

Does financial development mediate the relationship between remittance inflows and private Investment in sub-Saharan Africa?

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Abstract :

This study investigated the relationship between remittance inflows, financial development, and private investment in 16 Sub-Saharan African countries from 1990 to 2023 using panel data from WDI, WGI, and IMF databases. Employing P-ARDL and dynamic threshold models, results show that remittances significantly enhance private investment ($p < 0.021$) by easing liquidity constraints. Financial development also has a strong positive effect ($p < 0.001$). Their interaction is positive and significant ($p < 0.002$), with a threshold of 0.31 indicating varying effects across regimes. The study concludes both are complementary drivers and recommends improved financial systems and lower remittance costs.

Keywords: Financial Development; Remittance inflows; Private investment; PARDL

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1. Introduction

Remittance inflows have emerged as one of the most stable and counter cyclical sources of external finance for many developing countries. In sub-Saharan Africa (SSA), remittances reached an estimated US\$54 billion in 2023, surpassing foreign direct investment (FDI) in several economies and constituting a significant share of GDP in countries such as Nigeria, Ghana, Kenya, and Senegal (World Bank, 2024). Unlike FDI and aid, remittances are largely directed to households, offering the potential to ease liquidity constraints, augment savings, and increase investment in productive activities. However, despite their increasing magnitude and potential role in development, the empirical and policy debate remains unsettled on the extent to which remittances foster private investment and the conditions under which they do so.

A major problem in the literature is the lack of consensus on the theoretical and policy channels linking remittances to private investment. Some scholars argue that remittances are a form of informal insurance, allowing households to overcome financial constraints and increase their capacity to invest in small businesses, housing, and education (Giuliano & Ruiz-Arranz, 2009). Similarly, Aggarwal, et al., (2011) found that remittances can deepen financial development by increasing bank deposits and credit availability. These studies support the optimistic view that remittances contribute to capital formation and long-term economic development. In contrast, Chami, et al., (2005) provide evidence that remittances are largely used for consumption rather than investment, reducing labour supply incentives and potentially generating dependency effects. These conflicting findings highlight a policy gap: it is not clear whether governments should prioritise remittance mobilisation strategies (such as diaspora bonds or reduced transfer costs) as a driver of private investment or treat remittances mainly as a consumption-smoothing tool.

Another unresolved issue is the differential impact of financial development on the remittance–investment nexus. Financial development is theorised to serve as a conduit that transforms remittances into productive

investment (Giuliano & Ruiz-Arranz, 2009). Yet, SSA countries differ substantially in the depth and inclusiveness of their financial systems. In economies with strong banking sectors and accessible credit markets, remittances may boost private investment by providing collateral and encouraging formal savings. Conversely, in countries with shallow financial systems, remittances may bypass the formal sector entirely, being channelled instead to informal consumption or unproductive ventures (Bettin & Zazzaro, 2012). Most existing studies, however, use aggregated financial development indices without disaggregating dimensions such as financial access, efficiency, stability, or digital innovation (Demirgüç-Kunt & Levine, 2008). The literature does not adequately capture how different aspects of financial development condition the ability of remittances to stimulate private investment.

A related issue is the under-exploration of interactive and nonlinear effects. While some studies include interaction terms such as remittances and financial development (Giuliano & Ruiz-Arranz, 2009; Coulibaly, 2015), most analyses assume linear relationships and rely on composite financial indices. This neglects the possibility of thresholds: remittances may only exert positive effects on private investment once financial development exceeds a certain level, while beyond another point, the marginal effect may diminish (Barajas, et al., 2010).

However, although remittances, financial development, and investment have been extensively studied in the global development literature, important empirical shortcomings remain, particularly in the sub-Saharan African (SSA) context. First, most existing studies (e.g., Giuliano & Ruiz-Arranz, 2009; Aggarwal et al., 2011; Bettin & Zazzaro, 2012) focus on broad growth outcomes or financial deepening, while relatively fewer directly examine private investment as the dependent variable. Yet, private investment is a critical driver of capital accumulation and long-term productivity, and it provides a more precise channel through which remittances can affect economic growth. The scarcity of direct empirical evidence on this linkage in SSA leaves an open question about whether remittances actually contribute to productive capital formation or merely sustain consumption. These therefore prompted a study like this to examine the dynamic relationship among remittance inflows, financial development, and private investment in selected

sub-Saharan African countries.

2. Literature review

2.1 Theoretical review

Financial Intermediation Theory

Financial Intermediation Theory, as propounded by McKinnon (1973) and Shaw (1973) emphasizes the crucial role of financial institutions in mobilizing savings and allocating them to productive investment opportunities. According to the theory, remittances constitute an important source of financial inflows that increase the pool of loanable funds within an economy. However, the extent to which these funds translate into productive investment depends largely on the level of financial development. In a well-developed financial system, intermediaries such as banks and capital markets efficiently channel remittance inflows into investment by reducing information asymmetry, transaction costs, and risks. Conversely, in economies with underdeveloped financial systems, remittances are less likely to be intermediated effectively and are often directed toward consumption rather than investment. Thus, the theory establishes that financial development serves as a critical link that transforms remittance inflows into productive investment, thereby enhancing economic growth.

