



The role of remittances in the sustainable development of developing economies: a panel data analysis of 43 African countries

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Abstract

This study investigates the economic determinants of remittances in developing African nations, employing a panel analysis of 43 countries to discern the macroeconomic factors that significantly impact remittance inflows. As remittances play a pivotal role in the financial stability of many African economies, understanding these determinants is essential for informed policy-making and strategic economic planning. Utilizing data from 1980 to 2022, we applied the Feasible Generalized Least Squares methodology to assess the influence of various economic indicators. Our findings indicate a positive correlation between remittance inflows and key variables such as GDP per capita growth, money supply, imports, and exchange rates. Conversely, higher levels of government spending, inflation, and exports are associated with lower remittance inflows. The role of unemployment in influencing remittances is complex and warrants further investigation. Additionally, governance quality significantly affects remittance flows; stronger anti-corruption measures are linked to higher remittances, whereas more effective government and stronger rule of law are associated with lower remittances, likely due to a diminished dependency on external financial aid. These insights highlight the intricate relationship between economic performance, institutional quality, and remittance inflows, offering valuable guidance for policymakers in developing and emerging economies who seek to enhance remittance inflows as a crucial source of financial support.

Keywords Remittances · Economic growth · Money supply · Panel FGLS · Developing countries

JEL Classification F24 · F63 · H72 · O42 · O55

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1 Introduction

Remittances represent the monetary earnings acquired abroad by citizens and subsequently sent back to their countries of origin. They are pivotal in bolstering social resilience and fostering welfare improvements in the recipient countries (Akanbi and Yusuf 2024). Remittances are a financial bedrock for countless households across developing African economies, often forming a significant portion of their GDP. The importance of remittances in the African context is profound. For instance, in countries like The Gambia, remittances constitute up to 20% of the GDP, and surveys have also indicated that at the household level, up to 47% of households in The Gambia depend on remittances, providing a crucial buffer against economic shocks (Mohammed 2022). In 2023, remittance flows to low and middle-income countries are estimated to have grown by 3.8%, with Sub-Saharan Africa experiencing a growth of 1.9% in remittance inflows, reaching \$54 billion (World Bank 2023).

Researchers such as Mohammed (2022) assert that the escalating trajectory of remittances to certain nations underscores the emigration of skilled human capital from these regions. Notably, the influx of remittances relies heavily on a surge in economic opportunities in destination countries, particularly among high-skilled migrants. Studies indicate that high-skilled migrants, particularly those originating from Sub-Saharan Africa (SSA), often exhibit fewer liquidity constraints and consequently emerge as primary remittance senders (Mohammed 2022). It is, therefore, prudent to acknowledge the phenomenon of brain drain when analyzing the dynamics of remittances and their impact on economic growth. UNESCO's assessment in 2016 highlights SSA's disproportionately low share of high-skilled individuals globally, juxtaposed with its heightened rate of skilled emigration among developing nations (Bredtmann et al. 2019; Mohammed 2022).

According to Hosny (2020), remittance inflows are important to an economy. Firstly, remittances can increase government revenue through higher taxes, driven by augmented domestic and imported goods consumption. Secondly, they contribute to private savings and bank deposits, which banks may employ to acquire government debt securities. Thirdly, higher seigniorage revenue can result from increased demand for banking sector liabilities stimulated by remittances, consequently bolstering the demand for money. Finally, remittances facilitate consumption smoothing without fully developed credit markets.

Some researchers also argue that remittances somewhat adversely affect the economic growth of a country by lowering work incentives and raising the reservation salary for which an individual is willing to take up a given job (Hosny 2020; Chami et al. 2018a, b) further contend that higher amounts of remittance inflows could trigger a vicious cycle of economic stagnation of the receiving country and over-dependence of developing countries on developed countries, a phenomenon known as “the remittance trap.” Remittance inflows could also lead to an appreciation of exchange rates, leading to lower export competitiveness and a shrinking of tradable sectors (the Dutch disease), particularly in small open economies with hefty remittance inflows (Hosny 2020). Furthermore, remittances tend to encourage higher importation of specifically consumption goods and lower effectiveness of government agencies (Chami et al. 2018a, b). Other studies like Cooray and Mallick (2013) observed that remittance inflows could be pro-cyclical if investment intentions principally guide migrants' choice to transfer remittances.

In Africa, where remittances are essential for promoting economic stability and reducing poverty, this study fills important gaps in the body of knowledge on remittance inflows. This study employs a panel analysis of 43 African countries to unravel the intricate

relationship between remittance inflows and indicators such as including remittances as a percentage of GDP, gross domestic product per capita growth, broad money, general government total expenditure, the volume of imports of goods and services, the volume of exports of goods and services, inflation, average consumer prices, exchange rate and unemployment, and institutional quality factors like control of corruption, rule of law, government effectiveness. Previous research has frequently concentrated only on governance or macroeconomic factors in isolation. It also discusses the little-known aspects of remittance flows in sub-Saharan Africa, where they play a significant role in household welfare and account for a sizable portion of GDP. It closes important gaps by offering a strong empirical basis for comprehending remittance dynamics in Africa—a region that is frequently disregarded in favor of Asia and the Middle East. The report also discusses the diversity of households that receive remittances and the differing effects in urban and rural settings. This study contributes to the broader discourse on sustainable development, providing policymakers, development experts, and scholars with actionable strategies to harness remittances as a catalyst for inclusive growth and poverty reduction in Africa.

The remainder of the study is structured as follows: Sect. 2 examines the literature. Section 3 describes the data and model used for panel analysis. Section 4 presents the empirical results, Sect. 5 discusses the findings, and finally, the study's conclusion, recommendations, and limitations are presented in Sect. 6.

2 Literature review

2.1 Theoretical literature review

2.1.1 The new economics of labor migration (NELM) theory

Stark and Bloom (1985) proposed a comprehensive framework for studying migration dynamics and the influence of remittances on sending households. At its foundation, NELM contends that household welfare heavily influences migration decisions rather than individual goals. According to Stark and Bloom (1985), when opting to migrate, migrants weigh the expected net benefits to their families, with remittances as an important tool for supplementing household income and improving economic security. Over time, scientists have extended NELM to include the function of social networks and information flows in affecting migratory patterns (Durand et al. 1996). However, such decisions are undertaken at the familial level, where families can deliberately transfer different members to different labor markets to avoid linked risks and improve total household welfare (Wadood et al. 2023). Under this concept, remittances are interpreted as either explicit or implicit agreements between the sending family and the migrant member, in which the latter is obligated to support the former financially. Thus, the decision-making process within the family's risk management approach seeks to maximize household welfare while considering common risks and restrictions. This concept's key assumption is that the family remains in the home nation (Wadood et al. 2023). Emphasizing the variations in living standards between the host and home nations significantly impacts remittance behavior. According to the hypothesis, migrants often consider economic opportunities in their destination nations before migrating. They carefully consider their options and frequently choose to immigrate when the chance for earning overseas outweighs that of their home country (Akanbi and Yusuf 2024). As

a result, they are more likely to send substantial sums back home. Furthermore, recent research has highlighted the importance of migrants' agency and ambitions in migration decision-making, contradicting deterministic conceptions of migratory behavior (Haas 2010).

2.1.2 Altruism theory

As suggested by (Lucas and Stark 1985), the theory provides three viewpoints on remittances, including pure altruism, which holds that migrants benefit from the well-being of their family members, which motivates them to remit payments from overseas. This viewpoint is founded on the premise that people have a moral predisposition to help their family members, most often due to cultural standards, religious beliefs, or as a show of gratitude for their assistance (Akanbi and Yusuf 2024). In the context of pure altruism, migrants send remittances motivated by their natural altruistic impulses and impacted by emotional and social relationships with household members. The desire to care for and improve the well-being of their loved ones is the fundamental motivation for sending money home. However, as the geographical distance from familial links and the number of migrants in the same home grow, the altruism among migrant households gradually declines (Bhatt and Kharel 2021).

