging countries. On the other hand, the impact on these countries is statistically insignificant and negligible, as it has a negative impact of -0.00035%, which is close to zero. Human development index (HDI) measures the average achievement in key aspects of human development, where higher scores indicate a higher level of human development. This study finds the HDI is 9.20 indicates 1% increase in HDI is responsible for 9.20% positive change in the economic growth of African nations. This is the share of the general government's final consumption expenditure as a percentage of the total gross domestic product of a country. This has a negative relationship with economic growth. Our study founded the government size (GS) value -0.612 indicates 1% increase in GS will responsible to 0.612% negative change in GDP of the African nations which is quite insignificant number.

4.6. Test of Heteroscedasticity

Table 7, suggests that the P-value for the Chi-square value is <0.05, leading to rejection of the null hypothesis. This indicates that the model exhibits heteroscedasticity, and the hypothesis is as follows:

H_0 = The models have constant error variance.

H_1 = The models have non- constant error variance.

4.7. Wooldridge Test of Autocorrelation

Table 8 indicates that the model exhibits a problem with first-order autocorrelation, as the P-value is below the acceptable threshold of 5%.

H_0 = The models do not suffer from first order auto-correlation.

H_1 = The models suffer from first order auto-correlation.

4.8. Ramsey Reset Test

In Table 9, the P-value for the F test is below the 5% threshold, leading to the rejection of the null hypothesis. This suggests that the model may suffer from missing variable bias.

H_0 = Models have no omitted variable.

H_1 = Models have omitted variable.

4.9. Test of Endogeneity

Considering the unemployment rate as an instrumental variable, we conduct a GMM test (Table 10) in which remittance (LNREM), inflation rate (IR), human development index score (HDI), net migration rate (NM), trade openness (TO), and government size (GS) have statistically significant impacts on the economic growth (lnGDP) of the selected South Asian countries. In addition, The Wald Chi-square statistic of 11932.89 indicates that the independent variable jointly contributes to the variability in economic growth (lnGDP).

5. MAJOR FINDINGS

This study aims to determine the relationship between remittances and economic growth in selected African countries. The endogeneity problem can be solved using instrumental variables and a generalized method of moments (GMM) estimation. A large

Table 7: Modified wald test for group wise heteroscedasticity

Method	Chi-square	P-value
Fixed effect	2188.59	0.0000

Source: Authors' calculation

Table 8: Test of autocorrelation

F value	P value
194.076	0.0000

Source: Authors' calculation

Table 9: Ramsey RESET test

F value	P value
5.43	0.0011

Source: Authors' calculation

Table 10: Output of coefficients-GMM method

Variable	Coefficient	Z-value	P-value
lnGDP L1.	0.6210637	26.69	0.000
lnREM	0.0421568	5.88	0.000
FDIGDP	-0.0140774	-0.16	0.872
IR	-0.0002524	-4.42	0.000
HEGDP	0.1804025	0.31	0.759
EE	-0.2051023	-1.58	0.114
HDI	3.044312	8.09	0.000
NM	2.953178	5.13	0.000
TO	0.2051136	4.74	0.000
GS	-0.6817614	-5.27	0.000
UR	-0.0712713	-1.41	0.159
Cons	6.526684	16.50	0.000
Wald Chi-square		11932.89	
P-value		0.0000	

Source: Authors' calculation

sample size needs to be developed to remove the bias of the GMM estimators.

Considering the unemployment rate as an instrumental variable, we conduct a GMM test where remittance (lnREM), inflation rate (IR), human development index score (HDI), net migration rate (NM), trade openness (TO), and government size (GS) have statistically significant effects on the economic growth (lnGDP) of the selected South Asian countries. In the table, it can be seen that the coefficient of remittance (lnREM) is 0.0421568, which is positive, this means that foreign remittance has a positive impact on the economy of African nations, which means the absence of unproductive use of remittances as families use remitted money for productive purposes, which also enhances the labor supply for the nations. This significant impact also indicates that the right channel has been used to send remittances from foreign countries. Therefore, this study suggests that African countries should prioritize increasing remittances to boost their economic growth.

6. CONCLUSION

In conclusion, various panel estimation methods were used in this study, including GLS, pooled OLS, fixed effect model (FE), random effect (RE), and GMM. The models we used to determine the impact of remittances on economic growth in African

Nations. During this study, the Hausman test was used to select an appropriate model. According to the results, the fixed-effects model was the most appropriate for running the analysis. This study supports the view that African countries have received a large number of remittances in the last few decades, which reflects that remittances have a significant positive effect on economic growth, supporting the proposition of other literature reviews. Our study had some limitations. First, we only examined 42 countries due to issues with data availability and consistency, despite covering all nations in Africa. Second, we only used quantitative variables, and there may be qualitative variables that influence economic growth, which could be explored in future research. Third, we recognize that there may be unknown omitted factors that could have affected our analysis. Despite these limitations, our study provides valuable insights that could inform think tanks and their initiatives to promote economic growth.

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