2.2 Empirical Review

Empirical evidence increasingly highlights the interconnected role of remittance inflows and financial development in shaping private investment and broader economic growth. Studies show that remittance inflows provide a significant source of external finance for developing economies, often easing liquidity constraints for households and businesses, and creating opportunities for productive investment (Odhiambo, 2024; Amuedo-Dorantes & Pozo, 2006). However, the impact of these inflows on private investment is contingent on the depth and efficiency of domestic financial systems. For instance, Giuliano and Ruiz-Arranz (2009) demonstrate that remittances foster economic growth more effectively in countries with underdeveloped financial systems, suggesting that

where financial intermediation is limited, remittances may serve as a substitute for formal credit channels, enabling households and small enterprises to engage in investment activities that would otherwise be constrained by liquidity shortages. In parallel, the development of financial systems themselves through broader access to credit, banking infrastructure, and regulatory efficiency has been shown to significantly amplify the impact of external inflows on private investment. He (2024) and Li (2025) find that well-developed financial sectors enable economies to better absorb international capital and direct it into productive uses, while Farooq (2024) emphasises that financial sector development not only attracts FDI but also facilitates employment generation, demonstrating a direct link between financial depth and investment-led growth. Similarly, Mashrur (2025) and Jalles (2024) highlight that financial development enhances the growth effects of both FDI and domestic private investment, reflecting the crucial role of financial institutions and markets in channelling resources efficiently. Okeke and Chinanuife (2022) examined the impact of financial development on the relationship between remittances and investment in Nigeria. Using annual secondary data from Q1 1981 to Q4 2020 and employing the autoregressive distributed lag (ARDL) model, their findings suggest that financial deepening mitigates the impact of remittances on private domestic investment. Remittances, when combined with robust financial systems, can therefore serve as a powerful catalyst for private investment. Odhiambo (2024) shows that remittance inflows positively influence bank-based financial development in sub-Saharan Africa, particularly in contexts where government regulatory quality is strong, suggesting that policy frameworks can significantly shape the translation of remittances into productive investments. Moreover, studies at the micro level, including Amuedo-Dorantes and Pozo (2006) and Adams and Page (2005), indicate that remittances often finance small businesses, entrepreneurial activities, and household human capital investments, which indirectly stimulate demand for financial services, further reinforcing the nexus between remittances, financial development, and private investment. Nonetheless, the relationship is not universally linear. Chami et al., (2003) caution that remittances are often directed toward consumption rather than investment, particularly in economies with weak financial infrastructure, highlighting the importance of financial inclusion, low-cost transfer channels, and targeted policy interventions. Yun (2025) and Marozva (2025) similarly reveal

that the effectiveness of capital and FDI inflows depends on the broader economic and institutional context, including absorptive capacity, policy stability, and financial market sophistication. Dombo (2024) and Kannyiri (2024) further emphasise that financial market development, rather than the mere presence of financial institutions, is crucial for attracting foreign inflows and converting them into private investment, particularly in emerging and developing economies. Dash (2023), employing advanced panel econometric techniques on 24 low-income countries between 2004 and 2018, finds that remittances significantly increase domestic investment in the long run, particularly where financial markets and human capital are stronger. Similarly, Ho (2024), using dynamic panel methods (system GMM and defactored IV estimators) on 91 developing countries, concludes that remittances tend to crowd in private investment, even when institutional quality by itself shows mixed results. Importantly, Ho reveals that the interaction between remittances and institutional quality strengthens the positive investment effect, suggesting a complementary relationship between financial flows and governance.

3. Methodology

3.1 Model specification

In line with the theories discussed earlier, this study examines the relationship among remittance inflows, financial development, and private investment in sixteen (16) selected sub-Saharan African countries from 1990 to 2023. To ensure representativeness, the study selected four countries from each SSA subregion based on remittance dependence, financial sector development, and data availability. From West Africa, Nigeria, Ghana, Senegal, and Mali are chosen; from East Africa, Kenya, Ethiopia, Uganda, and Tanzania; from Southern Africa, South Africa, Zimbabwe, Mozambique, and Zambia; and from Central Africa, Cameroon, the Democratic Republic of Congo, Gabon, and Chad.

The study models the level of private investment as a function of remittance inflows and financial development.

$$PI = f(REM, FD)$$

1

The empirical specification of the relation specified in Equation (1) is expressed as follows:

$$PI_{it} = \beta_0 + \beta_1 REM_{it} + \beta_2 FD_{it} + \mu_{it}$$

2

However, incorporating the set of control variables in Equation (2), gives:

$$PI_{it} = \beta_0 + \beta_1 REM_{it} + \beta_2 FD_{it} + \beta_3 GDP_{it} + \beta_4 INF_{it} + \beta_5 OPEN_{it} + \beta_6 INS_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

3

Where: PI_{it} represent Private Investment in country i at time t , REM_{it} , Remittance inflows, the main explanatory variable of interest, FD_{it} , Financial Development indicator. GDP_{it} : GDP growth rate (controls for market size and macroeconomic conditions). INF_{it} : Inflation rate (captures macroeconomic stability). $OPEN_{it}$: Trade openness (accounts for external sector influence) and INS_{it} : institutional quality (composite governance indicator) μ_i : Country – specific fixed effects, λ_t : year fixed effect and ε_{it} : Error term.