The second viewpoint is pure self-interest, which implies that remittances are motivated by the remitters' selfish goals, such as inheritance hopes, investment in home assets, or a desire to return home. (Bhatt and Kharel 2021) elucidate that under pure self-interest, individuals are inclined to remit funds to fortify their reputation and potentially alleviate familial obligations. A guarantee of inheritance is critical in positively encouraging remittances, particularly in anticipating inheritance and subsequent associated income. Firstly, people send money in the hope of inheriting family assets. Second, remittances may motivate people to invest in their home country or pay for maintenance or services supplied by the family at home, such as asset management or child support. Finally, remittance behavior may reveal strategic tendencies among skilled workers, attempting to protect their earnings from depreciation in the presence of low-skilled migrants, whose remittances prevent movement among less skilled individuals (Bhatt and Kharel 2021; Grüne 2017; Lucas and Stark 1985).

Finally, tempered altruism or enlightened self-interest, which incorporates components of both approaches, regards remittances as part of mutually advantageous contractual arrangements between migrants and their home communities (Lucas and Stark 1985). The theory provides a framework for understanding remittance behavior, emphasizing the role of familial relationships and social obligations in generating migrant remittance flows (Stark 1995). Altruism theory emphasizes the reciprocal character of remittance exchanges since migrants frequently demand emotional and social support from their relatives in exchange for financial aid (Stark 1995).

It is also worth mentioning that available research indicates that remittances are mostly motivated by philanthropic rather than investment objectives. They display counter-cyclical behavior, with higher levels under difficult economic situations in the sender's home country. Furthermore, remittances are generally used for consumption rather than investment purposes. Moreover, they show low sensitivity to relative rates of return on investments in the sender's native country (Gupta 2005).

2.1.3 Dependence theory

Drawing on the work of researchers such as Cardoso and Faletto (1979), the theory provides a critical viewpoint on the implications of remittances for sending nations, particularly regarding economic development and dependency connections. According to the dependency theory, discrepancies in national development levels lead to certain countries dominating others, primarily due to their political and economic might. These dominant nations attract persons from less developed countries by providing numerous possibilities and allowing migrants to send remittances. The situation is heavily reliant on the host countries' economic status. As a result, the number and direction of remittances significantly impact the economic relationships between developing and developed countries (Akanbi and Yusuf 2024).

Dependence theory contends that relying on remittances as a source of income might prolong structural disparities and impede long-term development prospects. According to Haque and Kim (1995), remittance inflows might hinder investment in productive sectors of the economy and contribute to a cycle of reliance on foreign sources of income. Furthermore, dependence theorists argue that remittance flows can worsen social inequality within sending areas since families with migrant relatives may become economically privileged over those without access to remittances (Durand et al. 1996). Recent research has expanded on dependence theory to investigate how remittances interact with broader development processes, offering insight into both the positive and negative consequences of remittance dependence (Ratha et al. 2011).

2.1.4 Neoclassical Theory

Originally attributed to Adam Smith (2000) and his classical idea of national wealth. According to neoclassical theory, people migrate between low-wage and high-wage regions for better economic possibilities. According to this idea, the wage disparity between home and host countries influences remittances, with higher salaries in host countries resulting in higher remittances (Friedberg and Hunt 1995). Labor market characteristics, such as regulations and controls, are viewed as significant influencers of remittances (Friedberg and Hunt 1995). Recent arguments for Neoclassical theory emphasize the role of economic differences between home and host nations, technological improvements that reduce migration costs, and the impact of labor market flexibility regulations (Ivrendi et al. 2014). According to the theory, rational trade and migration decisions lead to long-term equilibrium in labor markets and economies. Wages remain low in places with a high labor supply, driving individuals from such areas to migrate to regions with a reduced labor supply, resulting in higher wages (Ngumba 2022).

2.1.5 Human capital theory

The Human Capital Theory, first articulated by Schultz (1961), proposes that individuals invest in education and skills to increase productivity and earn more money. The projected return on investment in human capital influences migration decisions, with people moving to areas where their abilities are more valued. As a result, remittances are viewed as a return on migrants' human capital investments (Durand et al. 1996). Recent debates within the Human Capital theory framework emphasize the significance of education and skill

levels in shaping remittance behavior. Furthermore, technological and communication improvements make it easier to transfer human capital across borders, impacting remittance flows. According to this hypothesis, human capital is the fundamental engine of migration, as people look for chances outside of their current jobs. As a result, remittances are thought to boost human capital even more, as funds provided for the education of family members left behind contribute to general development (Ngumba 2022).

2.2 Empirical literature review

As highlighted by various studies, remittances play a pivotal role in sustainable development across developing economies, particularly in Africa and South Asia. Khan and Sahu (2024) emphasize their multifaceted role in enhancing financial inclusion and socioeconomic stability, which are critical for achieving Sustainable Development Goals (SDGs). Khan (2024) further explores the economic and governance factors driving remittance inflows from major sending countries to India, offering a strategic framework for policymakers. Empirical evidence by Khan (2023a) underscores remittances' potential to alleviate income-based poverty in South Asia. At the same time, Khan and Gunwant (2024a) utilize ARIMA modeling to forecast remittance inflows, emphasizing the need for robust econometric tools to manage economic stability. Additionally, Khan (2023b) highlights the resilience of economies to remittance shocks, with positive shocks significantly boosting growth. Gender-focused research by Khan and Gunwant (2024b) reveals the role of remittances in reducing gender-based unemployment and advocating for inclusive growth.

Recent studies have extensively examined the relationship between governance quality and remittance inflows. Akanbi and Yusuf (2024) investigated this nexus in the Nigerian economy, employing an Autoregressive Distributed Lag (ARDL) error correction model to analyze data from 1990 to 2022. Their findings revealed that political stability, rule of law, and government effectiveness significantly influence long-term remittance flows. The study emphasized that improved governance, enhanced transparency, and reduced transaction costs foster trust and encourage remittances. Similarly, Delessa et al. (2024) explored the interplay between remittance inflows, economic growth, institutional quality, and economic stability in 24 sub-Saharan African countries from 2005 to 2019. The study underscored the pivotal role of institutional quality in augmenting remittance inflows, highlighting its importance in fostering economic resilience by using a dynamic panel-based cointegration approach.

Macroeconomic determinants of remittances have also been a focal point of research. Shah (2024) examined the impact of output growth, inflation, exchange rates, and money supply on remittances in India from 1997 to 2019. The study identified significant effects of these variables on remittance flows utilizing a panel data approach. Similarly, Ngumba (2022) analyzed the macroeconomic determinants of remittances in Kenya from 1970 to 2021, employing the ARDL modeling approach. The study found a long-term association between GDP, inflation, real effective exchange rates, and remittance inflows. Osayi and Kasimu (2023) further corroborated these findings in the Nigerian context, revealing a positive and significant relationship between GDP and remittances, while exchange rates were negatively impacted. The microeconomic dimensions of remittances have also garnered scholarly attention. Jijin et al. (2022) investigated the microeconomic determinants of remittances to India from 1996 to 2019, using the ARDL approach. The study revealed that rising home prices positively influence remittance inflows, while currency depreciation reduces them, indicating a remittance substitution effect. Bhatt and Kharel (2021)

analyzed remittances in Nepal from 1994 to 2020, finding that exchange rates and workers' outflows significantly and positively influence remittance inflows, with exchange rates exerting a greater impact.

The role of remittances in addressing unemployment and fostering economic stability has been another critical area of inquiry. Ikhsana et al. (2023) explored the relationship between remittances, macroeconomic variables, and unemployment rates across 65 countries from 2000 to 2014, employing the generalized method of moments. The study found that countries with higher remittance levels experienced elevated unemployment rates, suggesting potential disincentives for labor market participation. Conversely, Omon (2021) examined the monetary determinants of migrant remittances in West African Monetary Zone countries from 1990 to 2016, revealing that financial sector development, unemployment rates, and GDP positively correlated with remittance inflows, while exchange rates and per capita income of migrants had a negative influence. Comparative and regional analyses have further enriched the discourse on remittance dynamics. Yoshino et al. (2020) studied the determinants of international remittances in 22 middle-income Asia-Pacific countries from 1990 to 2015, employing the Generalized Method of Moments (GMM) approach. The study found that GDP growth disparities, secondary education enrollment ratios, and trade openness positively influenced remittances, while foreign direct investment had a negative impact. Qutb (2020) investigated Egypt's remittances using a dynamic ARDL approach from 1980 to 2018, highlighting the positive influence of exchange rates, GDP per capita, and political conditions on remittance inflows. Ali and Murtaza (2023) examined remittances in India and Pakistan, focusing on unskilled migrants. Employing the Johansen Cointegration approach on data from 1982 to 2017, the study found that skilled workers remitted more than unskilled workers, while exchange rates and inflation negatively influenced remittances.

The broader implications of remittances for sustainable development have also been explored. Khan and Sahu (2024) emphasized the multifaceted role of remittances in enhancing financial inclusion and socioeconomic stability in India, aligning with the Sustainable Development Goals (SDGs). Khan (2024) further highlighted the economic and governance factors influencing remittance inflows from major sending countries to India, providing a strategic framework for policymakers. Additionally, Khan (2023a, b) demonstrated the poverty-alleviating potential of remittances in South Asia, underscoring their role as a tool for sustainable development.

2.3 Evaluation of literature

While the existing body of literature provides valuable insights into the determinants and impacts of remittance inflows, several limitations, and research gaps remain unaddressed. First, many studies, such as those by Akanbi and Yusuf (2024) and Delessa et al. (2024), focus narrowly on governance and institutional quality, often overlooking the interplay between macroeconomic variables and institutional factors in shaping remittance dynamics. Second, regional analyses, such as those by Yoshino et al. (2020) and Qutb (2020), predominantly concentrate on Asia and the Middle East, leaving a significant gap in understanding the unique drivers of remittances in sub-Saharan Africa, where remittances constitute a substantial share of GDP. Third, while studies like Ikhsana et al. (2023) and Omon (2021) explore the labor market and financial sector implications of remittances, they often fail to account for the heterogeneity of remittance-receiving households and the varying impacts across urban and rural contexts. Additionally, the reliance on single-country or

small-sample analyses, as seen in Ngumba (2022) and Bhatt and Kharel (2021), limits the generalizability of findings. This study addresses these gaps by employing a comprehensive panel analysis of 43 African countries, integrating macroeconomic and institutional variables to provide a holistic understanding of remittance determinants. By doing so, it aims to offer actionable policy recommendations tailored to the African context, thereby contributing to the literature on remittances and sustainable development. While remittances are widely recognized as a critical driver of economic stability and poverty alleviation, their potential adverse effects, such as reduced labor market participation and exchange rate appreciation, warrant careful consideration. This study builds on these insights by employing a comprehensive panel analysis of 43 African countries, aiming to unravel the macroeconomic and institutional determinants of remittance inflows, seeking to inform policies that maximize the developmental benefits of remittances while mitigating their potential drawbacks, thereby contributing to the broader discourse on sustainable development in Africa.

3 Data and model

3.1 Data

Our comprehensive study relies on annual data from 1980 to 2022 for 43 African countries. The research focused on the following countries: Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Chad, Cabo Verde, Cameroon, Central African Republic, Comoros, Congo Democratic Republic, Congo Republic, Cote d'Ivoire, Djibouti, Equatorial Guinea, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Madagascar, Mali, Mauritius, Morocco, Namibia, Niger, Rwanda, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia, and Zimbabwe. The choice of countries was purely based on the availability of data. The data used in the study is secondary and was obtained from the World Bank Development Indicator (WDI) database. The period selected is to provide sufficient statistical significance of the relation under study, incorporate the changing economic dynamics in Africa, and capture the robustness of African economies with respect to the indicators in the study.

The study's primary focus is on "Remittances," which serves as the dependent variable, representing the monetary transfers made by individuals working abroad, whose determinants are evaluated against the dependent variables as summarized below (Table 1).

3.2 Model

Due to heteroskedasticity, some form of k-order serial correlation, cross-sectional dependency, stationarity, heterogeneity, and cointegration properties of our dataset, we need to apply a model that could address these characteristics and provide robust estimation coefficients. An appropriate methodology would be to use a regression model like the feasible generalized least squares (FGLS) and panel-corrected standard error regression (PCSEs). These methods are static modeling techniques that estimate long-run coefficients and address the robustness of our dataset as opposed to the ordinary least squares (OLS) methods. The FGLS method applied here is as proposed by Bai et al. (2020 2021), Bent (2017), and O'hara and Parmeter (2013) and used by Baskıcı et al. (2023). We employed a linear model to analyze the relationship between variables, represented by:

Table 1 Variable description

Variable	Acronym	Measurement	Source
Remittances	REMIT	Personal remittances (% of GDP)	World Bank
Economic growth	GDPCAP	Gross domestic product per capita, constant prices	World Bank
Broad money	MS	(% of GDP)	World Bank
Government spending	SPEND	General government total expenditure	World Bank
Imports	IMPORT	The volume of imports of goods and services (% of GDP)	World Bank
Exports	EXPORT	The volume of exports of goods and services (% of GDP)	World Bank
Inflation	INF	Average consumer prices % change	World Bank
Exchange Rate	EXCH	Local currency units per USD	World Bank
Control of Corruption	CORRCONTR	Percentile rank	World Bank
Rule of law	RULEOFLAW	Percentile rank	World Bank
Government effectiveness	GOVTEFF	Percentile rank	World Bank
Unemployment	UNEMP	Percent change	World Bank

$$y_{it} = x'_{it}\beta + u_{it}$$

This model was stacked and represented in full matrix notation as:

$$Y = X\beta + U$$

where: $Y = (y'_1, \dots, y'_T)'$ is a vector of y_{it} with each y_t being a $N \times 1$ vector, $X = (x'_1, \dots, x'_T)'$ is the $NT \times d$ matrix of x_{it} with each x_t being an $N \times d$, $U = (u'_1, \dots, u'_T)'$ is the regressor noises $NT \times 1$ vector of u_{it} with each u_t being a $N \times 1$ vector.

The Feasible Generalized Least Squares (GLS) estimator of β is thus such that:

$$\hat{\beta}_{FGLS} = (X' \hat{\Omega}^{-1} X)^{-1} X' \hat{\Omega}^{-1} Y$$

This method assumes an unknown cluster structure (Ω) and thus uses its estimator ($\hat{\Omega}$) to obtain the coefficients above. Where ($\Omega = (Eu_t u'_t)$) is a high-dimensional conditional covariance matrix, $\hat{\Omega} = (\hat{\Omega}(\theta))$, is a parametric estimation with parameter vector θ of the unknown matrix. The $\hat{\Omega}$ is modified to correct the OLS assumptions violated in the dataset (Hanif et al. 2020). The feasible Generalized Least Squares (GLS) estimator is more efficient when heteroskedasticity, serial, and cross-sectional correlations are present (Bai et al. 2021). This method employs a covariance matrix estimation technique involving banding and thresholding. This method provided insights into the serial and cross-sectional correlations within the dataset, allowing for robust econometric analysis. We run the model under the assumptions of heteroskedasticity with cross-sectional correlated error structure as well as independent AR(1) and panel-specific AR(1) forms of autocorrelation. Additionally, we employ the Panel-Corrected Standard Error Regression model under similar assumptions alongside the main FGLS model to complement the empirical analysis.