Furthermore, in order to evaluate the influence of remittance inflows on the relationship between financial development and private investment, Equation 3.4 becomes:

$$PI_{it} = \beta_0 + \beta_1 REM_{it} + \beta_2 FD_{it} + \beta_3 (REM_{it} * FD_{it}) + \beta_4 GDP_{it} + \beta_5 INF_{it} + \beta_6 OPEN_{it} + \beta_7 INS_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

4

The variable $REM_{it} * FD_{it}$ represents the interaction term between remittance inflows and financial development. The coefficients $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ and β_7 denote the parameters to be estimated.

3.2 Definition and Measurement of Variables

Table 1: Measurement of Variables and Sources

Variable	Symbol	Measurement / Proxy	Data Source
Private Investment	PI	Gross fixed capital formation by the private sector (% of GDP)	World Development Indicators (WDI, World Bank)
Remittance Inflows	REM	Personal remittances received (% of GDP)	WDI (World Bank), IMF Balance of Payments
Financial Development	FD	Financial Development Index	WDI (World Bank), IMF Financial Development Database
GDP Growth	GDP	Annual growth rate of real GDP (%)	WDI (World Bank)
Inflation	INF	Consumer Price Index (CPI, annual %)	WDI (World Bank), IMF IFS
Trade Openness	OPEN	Sum of exports and imports (% of GDP)	WDI (World Bank)
Institutional Quality	INS	Composite governance index (e.g., World Governance Indicators)	World Governance Indicators (WGI, World Bank)

Source: Authors Compilation

The study employed the Panel Autoregressive Distributed Lag (P-ARDL) model to assess the effects of remittance inflows and financial development on private investment, while dynamic panel threshold regression was used to determine the financial development threshold in their relationship. The ARDL model captures both short- and long-run effects and remains reliable even with small sample sizes, as long-run estimates are super-consistent and short-run estimates consistent. The panel ARDL short run equation is represented as follows:

$$\begin{aligned} \Delta PI_{it} = & \alpha_i + \sum_{j=i}^p \alpha_{1,ij} \Delta PI_{i,t-j} \\ & + \sum_{j=0}^{q_1} \alpha_{2,ij} \Delta REM_{i,t-j} + \sum_{j=0}^{q_2} \alpha_{3,ij} \Delta FD_{i,t-j} + \\ & \sum_{j=0}^{q_3} \alpha_{4,jj} \Delta GDP_{i,t-j} = \sum_{j=0}^{q_4} \alpha_{5,jj} \Delta INF_{i,t-j} + \sum_{j=0}^{q_5} \alpha_{6,jj} \Delta OPEN_{i,t-j} + \\ & \sum_{j=0}^{q_6} \alpha_{7,jj} \Delta INS_{i,t-j} \\ & + \varepsilon_{it} \dots \dots \dots \end{aligned} \quad 5$$

Where $i = 1, 2, 3 \dots N$ and $t = 1, 2, 3 \dots T$ α_i represents the fixed effects, $\alpha_1 - \alpha_7$ is the lagged coefficients of the independent variables and the regressors and ε_{it} is the error term which is assured to be white noise and varies across countries and time.

Once a long-run relationship is established between the variables in the model, the panel ECM model can then be expressed as follows:

$$\begin{aligned} \Delta PI_{it} = & \beta_0 + \beta_1 REM_{i,t-j} + \beta_2 FD_{i,t-j} + \beta_3 GDP_{i,t-j} + \\ & \beta_4 INF_{i,t-j} + \beta_5 OPEN_{i,t-j} + \beta_6 INS_{i,t-j} + \tau ECT_{i,T-j} + \varepsilon_{it} \end{aligned} \quad 6$$

β_{1-6} represent the convergence of short-run dynamic coefficients to long-run equilibrium while τ is the error correction model and speed of adjustment parameter derived from the predicted equilibrium relationship. The aforementioned ECM could be considered as including both short-term transient effects and long-term consequences

However, to account for dynamism, endogeneity, and simultaneity bias in panel threshold regression, following Hansen (1999, 2000), the baseline threshold

regression can be written as:

$$PI_{it} = \alpha_0 + \alpha_1 PI_{it-1} + \beta_1 REM_{it} \cdot I(FD_{it} \leq \gamma) + \beta_2 REM_{it} \cdot I(FD_{it} > \gamma) + \delta_1 GDP_{it} + \delta_2 INF_{it} + \delta_3 OPEN_{it} + \delta_4 INS_{it} + \mu_i + \varepsilon_{it}$$

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Where: PI_{it} represent Private Investment in country i at time t , PI_{it-1} represent the lagged dependent variable, capturing persistence and adjustment dynamics in private investment (hence the “dynamic” part), REM_{it} , Remittance inflows, the main explanatory variable of interest, FD_{it} , Financial Development indicator (threshold variable). γ is the threshold value of financial development that splits the sample into “low” and “high” regimes. $I(.)$ is the indicator function, which takes value 1 if the condition is satisfied and 0 otherwise, when $FD_{it} \leq \gamma$, remittances affect private investment with coefficient β_1 and when $FD_{it} > \gamma$, remittances affect private investment with coefficient β_2 . GDP_{it} : GDP growth rate (controls for market size and macroeconomic conditions). INF_{it} : Inflation rate (captures macroeconomic stability). $OPEN_{it}$: Trade openness (accounts for external sector influence) and INS_{it} : institutional quality (composite governance indicator), μ_i : Country – specific fixed effects, and ε_{it} : Error term.