The general equation for our model is given below.

$$\begin{aligned} \ln REMIT = & \alpha + \beta_1 \ln GDP_{CAP} + \beta_2 \ln MS + \beta_3 \ln SPEND + \\ & \beta_4 \ln IMPORT + \beta_5 \ln EXPORT + \beta_6 \ln INF + \beta_7 \ln EXCH + \beta_8 \ln CORRCONTR + \\ & \beta_9 \ln RULEOFLAW + \beta_{10} \ln GOVTEFF + \beta_{11} \ln UNEMP + \mu \end{aligned}$$

where $\ln$ is the natural logarithm, μ the random error term, α the constant to the equation, and $\beta_1 \dots \beta_{11}$ -estimated regressor coefficients.

4 Empirical results

The analysis follows the strategy presented in Fig. 1. Descriptives, heteroskedasticity, and correlation are assessed, followed by cross-section dependence tests and stationarity. Cointegration and slope homogeneity are then done. In the fourth stage, long-run estimators of FGLS and PCSEs are presented. Finally, granger causality is obtained.

The dataset comprised 43 countries ($N=43$), 43 years ($T=43$). REMIT, representing remittance inflows, had a mean of 4.936% of GDP and a standard deviation of 18.411%. It exhibits a heavily right-skewed distribution, as indicated by its skewness of 9.34 and a kurtosis of 100.284, suggesting extensive tailing. Similarly, GDPCAP, representing GDP per capita growth, had a mean of 1.207% with a standard deviation of 6.578%, also demonstrating a right-skewed distribution with a skewness of 6.064 and a kurtosis of 126.638, indicating heavy tails. MS representing money supply had a mean of 31.767%, a standard deviation of 22.424, and a moderately normal distribution. SPEND, denoting government expenditure, had a mean of 106.607% and a deviation of 13.563%, with a nearly symmetrical distribution of skewness of 0.365 and kurtosis of 8.926, suggesting moderately heavy tails. The IMPORT representing imports had a mean and standard deviation of 37.683% and 19.9881%, respectively, while EXPORT representing exports had a mean of 29.724 and a standard deviation of 20.373%. The variables IMPORT and EXPORT exhibited moderately right-skewed distributions with skewness values of 2.203 and 2.012 and kurtosis values of 10.736 and 10.34, indicating heavy tails. INF, representing inflation, demonstrates a highly right-skewed distribution with a skewness of 35.225 and a kurtosis of 1328.755, indicating extremely heavy tails. EXCH, denoting the exchange rate, also shows

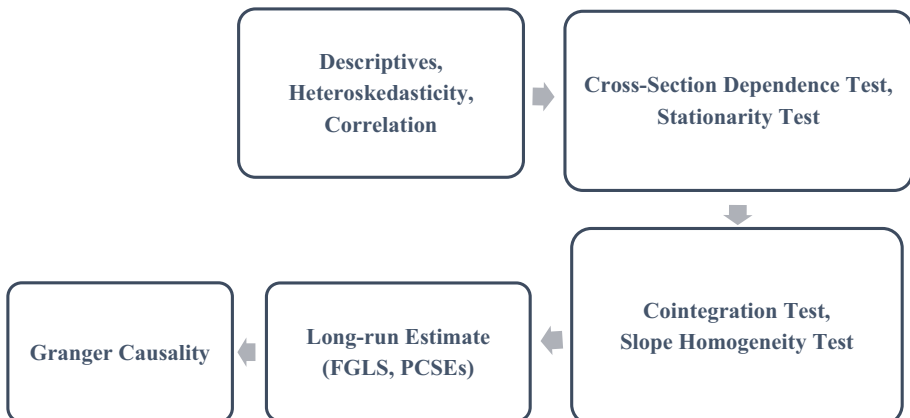


Fig. 1 Analysis stages

a highly right-skewed distribution with a skewness of 42.79 and a kurtosis of 1832.001, suggesting extremely heavy tails. Conversely, CORRCONTR, RULEOFLAW, GOVTEFF, and UNEMP demonstrate nearly symmetrical distributions, with skewness values ranging from 0.364 to 0.765 and kurtosis values ranging from 2.131 to 2.468, suggesting moderately heavy tails. The descriptives are detailed in Table 2. The data was transformed into a natural logarithm before analysis.

The study used the Breusch-Pagan Lagrangian multiplier and Modified Wald tests for groupwise heteroscedasticity with random and fixed effects linear regression, respectively, to test for heteroskedasticity. The assumption is that each observation's error term's variance remains constant, preventing bias in standard error estimates. We reject the null hypothesis at a 1% significance level in both tests and conclude that the data does not exhibit constant variance(heteroscedasticity). The dataset was tested for serial autocorrelation using Woodridge's test, with the null hypothesis of no first-order autocorrelation being rejected at a 0.05 p -value threshold. This rejection suggests some form of first-order autocorrelation within the dataset. Table 3 presents the findings.

We employ the Pesaran (2004) CD test for cross-sectional dependence in the second stage. The null hypothesis of this test posits no cross-sectional dependence, expressed as: $H_0 : \rho_{ij} = \rho_{ji} = (\epsilon_{it}, \epsilon_{jt}) = 0$ for all $(i \neq j)$. The alternative hypothesis suggests the presence of cross-sectional dependence for at least one pair given as: $H_1 : \rho_{ij} = \rho_{ji}$ for some $(i \neq j)$ (Acel et al. 2017).

The CD statistics are given by: $CD = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_i^{N-1} \sum_{j+1}^N \hat{\rho}_{ij} \right) \sim N(0,1)$ where $(\hat{\rho}_{ij})$ is the sample estimate of the pairwise Pearson's correlation coefficients from ADF-type regressions. $\rho_{ij} = \rho_{ji} = \frac{\sum_{t=1}^T \epsilon_{ij} \epsilon_{jt}}{\left(\sum_{t=1}^T \epsilon_{ij}^2 \right)^{1/2} \left(\sum_{t=1}^T \epsilon_{jt}^2 \right)^{1/2}}$

If cross-sectional dependence cannot be rejected, we proceed with second-generation panel unit root tests (PURT). These include the Cross-Sectional Augmented IPS (CIPS) test, initially proposed by Pesaran (2007), and the Maddala and Wu (1999) panel unit root test.

Table 2 Descriptive statistics

Variables	Obs	Mean	Std. dev	Min	Max	Skew	Kurt
REMIT	1555	4.936	18.411	0	235.928	9.34	100.284
GDPCAP	1789	1.207	6.578	-41.587	140.48	6.064	126.638
MS	1737	31.767	22.424	0.035	159.949	1.8	6.69
SPEND	1607	106.607	13.563	50.239	200.971	0.365	8.926
IMPORT	1667	37.683	19.981	1.128	191.458	2.203	10.736
EXPORT	1667	29.724	20.373	1.571	169	2.012	10.34
INF	1596	38.6	622.472	-17.64	23,773.132	35.225	1328.755
EXCH	1834	3,670,000	1.570e+08	0	6.720e+09	42.79	1832.001
CORRCONTR	1029	27.916	19.788	0.948	83.06	0.635	2.389
RULEOFLAW	1032	31.143	20.582	0.469	83.5	0.364	2.131
GOVTEFF	1029	28.419	20.944	0.948	84.615	0.719	2.468
UNEMP	1376	9.573	7.505	0.32	31.84	0.765	2.4