The model above examines whether the marginal effect of remittances on private investment changes when the financial development indicator crosses a certain level (γ).

For instance:

- i. In financially underdeveloped economies ($FD_{it} \leq \gamma$), remittances may primarily be used for consumption rather than investment, hence a weaker (or even negative) impact.
- ii. In financially developed economies ($FD_{it} > \gamma$), remittances are more likely to be channelled through banks and other intermediaries, easing credit constraints and enhancing private investment.

4. Data analysis and discussion

Table 4.1: Descriptive Statistics

Variable	PI	REM	FD	GDP	INF	OPEN	INS
Mean	20.87	4.26	0.29	3.81	9.47	67.54	-0.63
Std. Dev.	6.12	5.08	0.17	4.96	11.88	28.36	0.48
Min	8.94	0.01	0.05	-14.27	-2.41	21.03	-1.87
Max	38.15	33.41	0.82	25.64	98.23	161.72	0.91
Skewness	0.61	2.14	0.93	0.88	3.21	0.97	0.42
Kurtosis	3.18	8.96	3.47	4.92	14.37	3.89	2.74
Jarque–Bera	42.76* **	689.43* **	61.18* **	174.55* **	2,341.67* **	92.44* **	18.32* **
Obs	544	544	544	544	544	544	544

Source: Author’s Computation Note: ***, ** denotes significance at the 1% level and 5% respectively

Table 4.1 presents the descriptive statistics of the variables used in the study, showing their average values, variability, distributional patterns, and sample coverage across the panel data. Private investment (PI) has an average value of 20.87 percent of GDP with a standard deviation of 6.12, indicating moderate fluctuations across countries and time. The wide range between the minimum value of 8.94 percent and maximum value of 38.15 percent reflects considerable differences in investment performance among the sampled economies. The positive skewness of 0.61 suggests a mildly right-skewed distribution, while the kurtosis of 3.18 indicates an approximately normal distribution. However, the significant Jarque–Bera statistic confirms that the series is not normally distributed. Remittance inflows (REM) record a low mean value of 4.26 percent of GDP but a high standard deviation of 5.08, revealing strong volatility and

uneven dependence on remittances across countries. The large range, from 0.01 percent to 33.41 percent, further highlights these disparities. The variable is strongly right-skewed and highly leptokurtic, indicating the presence of extreme values, while the Jarque–Bera statistic strongly rejects normality.

Financial development (FD) shows an average index value of 0.29 with moderate dispersion, implying generally low but varying levels of financial sector development among the economies. The range of 0.05 to 0.82 indicates substantial heterogeneity in financial depth and efficiency. The distribution is moderately right-skewed and slightly leptokurtic, with the Jarque–Bera statistic also rejecting normality. Economic growth averages 3.81 percent but exhibits high volatility, as reflected in the standard deviation of 4.96. Growth rates range from a contraction of –14.27 percent to an expansion of 25.64 percent, indicating the coexistence of economic crises and boom periods within the sample. The distribution is right-skewed and leptokurtic, suggesting frequent extreme growth outcomes, while the Jarque–Bera result confirms non-normality. Inflation records an average rate of 9.47 percent with a very large standard deviation of 11.88, showing severe price instability across countries and years. The variable ranges from mild deflation to extremely high inflation, and its highly right-skewed and leptokurtic distribution indicates frequent inflationary outliers. Trade openness averages 67.54 percent of GDP, suggesting substantial integration into global trade despite wide disparities across countries. Institutional quality has a negative mean value of –0.63, implying generally weak governance structures, although the wide range reflects significant institutional differences among the sampled economies.

In essence, the descriptive statistics reveal considerable heterogeneity, volatility, and non-normality across all variables, as evidenced by wide ranges, significant skewness and kurtosis, and uniformly significant Jarque–Bera statistics. These distributional characteristics justify the use of robust econometric techniques capable of accommodating non-normality and outliers in subsequent empirical analysis.

4.2 Correlation Analysis

The correlation analysis provides important preliminary insights into the interrelationships among the key variables and offers empirical support for the theoretical foundations underpinning a study (Aribatise & Akintunde, 2023). The result of the correlation matrix which is crucial to determine the degree of relationship among the variables employed in the regression analysis were shown in the Table 4.2.

Table 4.2: Correlation Matrix

Variable	PI	REM	FD	GDP	INF	OPEN	INS
PI	1.000						
REM	0.342	1.000					
FD	0.472	0.386	1.000				
GDP	0.291	0.214	0.337	1.000			
INF	-0.264	-0.118	-0.229	-0.173	1.000		
OPEN	0.413	0.268	0.451	0.322	-0.196	1.000	
INS	0.521	0.304	0.593	0.287	-0.341	0.418	1.000

Source: Author’s Computation

Table 4.2 presents the correlation matrix among the variables used in the study and reveals important relationships between private investment and the explanatory variables in Sub-Saharan Africa (SSA). Private investment (PI) is positively correlated with remittance inflows (REM), financial development (FD), trade openness (OPEN), and institutional quality (INS), indicating that these variables contribute positively to private capital formation. The positive relationship between PI and remittances suggests that remittance inflows help relax liquidity constraints, increase household savings, and provide alternative financing sources for investment, especially in economies with weak credit markets. Likewise, the positive association between PI and financial development reflects the importance of efficient financial systems in mobilising savings, improving access to credit, and reducing transaction costs, thereby promoting investment activities. Trade openness also exhibits a positive relationship with private investment, implying that greater integration into international markets enhances investment opportunities through access to larger markets, technology

transfer, and increased competition. Institutional quality equally shows a positive relationship with PI, suggesting that strong governance, effective regulations, and stable policy environments are essential for stimulating investor confidence and encouraging long-term investment decisions. Among the explanatory variables, institutional quality records a relatively strong positive correlation with private investment, with a coefficient of 0.52. This indicates that institutional factors play a crucial role in shaping investment outcomes in SSA. The result implies that improvements in governance, regulatory effectiveness, and rule of law may exert stronger effects on private investment than external financial inflows alone. Thus, weak institutions may limit the capacity of remittances, financial development, and trade openness to translate into sustainable investment growth. The findings also reveal a strong positive relationship between financial development and institutional quality, with a correlation coefficient of 0.59. This suggests complementarity between governance structures and financial sector development. Strong institutions promote effective financial intermediation through contract enforcement, property rights protection, and regulatory transparency, while developed financial systems further strengthen institutional credibility and efficiency. Consequently, financial sector reforms in SSA are likely to yield better outcomes when accompanied by institutional improvements. In contrast, inflation is negatively correlated with private investment, financial development, GDP growth, and institutional quality, indicating the harmful effects of macroeconomic instability. High inflation discourages investment by increasing uncertainty, reducing real returns, and weakening financial intermediation. Finally, all pairwise correlation coefficients are below the conventional threshold of 0.70, confirming the absence of serious multicollinearity among the explanatory variables. This validates the inclusion of the variables in the panel ARDL and threshold regression models and suggests that each variable captures distinct effects on private investment in SSA.

4.3 Panel Unit Root Tests

To assess the suitability of the methodology, it is crucial to investigate the stationarity properties of the variables, particularly in a dynamic panel data model (Aribatise and Akintunde, 2025).

Table 4.4: Panel Unit Root Tests at Levels

Variable	LLC (Stat)	Prob.	IPS (Stat)	Prob.	Fisher ADF (χ^2)	Prob.	Fisher PP (χ^2)	Prob.
PI	-1.24	0.108	-0.88	0.189	29.41	0.142	26.73	0.211
REM	-0.91	0.182	-0.63	0.264	27.82	0.193	25.19	0.248
FD	-1.37	0.086	-1.05	0.147	31.64	0.101	28.53	0.163
GDP	-2.11**	0.017	-1.97**	0.024	45.72**	0.031	43.18**	0.039
INF	-2.36**	0.009	-2.08**	0.019	48.56**	0.022	44.93**	0.035
OPEN	-1.44	0.074	-1.21	0.113	33.09	0.089	30.12	0.131
INS	-1.26	0.103	-1.02	0.154	32.15	0.097	29.48	0.149

Source: Author’s Computation

Notes: ** indicates rejection of the null at the 5% level and Fisher statistics follow a χ^2 distribution.

The panel unit root results at levels in Table 4.3 indicate mixed orders of integration across the variables. Private investment (PI), remittances (REM), financial development (FD), trade openness (OPEN), and institutional quality (INS) fail to reject the null hypothesis of a unit root across all tests, implying non-stationarity in levels and integration of order one, I(1). In contrast, GDP growth and inflation (INF) are stationary in levels, as evidenced by statistically significant LLC, IPS, Fisher ADF, and Fisher PP statistics at conventional levels, indicating I(0) processes. This mixture of I(0) and I(1) variables justifies the use of the panel ARDL framework.

Table 4.4: Panel Unit Root Tests at First Differences

Variable	LLC (Stat)	Prob.	IPS (Stat)	Prob.	Fisher ADF (χ^2)	Prob.	Fisher PP (χ^2)	Prob.
PI	-6.82**	0.000	-7.41**	0.000	142.37**	0.000	161.25**	0.000
REM	-7.16**	0.000	-7.94**	0.000	148.26**	0.000	169.88**	0.000

FD	-6.53**	0.000	-7.12**	0.000	136.91**	0.000	152.44**	0.000
GDP	-7.03*	0.000	-7.68*	0.000	144.82*	0.000	163.57*	0.000
INF	-6.91*	0.000	-7.56*	0.000	141.73*	0.000	158.39*	0.000
OPEN	-6.28**	0.000	-6.89**	0.000	132.14**	0.000	147.67**	0.000
INS	-6.82**	0.000	-7.41**	0.000	142.37**	0.000	161.25**	0.000

Source: Author’s Computation,

Note ** denotes significance at the 1% level.

The panel unit root results at first difference in Table 4.4 show strong and consistent evidence of stationarity for all variables. The Levin–Lin–Chu, Im–Pesaran–Shin, Fisher ADF, and Fisher PP tests are all highly significant across private investment, remittances, financial development, GDP, inflation, trade openness, and institutional quality, leading to a rejection of the null hypothesis of a unit root in every case. This indicates that all variables become stationary after first differencing and are therefore integrated of order one, I(1). Combined with the level results, these findings confirm a mixed I(0) and I(1) structure, thereby validating the use of the panel ARDL approach for examining both short-run dynamics and long-run relationships. However, strong rejection at first differences confirms no variable is I(2). This further provide the foundation for panel cointegration testing.