Authors' calculations

Table 3 Multicollinearity, heteroskedasticity and autocorrelation tests

Heteroskedasticity tests		
Modified Wald test for groupwise heteroskedasticity in fixed effects model H_0 : $\sigma^2(i) = \sigma^2$ for all i		
Test statistic	Statistic	<i>p</i> -value
Chi-square	3.0e + 05	0.000
Breusch and Pagan Lagrangian Multiplier test for heteroskedasticity in random effects model H_0 : variance (u) = 0		
Test statistic	Statistic	<i>p</i> -value
Chi-square	4152.70	0.000
Autocorrelation tests		
Wooldridge test for autocorrelation in panel data H_0 : no first order-autocorrelation		
Test statistic	Statistic	<i>p</i> -value
F (1, 9)	12.886	0.0009
Authors' calculations		

Table 4 Cross-sectional dependence test

Variable	CD-test	<i>p</i> -values	Average joint T	Mean ρ	Mean abs (ρ)
lnREMIT	14.515	0.000	43.00	0.07	0.51
lnGDPCAP	1.431	0.152	43.00	0.01	0.23
lnMS	52.307	0.000	43.00	0.27	0.44
lnSPEND	7.561	0.000	43.00	0.04	0.34
lnIMPORT	8.075	0.000	43.00	0.04	0.36
lnEXPORT	6.521	0.000	43.00	0.03	0.41
lnINF	30.203	0.000	43.00	0.15	0.36
lnEXCH	151.332	0.000	43.00	0.77	0.77
lnCORRCONTR	−0.911	0.000	43.00	0.00	0.61
lnRULEOFLAW	−0.266	0.000	43.00	0.00	0.59
lnGOVTEFF	14.131	0.000	43.00	0.07	0.46
lnUNEMP	−2.312	0.021	43.00	−0.01	0.52

Under the null hypothesis of cross-section independence, $CD \sim N(0,1)$

P-values close to zero indicate data are correlated across panel groups

Authors' calculations from World Banka Data

From the cross-sectional dependence test in Table 4, all variables confirm the existence of cross-sectional dependence where the *p*-values obtained are less than 0.05, except for GDP per capita, corruption control, and government effectiveness, for which there was no cross-dependence. As a result, we apply the mentioned second-generation unit root tests to test stationarity.

In this study, the CIPS method complements Maddala and Wu's (1999) Panel Unit Root test's first-generation test. These tests are implemented using the "multipturt" Stata code.

The first-generation Maddala and Wu (1999) Fisher-type test assumes cross-section independence of panels. Under this assumption, the test statistic is chi-square distributed such that $\lambda = -2 \sum_{i=1}^N \ln(\rho_i) \sim \chi_{2N}^2$. This test also circumvents issues of sequential asymptotic, unlike the Levin-Lin-Chu (LLC) and Im-Pesaran-Shin (IPS) tests. Consequently, it provides the exact distribution of the test statistics. Additionally, the Maddala-Wu test is predicated on the sum of the log p -values of T_i , and its distribution does not rely on nuisance parameters (Barbieri 2006). They suggested applying bootstrap methods to derive empirical distributions for test statistics such as the LLC, IPS, or Fisher-type tests to address cross-sectional dependence, thereby facilitating inference. Although the bootstrap methodology reduces the size distortions attributable to cross-sectional correlations, it does not eliminate them. Consequently, while the bootstrap-enhanced first-generation tests exhibit improved performance, they do not entirely substantiate the bootstrap methodology's validity. Thus, a second-generation stationarity test incorporating procedures that explicitly account for cross-sectional dependence is necessary.

Under the Maddala and Wu (1999) test at the 95% confidence interval (Table 5), specified without trend, all the variables exhibit stationarity except for the money supply, while under specification with trend in addition to the money supply, control of corruption, rule of law, government effectiveness and unemployment showed nonstationarity.

The Cross-Sectional Augmented IPS (CIPS) test, introduced by Pesaran (2007), accounting for cross-sectional dependence, known as Cross-sectionally Augmented IPS (CIPS), provides an alternative approach for which the standard Augmented Dickey-Fuller (ADF) regression model is augmented further with cross-sectional averages of lagged levels and first differences of individual series instead of basing the unit-roots on the deviations from estimated factors. The asymptotic results are then obtained from the Cross-Sectionally Augmented Dickey-Fuller (CADF), with their averages referred to as

Table 5 Maddala and Wu (1999) panel unit root test (MW)

Variable	Lags	Specification without trend		Specification with trend	
		Chi. Sq	p -value	Chi. Sq	p -value
lnREMIT	1	112.793	0.028	165.890	0.000
lnGDPCAP	1	401.917	0.000	285.708	0.000
lnMS	1	65.924	0.947	68.786	0.913
lnSPEND	1	185.284	0.000	163.203	0.000
lnIMPORT	1	143.323	0.000	125.621	0.003
lnEXPORT	1	125.462	0.004	155.777	0.000
lnINF	1	288.718	0.000	227.167	0.000
lnEXCH	1	145.061	0.000	102.337	0.110
lnCORRCONTR	1	143.934	0.000	61.783	0.977
lnRULEOFLAW	1	138.277	0.000	53.690	0.998
lnGOVTEFF	1	140.048	0.000	61.537	0.979
lnUNEMP	1	145.247	0.000	142.212	0.000

Authors' calculations

Table 6 Pesaran (2007) panel unit root test (CIPS)

Variable	Lags	Specification without trend		Specification with trend	
		Zt-bar	p-value	Zt-bar	p-value
lnREMIT	1	-4.734	0.000	-2.816	0.002
lnGDPCAP	1	-9.675	0.000	-5.991	0.000
lnMS	1	-0.615	0.269	-1.839	0.033
lnSPEND	1	-4.869	0.000	-2.801	0.003
lnIMPORT	1	-2.217	0.013	-0.174	0.431
lnEXPORT	1	0.246	0.597	-1.427	0.077
lnINF	1	-6.401	0.000	-3.237	0.001
lnEXCH	1	-0.613	0.270	2.022	0.978
lnCORRCONTR	1	-3.310	0.000	1.110	0.866
lnRULEOFLAW	1	-1.447	0.074	0.051	0.520
lnGOVTEFF	1	-3.936	0.000	-0.401	0.344
lnUNEMP	1	-0.122	0.451	-0.976	0.164

Authors' calculations

the CIPS test. The asymptotic null distribution of the individual $CADF_i$ statistics, with the corresponding CIPS statistics, then derived using the equation:

$$CIPS = N^{-1} \sum_{i=1}^N CADF_i$$

where $N, T \sim \infty$, such that $N/T = k$ is defined as a finite non-zero positive constant.

The CIPS statistics of interest are then derived from the CADF regression model represented as $\Delta y_{it} = a_i + b_i y_{it-1} + c_i \bar{y}_{t-1} + d_i \Delta \bar{y}_t + \varepsilon_{it}$ where $\Delta \bar{y}_t = N^{-1} \sum_{i=1}^N \Delta y_{it}$ and $\bar{y}_{t-1} = N^{-1} \sum_{i=1}^N y_{it-1}$. The t-ratio of the OLS estimate of the b_i is defined as $t_i(N, T)$ is referred to as the CADF statistic for i , and the average of this t-ratio is the $CIPS(N, T) = N^{-1} \sum_{i=1}^N t_i(N, T)$ which gives us the panel unit-root test statistics which is the cross-sectionally augmented version of the test statistic accounting for heteroskedasticity, autocorrelation of residuals, and cross-sectional dependency (Hashiguchi and Hamori 2010; Pesaran 2007).

When we use the Pesaran (2007) test specified without trend, at the 5% significance level, we fail to reject the null of stationarity at the first difference for the money supply, export, and unemployment, while we fail to reject the null hypothesis for the other variables. When specified with trend, at the same significance level, export, import, exchange rate, control of corruption, rule of law, government effectiveness, and unemployment showed nonstationarity at the first difference, as presented in Table 6.