4.5 Panel Cointegration

After establishing the order of integration where PI, REM, FD, OPEN, and INS are I(1) and GDP and INF are I(0), the next step was to investigate whether a long-run equilibrium relationship exists among the variables. This was accomplished through panel cointegration tests, which assessed whether the series, despite being non-stationary in levels, move together over time and exhibit a stable long-run relationship.

Table 4.5a: Pedroni Panel Cointegration Test Results (H₀: no cointegration).

Within-Dimension (Panel Statistics)

Statistic	Value	Prob.
Panel v-statistic	2.41**	0.008
Panel rho-statistic	-2.18**	0.015
Panel PP-statistic	-3.64***	0.000
Panel ADF-statistic	-3.21***	0.001

Source: Author’s Computation

Between-Dimension (Group Statistics)

Statistic	Value	Prob.
Group rho-statistic	-1.97**	0.024
Group PP-statistic	-4.12***	0.000
Group ADF-statistic	-3.76***	0.000

Source: Author’s Computation

Notes: * and ** denote significance at the 1% and 5% levels, respectively.

The panel cointegration tests in Table 4.5a indicate the existence of a stable long-run equilibrium relationship among private investment, remittances, financial development, GDP, inflation, trade openness, and institutional quality. The rejection of the null hypothesis of no cointegration by the majority of within- and between-dimension statistics confirms that these variables move together over time despite being non-stationary in levels. This implies that short-run deviations are corrected toward long-run equilibrium, validating the estimation of long-run coefficients and short-run dynamics within a panel ARDL framework.

Table 4.5b: Kao Residual Cointegration Test

Statistic	ADF
Test value	-2.89***
Prob.	0.002

Source: Author’s Computation

A statistically significant test statistic (p-value < 0.05) in Table 4.5b leads to the rejection of the null hypothesis, indicating that the residuals are stationary

and that a stable long-run equilibrium relationship exists among the variables. This confirms the validity of estimating long-run and short-run dynamics using the panel ARDL or other cointegration-based approaches.

Table 4.5c: Westerlund Error-Correction-Based Cointegration Test

Statistic	Value	Prob.
Gt	-2.43**	0.012
Ga	-12.86***	0.000
Pt	-3.19***	0.001
Pa	-15.47***	0.000

Source: Author’s Computation

In line with the existing studies (Olaniyi & Odhiambo, 2024; Ali et al., 2022; Vo et al., 2022; Küçüksakarya, 2021; Yusuf et al., 2020; Cialani, 2017) this study further employed the cointegration approach of Persyn and Westerlund (2008). This method produces robust cointegration findings in the presence of heterogeneity. It is evident from Table 4.5c that all of the statistics, support the rejection of null hypothesis of no cointegration. This confirms the existence of long-run relationship among the variables for the selected Sub-Saharan Africa countries under consideration. Thus, it can sufficiently lead to the conclusion that the variables of the analysis have long-run relationship. This validates the estimation of panel ARDL model to distinguish short-run dynamics from long-run effects.

4.6 Panel Autoregressive Distributed Lag (ARDL) Pool Mean Group (PMG)

The Panel ARDL (PMG) approach estimates both short-run dynamics and long-run relationships in panels with mixed I(0) and I(1) variables. It allows heterogeneous short-run coefficients across countries while constraining long-run coefficients to be homogeneous, providing efficient and consistent estimates for analysing the impact of remittances, financial development, and macroeconomic factors on private investment.

Table 4.6: Panel ARDL (PMG) Long-Run Estimates (with Interaction)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REM	0.118**	0.051	2.31	0.021
FD	0.462***	0.133	3.47	0.001
REM × FD	0.284***	0.091	3.12	0.002
GDP	0.143**	0.067	2.13	0.034
INF	-0.091**	0.044	-2.07	0.039
OPEN	0.208***	0.062	3.35	0.001
INS	0.371***	0.098	3.79	0.000

Source: Author’s Computation **Note** ***, ** denote significance at 1% and 5%, respectively.

Table 4.6 presents the long-run panel ARDL estimates on the determinants of private investment in Sub-Saharan Africa (SSA) and highlights the important roles of remittance inflows and financial development. The results show that remittance inflows (REM) have a positive and statistically significant effect on private investment, with a coefficient of 0.118 ($p = 0.021$). This implies that a one-percentage-point increase in remittances as a share of GDP increases private investment by 0.118 percentage points. The finding suggests that remittances serve as an important source of external finance capable of easing liquidity constraints, supporting entrepreneurial activities, and promoting capital formation in SSA. Financial development (FD) also exerts a strong positive influence on private investment, with a coefficient of 0.462 ($p = 0.001$). This indicates that improvements in the financial system significantly enhance investment by mobilising savings, improving access to credit, lowering transaction costs, and ensuring efficient allocation of resources to productive sectors. The result confirms the importance of financial sector deepening in stimulating private sector activities. Furthermore, the interaction term between remittances and financial development (REM × FD) is positive and highly significant, with a coefficient of 0.284 ($p = 0.002$). This demonstrates that the positive effect of remittances on private investment becomes stronger in countries with more developed financial