Panel data analysis enables the selective pooling of information from both time series and cross-sectional dimensions, thereby enhancing the efficiency of estimates. However, achieving this requires ensuring parameter homogeneity across the dataset. We employ the standard delta method proposed by Pesaran and Yamagata (2008) and the Blomquist and Westerlund (2013) test to assess homogeneity while incorporating cross-sectional dependence and robust errors. We employ the “xthst” Stata code, which allows us to apply the heteroskedasticity and autocorrelation consistent (HAC) estimator of regression errors on both tests and incorporate the cross-dependency that characterizes our

Table 7 Slope homogeneity

Slope homogeneity	
Pesaran and Yamagata (2008) test	
Delta test	Test stat
$\hat{\Delta}$	-0.900
$\hat{\Delta}_{Adj}$	-3.366 ^a
Blomquist and Westerlund (2013) test	
Delta test	Test stat
$\hat{\Delta}$	26.032 ^a
$\hat{\Delta}_{Adj}$	97.404 ^a

a, b, and c superscripts imply significance at 1%, 5%, and 10% respectively

Authors' calculations

dataset. If the p -value exceeds 0.05, we fail to reject the null hypothesis, suggesting homogeneity in cointegration coefficients; otherwise, we infer heterogeneity, necessitating alternative techniques (Hussain et al. 2022).

Pesaran and Yamagata (2008) developed a test grounded on the assumption that dynamically modeled variables are uncorrelated over time. This test, an extension of Swamy's (1970) approach, was adapted to accommodate panel models with cross-sectional dimensions exceeding time series dimensions. This test assumes serially uncorrelated errors in dynamic models, and heteroscedastic errors are permitted (Gündüz 2017). The delta ($\hat{\Delta}$) statistic is a modified standard measure calculated using pooled fixed effects rather than individual observations. The estimation is based on equations incorporating robust Heteroskedasticity and Autocorrelation Consistent (HAC) standard errors can be generalized as below:

$$\hat{\Delta}_{HAC} = \sqrt{N} \left(\frac{N^{-1} S_{HAC} - k}{\sqrt{2k}} \right) \sim \chi_k^2$$

$$(\hat{\Delta}_{HAC})_{adj} = \sqrt{N} \left(\frac{N^{-1} S_{HAC} - k}{v(T, k)} \right) \sim N(0, 1)$$

where N represents the number of cross-sectional units, k denotes the number of independent variables. From the output in Table 7, the standard delta has a p -value ($0.368 > 0.05$); thus, we fail to reject the null hypothesis of homogeneity, but the adjusted delta suggests rejecting the null hypothesis. As such, we do the test with the Blomquist and Westerlund (2013) test for consistency. The Blomquist and Westerlund (2013) test, which effectively addresses heteroskedasticity and/or serial correlation in regression errors by replacing the serially correlated covariance estimator with the heteroskedasticity and autocorrelation consistent (HAC) estimator, is used. The new standard delta (Δ) HAC version under this test the given by: $\Delta_{HAC} = \sqrt{N} \left(\frac{N^{-1} S_{HAC} - k}{\sqrt{2k}} \right)$ where;

$$S_{HAC} = \sum_{i=1}^N T \left(\hat{\beta}_i - \hat{\beta} \right)' \left(\hat{Q}_{iT} \hat{V}_{iT}^{-1} \hat{Q}_{iT} \right) \left(\hat{\beta}_i - \hat{\beta} \right)'$$

$\hat{\beta} = \left(\sum_{i=1}^N T \left(\hat{Q}_{iT} \hat{V}_{iT}^{-1} \hat{Q}_{iT} \right) \right)^{-1} \sum_{i=1}^N \hat{Q}_{iT} \hat{V}_{iT}^{-1} X_i' M_{\tau} y_i$ with $\hat{\beta}_i$ being the OLS estimator to cross section unit i ; $X_i = (X_{i,1}, \dots, X_{i,T})$ is $T \times k$, $M_{\tau} = I_T - \tau_T (\tau_T' \tau_T)^{-1} \tau_T'$, $\tau_T = (1, \dots, 1)$ is the $T \times 1$ and $\hat{Q}_{iT} = T^{-1} (X_i' M_{\tau} X_i)$. The heteroskedasticity and serial correlation are taken into account by the HAC estimator of $\hat{V}_{iT} = \hat{\Gamma}_i(0) + \sum_{j=1}^{T-1} k \left(\frac{j}{M_{i,T}} \right) [\hat{\Gamma}_i(j) + \hat{\Gamma}_i(j)']$ for which $\hat{\Gamma}_i(j) = T^{-1} \sum_{t=j+1}^T \hat{u}_{i,t} \hat{u}_{i,t-j}'$, $\hat{u}_{i,t} = (x_{it} - \bar{x}_i) \hat{\Sigma}_{it}$, $\bar{x}_i = \sum_{t=1}^T X_{i,t}$ and $\hat{\Sigma}_{it} = ((y_{it} - \bar{y}_i) - \hat{\beta}'(x_{it} - \bar{x}_i))$

The Blomquist and Westerlund (2013) test (Table 7) suggests that there is enough evidence to reject the null hypothesis of homogenous slope coefficients. Thus, we conclude that the dataset is heterogeneous, necessitating alternative techniques that address heterogeneity (Hussain et al. 2022).

The study tested cointegration to examine a long-run stable relationship among the variables. We adopted three cointegration tests considering stationarity, cross-dependency, and correlation. First, we employ the Kao and Chiang (1997, 2000) cointegration test, a method for panel cointegration analysis that employs Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests to assess cointegration. It focuses on scenarios where cointegration vectors are homogeneous across individuals, implying different intercepts but common slopes (Kilicarslan and Dumrul 2018). The results from this test reject the null hypothesis of no cointegration. Then, the Pedroni (1999, 2004) cointegration test introduces seven test statistics to test the null hypothesis of no cointegration in nonstationary panels. These statistics allow heterogeneity in short-run dynamics and long-run slope and intercept coefficients. The null hypothesis was rejected under a 5% significance level, and cointegration was concluded. Finally, Westerlund (2008) tests, a type of panel cointegration tests based on error-correction models, are used. The test can account for cross-sectional dependence and heterogeneity among the panel units. This test also rejects the null hypothesis of no cointegration. At a 5% significance level, all the tests gave similar results such that the null hypothesis was rejected and the presence of cointegration was concluded. Table 8 shows the findings.

4.1 Regression results

The regression model indicates a positive relationship between GDP per capita growth and remittance inflows. The coefficient was significant at the 1% significance level, suggesting that a unit change in remittances is associated with a corresponding 0.9 unit change in GDP per capita, under the assumption of no correlation in FGLS and PCSEs frameworks. Moreover, money supply also exerts a positive and significant influence on remittance inflows, with a 1.07-unit change in money supply corresponding to a unit change in remittances. Conversely, government expenditure negatively and significantly affects remittance inflows, with a 0.40-unit decrease in government spending associated with a unit increase in remittance inflows. Imports positively and significantly impact remittance inflows, with a unit increase in remittances associated with a 0.83-unit rise in imports. Conversely, exports exhibit a negative relationship with remittance inflows, with a unit increase in remittance inflows corresponding to a 0.7-unit decrease in exports. Inflation negatively and significantly influences remittance inflows, with a unit increase in remittances associated with a

Table 8 Cointegration tests

Pedroni cointegration test		
Null hypothesis: no cointegration		
	Statistic	<i>p</i> -value
Modified Phillips-Perron <i>t</i>	5.5796	0.0000
Phillips-Perron <i>t</i>	−2.9931	0.0014
Augmented Dickey-Fuller <i>t</i>	−3.2407	0.0006
Modified Phillips-Perron <i>t</i>	5.5796	0.0000
Kao cointegration test		
Null hypothesis: no cointegration		
	Statistic	<i>p</i> -value
Modified Dickey-Fuller <i>t</i>	−1.3047	0.0960
Dickey-Fuller <i>t</i>	−4.6715	0.0000
Augmented Dickey-Fuller <i>t</i>	−2.7024	0.0034
Unadjusted modified Dickey-Fuller <i>t</i>	−1.9939	0.0231
Unadjusted Dickey-Fuller <i>t</i>	−5.0533	0.0000
Westerlund cointegration test		
	Test statistics	<i>p</i> -value
Variance ratio	1.8744	0.0304

Authors' calculations

0.05-unit reduction in inflation. The exchange rate is positive and significantly related to remittance inflows, with a 0.15-unit increase in the exchange rate corresponding to a unit increase in remittances. Control of corruption is significant and positively associated with remittance inflows, with a 0.6-unit increase in control of corruption translating to a unit increase in remittance inflows. Remittances are negatively related to the rule of law, with a unit increase in remittances linked to a 0.03 unit decline in the rule of law. The relation is insignificant under PCSEs and positive the assumptions of standard AR(1) and panel-specific AR(1) across the models. Government effectiveness negatively and significantly relates to remittances, with a 0.66-unit decrease in government effectiveness associated with increased remittance inflows. Unemployment exhibits a negative and significant relationship with remittance inflows, with a 0.05-unit decrease in unemployment corresponding to increased remittance inflows. However, this association is insignificant under the PCSEs model and positive under the assumption of a standard AR(1) and panel-specific AR(1) in the FGLS and standard AR(1) assumption in the PCSEs model, respectively, indicating an ambiguous relation with remittance inflows. The findings are presented in Table 9.

Due to the presence of cointegration, the Granger causality test is justified. Thus, we carry out the Juodis et al. (2021) Granger non-causality Test. The high Wald test statistic of 200.7485 with a *p*-value of 0.000 strongly rejects the null hypothesis (H_0) that the selected covariates do not Granger-cause remittance inflows (lnREMIT) at a 99% confidence interval. This indicates that at least one of the covariates does Granger-cause lnREMIT. On the

Table 9 Regression results

InREMIT	Feasible generalized least squares regression heteroskedastic with cross-sectional correlation			Panel-corrected standard errors regression Heteroskedastic with cross-sectional correlation		
	No autocorrelation	Common AR(1)	Panel-specific AR(1)	No autocorrelation	Common AR(1)	Panel-specific AR(1)
InGDPCAP	0.85805*** (0.00339)	0.20428*** (0.00118)	0.12901*** (0.00023)	0.87172*** (0.07623)	0.20773*** (0.0349)	0.135*** (0.02384)
InMS	1.07133*** (0.00701)	0.33149*** (0.00569)	0.39668*** (0.00111)	1.07972*** (0.11195)	0.32786*** (0.10095)	0.3764*** (0.08793)
InSPEND	-0.39468*** (0.00565)	-0.17077*** (0.00613)	-0.05255*** (0.00429)	-0.39566*** (0.10259)	-0.16913 (0.11978)	-0.36318*** (0.10462)
InIMPORT	0.833*** (0.00821)	0.41143*** (0.0094)	0.47651*** (0.00226)	0.83603*** (0.15698)	0.40881** (0.17963)	0.5668*** (0.14206)
InEXPORT	-0.71112*** (0.00675)	-0.2525*** (0.00715)	-0.31159*** (0.00151)	-0.71634*** (0.10651)	-0.25421* (0.14885)	-0.34*** (0.08983)
InEXPORT	-0.71112*** (0.00675)	-0.2525*** (0.00715)	-0.31159*** (0.00151)	-0.71634*** (0.10651)	-0.25421* (0.14885)	-0.34*** (0.08983)
InINF	-0.0513*** (0.00109)	-0.03411*** (0.00083)	-0.02863*** (0.00018)	-0.05066*** (0.01156)	-0.03411*** (0.01489)	-0.02717** (0.01131)
InEXCH	0.14887*** (0.00129)	0.14733*** (0.00189)	0.18969*** (0.00037)	0.14936*** (0.01998)	0.15024*** (0.02537)	0.15117*** (0.0168)
InCORRCONTR	0.59591*** (0.00917)	0.28365*** (0.00779)	1.27929*** (0.00237)	0.59057*** (0.16745)	0.29603* (0.17062)	0.81264*** (0.10841)
InRULEOFLAW	-0.03341*** (0.00433)	0.04495*** (0.00682)	0.16566*** (0.00082)	-0.03973 (0.0405)	0.03795 (0.07866)	0.04732 (0.06232)
InGOVTEFF	-0.65576*** (0.00769)	-0.17604*** (0.0076)	-1.11393*** (0.00223)	-0.64845*** (0.15635)	-0.1816 (0.14272)	-0.55123*** (0.06652)
InUNEMP	-0.04786*** (0.00574)	0.11556*** (0.00708)	0.08528*** (0.00123)	-0.05369 (0.15809)	0.12432 (0.18184)	-0.02025 (0.08401)

Table 9 (continued)

InREMIT	Feasible generalized least squares regression heteroskedastic with cross-sectional correlation		Panel-corrected standard errors regression Heteroskedastic with cross-sectional correlation	
	No autocorrelation	Common AR(1)	Panel-specific AR(1)	Panel-specific AR(1)
_cons	-3.44878*** (0.0254)	-2.66417*** (0.03972)	-5.72332*** (0.02063)	-2.1953*** (0.42389)
Observations	1849	1849	1849	1849
Pseudo R ²	.z	.z	.z	0.15719

Standard errors are in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Authors' calculations

specific variables money supply, inflation, exchange rate, control of corruption, and rule of law at the 1% significance level, for GDP per capita and government spending, the causal effect was significant at the 10% significance level. Other variables did not portray a significant causal impact on the inflow of remittances. The findings are presented in Table 10.

5 Discussion

From the findings, our analysis reveals a positive correlation between GDP per capita growth and remittance inflows, consistent with existing literature. This suggests that as economies experience growth and prosperity, there tends to be a corresponding increase in remittance inflows, as individuals abroad send funds back to support family members and invest in local businesses. This finding corroborates existing literature, such as the work of Osayi and Kasimu (2023). Secondly, the positive association between money supply as a percentage of GDP and remittance inflows underscores the role of monetary factors in influencing remittance behavior. Higher money supply relative to GDP attracts more remittances, possibly due to the increased liquidity and economic activity it stimulates within the economy. Aligning with the findings of Shah (2024).

In contrast, our findings indicate a negative relationship between government spending as a percentage of GDP and remittance inflows. Similar to a study by Akanbi and Yusuf (2024). Increasing government expenditure towards providing extensive social welfare programs or creating robust domestic economic opportunities may decrease reliance on external financial support through remittances. This suggests that high government spending

Table 10 Juodis et al. (2021) Granger non-causality test

JKS non-causality test						
H0: Selected covariates do not Granger-cause lnREMIT						
HPJ Wald test: 200.7485						
<i>p</i> -value: 0.0000						
Results for the Half-Panel Jackknife estimator						
	Coef	Std. Err	<i>z</i>	<i>p</i> > <i>z</i>	[95%Conf]	Interval
L1. lnGDPCAP	0.024	0.013	1.870	0.061	−0.001	0.048
L1. lnMS	0.145	0.046	3.180	0.001	0.055	0.234
L1. lnSPEND	−0.104	0.057	−1.820	0.069	−0.216	0.008
L1. lnIMPORT	0.115	0.082	1.410	0.158	−0.045	0.275
L1. lnEXPORT	−0.002	0.054	−0.040	0.972	−0.107	0.103
L1. lnINF	−0.018	0.005	−3.320	0.001	−0.028	−0.007
L1. lnEXCH	−0.041	0.008	−5.370	0.000	−0.055	−0.026
L1. lnCORRCONTR	0.246	0.052	4.720	0.000	0.144	0.348
L1. lnRULEOFLOW	−0.060	0.017	−3.500	0.000	−0.094	−0.027
L1. lnGOVTEFF	−0.070	0.052	−1.360	0.173	−0.171	0.031
L1. lnUNEMP	0.003	0.056	0.050	0.957	−0.107	0.113

Authors' calculations

may crowd out private remittance inflows by offering the needed consumption or resources that would otherwise be dependent on remittance inflows. Moreover, the positive coefficient associated with imports as a share of GDP implies that increased imports coincide with higher remittance inflows. This suggests that a more open economy with higher imports attracts more remittances, potentially due to increased economic activity and cross-border connections. Conversely, our analysis reveals a negative correlation between exports as a share of GDP and remittance inflows, indicating that strong export-oriented economies may have lower remittance inflows. This implies that households in such economies rely less on external financial support, as their export income fulfills their financial needs.