systems. In essence, remittances provide financial resources, while efficient financial institutions facilitate their productive utilisation, revealing a complementary relationship between remittance inflows and financial development in promoting private investment. Regarding the control variables, GDP growth positively influences private investment, with a coefficient of 0.143 ($p = 0.034$). This suggests that higher economic growth improves profitability expectations and investor confidence, thereby encouraging investment activities. In contrast, inflation negatively affects private investment, as indicated by a coefficient of -0.091 ($p = 0.039$). The result implies that macroeconomic instability discourages investment by increasing uncertainty and reducing real returns on capital. Trade openness also has a positive and significant impact on private investment, with a coefficient of 0.208 ($p = 0.001$), indicating that integration into international markets, technology transfer, and greater market access stimulate private sector investment. Institutional quality (INS) records a positive and highly significant effect on private investment, with a coefficient of 0.371 ($p = 0.000$). This implies that better governance, stronger legal systems, and improved regulatory quality substantially promote private investment by reducing uncertainty, protecting property rights, and enhancing contract enforcement.

Table 4.7: Short-Run Dynamics and Error Correction (PMG)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ΔREM	0.042*	0.024	1.75	0.081
ΔFD	0.091*	0.051	1.79	0.074
$\Delta(\text{REM} \times \text{FD})$	0.067**	0.033	2.03	0.043
ΔGDP	0.084**	0.039	2.15	0.032
ΔINF	-0.063**	0.029	-2.17	0.031
ΔOPEN	0.112**	0.046	2.43	0.015
ΔINS	0.146***	0.053	2.75	0.006
$\text{ECT}_{(-1)}$	-0.41*	0.07	-5.86	0.000

Source: Author's Computation Note * , ** and * denote significance at 1%, 5%, and 10% respectively.**

Table 4.7 presents the Panel ARDL (PMG) short-run results and provides strong evidence of the dynamic relationship between private investment and its determinants in Sub-Saharan Africa (SSA). The error correction term (ECT) is negative and highly significant with a coefficient of -0.41 , confirming the existence of a long-run equilibrium relationship among private investment, remittances, financial development, macroeconomic conditions, trade openness, and institutional quality. The coefficient implies that about 41 percent of short-run disequilibrium is corrected annually, indicating a moderate speed of adjustment toward long-run equilibrium. This suggests that although private investment may fluctuate in response to short-term shocks, it gradually converges to its long-run path driven by structural and policy-related factors. The findings further show that remittance inflows (REM) positively affect private investment, with a coefficient of 0.118 ($p = 0.021$). However, the positive and highly significant interaction term between remittances and financial development ($REM \times FD = 0.284$, $p = 0.002$) indicates that the effectiveness of remittances in stimulating private investment depends greatly on the level of financial development. This implies that remittances alone may not automatically translate into productive investment unless supported by efficient and developed financial systems capable of channeling funds into productive economic activities. Therefore, economies with weak financial systems are less likely to maximise the investment benefits of remittance inflows. Financial development (FD) independently exerts a strong positive effect on private investment, with a coefficient of 0.462 ($p = 0.001$). This confirms the role of financial systems in mobilising savings, improving access to credit, lowering transaction costs, and promoting efficient allocation of resources. Institutional quality also emerges as a key determinant of private investment, with a positive and highly significant coefficient of 0.371 ($p = 0.000$). The result suggests that stronger governance, effective regulations, and improved rule of law encourage investment by reducing uncertainty, protecting property rights, and increasing investor confidence. Trade openness (OPEN) positively influences private investment, with a coefficient of 0.208 ($p = 0.001$), indicating that integration into international markets enhances investment opportunities through access to larger markets, competition, and technology transfer. Macroeconomic stability also plays an important role, as GDP growth positively affects private investment (0.143 , $p = 0.034$), while inflation negatively influences investment ($-$

0.091, $p = 0.039$), reflecting the adverse effects of price instability on investor confidence and profitability.

4.7 Panel Threshold Regression Results

Dynamic threshold regression is a statistical technique that allows for the estimation of threshold effects in dynamic models, where the relationship between variable changes overtime. It reveals a non-linear relationship between variables, where the effect of one variable on another changes abruptly once a certain threshold is reached (Aribatise & Akintunde, 2025). This approach accounts for time varying relationships, identifying regime switch and structural breaks in time series data. To examine non-linear effects and conditional relationships, we estimate a Hansen (1999) panel threshold model, focusing on whether the impact of remittance inflows on private investment depends on the level of financial development.

Table 4.8: Financial development threshold in the remittance–private investment nexus

Regime	FD Condition	REM Coefficient	Std. Error	t-Stat
Low-FD Regime	$FD \leq 0.31$	0.043	0.036	1.19
High-FD Regime	$FD > 0.31$	0.287***	0.081	3.54

Threshold	Value	(τ):	0.31
Bootstrap	F-statistic:		23.47
Prob.: 0.001			

Source: Author’s Computation **Note** ***, ** and * denote significance at 10%.

The threshold analysis in Table 4.8 provides nuanced insights into how the effectiveness of remittances in stimulating private investment is conditioned by the level of financial development in Sub-Saharan Africa. The model identifies a financial development threshold value of 0.31, above and below which the impact

of remittances on private investment differs markedly. The bootstrap F-statistic of 23.47 ($p = 0.00$) confirms that the threshold effect is statistically significant, indicating that financial development plays a decisive role in shaping the investment-promoting effects of remittance inflows. In the low financial development regime ($FD \leq 0.31$), the coefficient of remittances on private investment is positive but small and statistically insignificant (0.043, $t = 1.19$). This implies that in economies with shallow financial systems, remittance inflows are largely underutilised for productive investment. Funds may remain in informal channels, be used primarily for consumption, or fail to reach formal credit markets, thereby limiting their capacity to stimulate private sector capital formation. By contrast, in the high financial development regime ($FD > 0.31$), remittances exert a strong and statistically significant effect on private investment, with a coefficient of 0.287 ($t = 3.54$, $p < 0.01$). This indicates that in countries with more developed financial systems, remittance inflows are more effectively intermediated through banks and other financial institutions, facilitating access to credit, supporting entrepreneurial activity, and promoting productive capital accumulation. The dramatic difference in coefficients across regimes underscores the complementarity between remittances and financial development: the positive effect of remittances on investment strengthens considerably once financial systems reach a certain depth and efficiency.

5. Discussion of findings

The empirical findings of this study provide compelling evidence on the determinants of private investment in Sub-Saharan Africa, highlighting the critical roles of remittance inflows, financial development, institutional quality, trade openness, and macroeconomic stability. The positive and significant effect of remittances on private investment confirms the view that external financial inflows can alleviate liquidity constraints, expand household and firm-level savings, and facilitate productive investment, particularly in regions with limited domestic capital markets. This finding aligns with the theoretical perspective of the liquidity-constraint hypothesis, which posits that remittances act as a supplementary source of funds that can stimulate capital formation. Empirically, it resonates with studies by Aggarwal et al. (2011) and Giuliano and Ruiz-Arranz (2009), who found that remittances significantly promote investment in

developing economies. However, the relatively modest direct coefficient of remittances in the baseline ARDL model suggests that inflows alone may be insufficient, highlighting the importance of contextual factors, particularly financial infrastructure. Financial development emerges as a strong and significant determinant of private investment, reinforcing the notion that well-functioning financial systems are essential for mobilising savings, facilitating credit access, and efficiently allocating resources. The highly significant interaction term between remittances and financial development demonstrates that the investment-enhancing effect of remittances is amplified in countries with deeper financial systems, supporting the complementarity hypothesis. This evidence extends theoretical frameworks such as Schumpeterian growth theory, which emphasises the role of financial institutions in fostering innovation and investment. Empirical studies by Beck et al. (2000) and Shahbaz et al., (2013) also support the view that financial development is a prerequisite for external inflows to have meaningful investment impacts. Conversely, the threshold regression results further clarify this relationship by identifying a financial development threshold ($FD = 0.31$), below which remittances have a negligible effect. This nuance is consistent with the literature suggesting that in economies with shallow financial systems, remittance inflows may largely be used for consumption or informal transfers rather than productive investment.

Institutional quality and trade openness are also significant positive drivers of private investment. The strong coefficient of institutional quality underscores the central role of governance, regulatory efficiency, and the protection of property rights in fostering investor confidence and reducing uncertainty. This is consistent with the institutional theory of economic development, which posits that robust institutions are a prerequisite for effective capital accumulation. It aligns with studies such as North (1990) and Acemoglu et al. (2005), which demonstrate that weak institutions inhibit investment despite the availability of financial resources. Trade openness further enhances investment by integrating domestic markets into the global economy, improving technology transfer, and stimulating competition, which is consistent with classical trade and growth theory. These findings collectively highlight that both structural and policy environments complement financial inflows in promoting private investment. The

macroeconomic context, proxied by GDP growth and inflation, also shapes investment outcomes. Positive GDP growth enhances private investment, reflecting improved profitability prospects and investor confidence, whereas inflation exhibits a negative effect, consistent with the theory that macroeconomic instability raises uncertainty and reduces the real return on capital. These results align with earlier empirical studies by Fosu (1990) and Anyanwu (2012), which demonstrate that macroeconomic stability is critical for private sector development. However, the relatively moderate magnitude of GDP growth's effect compared to institutional quality and financial development suggests that structural and policy factors may play a more decisive role in long-run investment accumulation than cyclical economic performance. From a policy perspective, the evidence indicates that remittances can be a powerful catalyst for private investment only when complemented by robust financial systems, sound institutions, and an enabling macroeconomic and trade environment. Simultaneously, governance reforms that enhance institutional quality, contract enforcement, and transparency are essential to attract both domestic and external capital. The study's threshold and interaction findings provide a concrete benchmark: remittance-led investment growth is most pronounced in countries with financial development indices above 0.31, emphasising that policy interventions should focus on crossing this structural threshold. While these results largely confirm theoretical predictions and align with prior empirical studies, they also highlight regional heterogeneity, suggesting that blanket policies may be less effective than tailored strategies that consider financial and institutional capacity.

6. Conclusion and Recommendation

The study concluded that remittance inflows and financial development are complementary drivers of private investment in sub-Saharan Africa. It recommended policies aimed at strengthening financial sector development, expanding access to formal financial services, and reducing remittance transfer costs to enhance the productive use of remittances. These measures are essential for promoting private-sector-led growth and achieving long-term economic development in the region

7. References

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