Furthermore, the negative coefficient associated with the annual change in CPI inflation suggests that higher inflation rates are associated with lower remittance inflows as a share of GDP. This underscores the impact of economic conditions on remittance behavior, with high inflation eroding the value of remittances and leading to decreased inflows. This finding is consistent with the work of Shah (2024). The positive coefficient related to the nominal exchange rate implies that a weaker local currency relative to the USD is associated with increased remittance inflows, as in Ngumba (2022). Remittance recipients may benefit from favorable exchange rates, encouraging more significant inflows.

Institutional factors also play a significant role in shaping remittance behavior, with control of corruption positively related to remittances, while rule of law and government effectiveness exhibit a negative relationship. Countries with more robust governance frameworks and lower corruption levels may attract more remittances due to increased confidence in financial transactions. However, the negative coefficient associated with the rule of law percentile rank suggests that better adherence to the rule of law is associated with lower remittance inflows. In countries with more robust legal frameworks, there is less need for external financial support through remittances. Better-governed economies reduce dependency on remittances by fostering stable environments where effective institutions and strong rule of law promote productive investments and local employment opportunities, diminishing the need for remittance income (Pal et al. 2021; Issabayev et al. 2020; Ochada 2020). Additionally, robust legal frameworks and financial inclusion encourage the productive use of remittances rather than mere consumption, further supporting the negative correlation between the rule of law and remittance dependency (Majeed 2014; Naceur et al. 2020). Efficient government policies and functioning may reduce the reliance on remittances for economic support.

Finally, while unemployment demonstrates a negative and significant relationship with remittance inflows, the association appears ambiguous under certain model assumptions, highlighting the complexity of the relationship between labor market dynamics and remittances. However, the positive and significant coefficient suggests that higher unemployment rates correspond to higher remittance inflows as a share of GDP, similar to a study by Ikhsana et al. (2023). The relationship between unemployment and remittances is complex and context-dependent. While remittances can inflate living standards and disincentivize labor supply, potentially increasing unemployment (Habib 2022; Jawaid and Raza 2012), they may also alleviate poverty but foster dependency, reducing the incentive to seek employment (Arbenita and Besnik 2024; Chami et al. 2018a, b). Conversely, in some regions, remittances boost consumption and household welfare, stimulating local economies and indirectly reducing unemployment (Jawaid and Raza 2014; Elorabi et al. 2024; Wu et al. 2023). These disparities highlight the need to consider economic conditions, governance quality, and remittance utilization practices to understand their impact on labor markets fully. This finding highlights the role of remittances as a crucial source of financial support for households during periods of economic hardship, such as high unemployment.

Higher unemployment rates may correspond to higher remittance inflows as a vital source of financial support during periods of economic hardship. These contrasting effects highlight the need for context-specific analyses to fully understand the interplay between remittances, governance, and labor markets.

6 Conclusion and recommendations

6.1 Conclusion

This study aimed to investigate the determinants of remittance inflows in Africa and, to an extent, other developing and emerging economies. We employ FGLS methodology on a dataset comprising 43 African countries from 1980 to 2022 to achieve this. We incorporate both macroeconomic indicators, including gross domestic product per capita growth, broad money, general government total expenditure, the volume of imports of goods and services, the volume of exports of goods and services, inflation, average consumer prices, exchange rate, and unemployment, and institutional quality factors like control of corruption, the rule of law, government effectiveness to model this relationship with remittance inflows. The findings confirm positive correlations between remittance inflows and key variables such as GDP per capita growth, money supply, imports, and exchange rates. Conversely, higher levels of government spending, inflation, and exports are associated with lower remittance inflows. The role of unemployment in influencing remittances is ambiguous. Additionally, governance quality significantly affects remittance flows; stronger anti-corruption measures are linked to higher remittances, whereas more effective government and stronger rule of law are associated with lower remittances.

6.2 Recommendations

The findings of this study offer several actionable recommendations for policymakers aiming to enhance remittance inflows and their developmental impact in Africa and other developing economies. First, governments should prioritize strengthening anti-corruption measures, as the study confirms a positive correlation between anti-corruption efforts and remittance inflows. Transparency and accountability in governance can build trust among diaspora communities, encouraging them to send more remittances. Second, maintaining economic stability is crucial. Policymakers should focus on sustaining GDP per capita growth and controlling inflation, as these factors significantly influence remittance flows. Stable economic conditions foster confidence among migrants, making them more likely to remit funds back home.

Additionally, optimizing exchange rate policies can play a pivotal role. Since exchange rates positively correlate with remittance inflows, governments should adopt measures to stabilize exchange rates and prevent excessive volatility. This can make remitting funds more attractive and predictable for migrants. Enhancing financial inclusion is another critical step. Expanding access to financial services, particularly in rural areas, can facilitate the efficient transfer and utilization of remittances. Initiatives such as promoting mobile banking and reducing transaction costs associated with remittance transfers can significantly improve financial access.

Furthermore, governments should aim to balance public spending. While government expenditure is essential for development, excessive spending may deter remittance

inflows. Striking a balance between public investment and fiscal discipline can help avoid crowding out private remittance flows. Furthermore, policymakers should pursue policies promoting trade openness, facilitating cross-border transactions and improving market access for goods and services, stimulating economic activity, and increasing remittance receipts. There is also a need to understand potential trade-offs between export-oriented growth strategies and remittance dependency in developing economies. Thus, a concerted effort is necessary to identify strategies for diversifying sources of income and reducing reliance on remittances in export-driven economies. Efforts to enhance domestic economic opportunities and social welfare programs can reduce the need for external financial support through remittances.

6.3 Limitations and future research

While this study provides valuable insights into the determinants of remittance inflows, it has limitations. Because the study only looks at 43 African nations, it might not adequately represent the distinct dynamics of remittance transfers in other areas. Comparative analysis and a more global viewpoint can result from broadening the focus to include nations in Asia, Latin America, and the Middle East. Another drawback is the inability to prove causation because of possible endogeneity problems. Future research could use instrumental variable techniques or experimental designs to explain causal links better, even if the FGLS methodology considers some econometric issues. More research is necessary to clarify the connection between remittance inflows and unemployment. The intricate relationship between unemployment and remittance-sending behavior may be better understood through qualitative research or household-level surveys. Further analysis may examine how labor market policies and dynamics influence remittance behavior, particularly in African economies where unemployment rates tend to be high.

The study also highlights the nuanced relationship between governance quality and remittance inflows. More efficient administration and a more robust rule of law are linked to lower remittances, but more robust anti-corruption measures are linked to higher remittances. This implies that remittance behavior is influenced by governance quality in a variety of ways. Future studies could examine in further detail how particular governance metrics, such as the efficiency of the government and the rule of law, influence remittance flows. Lastly, even though the factors influencing remittance inflows are the focus of this study, other research might examine the broader socioeconomic effects of remittances. A more comprehensive grasp of their developmental potential might be obtained by examining their contributions to gender equality, education, health outcomes, and poverty reduction.

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Data availability The data will be presented when it is needed.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval and consent to participate Scientific content and ethical rules have been obeyed in this study.

Consent for publication All authors give their consent for the publication.

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