



Remittances and financial institutions development in Africa: A dynamic panel data approach

Ali Mohamed Ali Mahmoud¹

Mohamed Fathy Abdelgany²

Sara Abdelslam Tawfiq Ali^{3*}

^{1,2,3}Economics Department, Faculty of
Politics and Economics, Beni-Suef
University, Beni-Suef 62511, Egypt.

¹Email:

ALLABOUDOH@eps.bsu.edu.eg

²Email: office@egypt.at

³Email:

sara.abdelsalam@eps.bsu.edu.eg

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Abstract

Remittances constitute an essential and stable source of foreign capital inflows for many developing economies. This study employs the dynamic Generalized Method of Moments (GMM) approach to investigate the impact of remittances on the development of financial institutions across 30 African countries from 2010 to 2022. Financial institutions development is assessed through two key proxies: domestic credit to the private sector as a percentage of GDP and the financial institutions index. The analysis is conducted for the full sample (Sample A) and a sub-sample comprising low- and lower-middle-income countries (Sample B). The findings reveal that remittances significantly promote both measures of financial institutions' development across both samples. Notably, the effect of remittances is more pronounced on the financial institutions index than on domestic credit to the private sector. These findings underscore the importance of policies initiatives aimed at promoting the use of formal remittances channels and reducing barriers to remittance flows.

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(* Corresponding Author)

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1. Introduction

Remittance flows to low- and middle-income countries reached 685 billion \$ in 2024, and are expected to increase to 721 billion \$ by the end of 2026, up from 342 billion \$ in 2010. Specifically, remittances to African countries rose from 52.7 billion \$ in 2010 to 103 billion \$ in 2024. These flows exceed foreign direct investment and official development assistance (Ratha, 2024).¹ However, these official figures may underestimate the actual volume of remittances, as a considerable portion occurs through informal channels due to high transaction costs associated with formal systems (Ari, 2020). Remittances serve as a crucial and stable source of foreign exchange for developing nations, contributing to economic progress by positively impacting key macroeconomic indicators such as savings, investment, economic growth, poverty reduction, and income inequality (Dilip Ratha, 2005; Rodríguez, Rodríguez, & Guirado, 2024; Solimano, 2004). At the household level, remittances alleviate poverty by enabling recipient families to meet essential needs, including food, healthcare, and education (Gallina & Barendse, 2006; Vasylytsiv, Mulska, Osinska, & Makhonyuk, 2022).

¹A large number of developing countries have become increasingly dependent on remittances from their workers as an external source of funding. To see more, <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099714008132436612/idu1a9cf73b51fcad1425a1a0dd1ccsf2f3331ce>

Additionally, they can be channeled into income-generating activities (Karagöz, 2009). The mechanism through which remittances stimulate economic activity primarily stems from their role as an external source of financing investment, supporting the accumulation of both physical and human capital (Moufaq, 2020). By channeling remittances into education and healthcare, recipient households enhance their skills, productivity, and overall quality of their labor force. Furthermore, Remittances serve as catalyst for economic growth by fostering productive investments, with recipients often allocate a portion of these inflows toward entrepreneurial initiatives and the expansion of small- and medium-sized enterprises (Acharya, 2018; Docquier, 2017). Nevertheless, remittances have proven to be remarkably resilient during periods of economic distress. For instance, in 2020, remittance inflows fell by only 1.1% despite a 3% global income contraction caused by the COVID-19 pandemic, underscoring their critical role in supporting household consumption, maintaining economic stability, and sustaining essential sectors such as healthcare professionals (Ratha et al., 2023).

Despite their many advantages, remittances can also produce unintended negative consequences. They may discourage labor force participation, foster dependency behaviors that inhibit sustainable economic development, and contribute to real exchange rate appreciation by increasing the prices of nontradable goods, thereby reducing export competitiveness (Amuedo-Dorantes, 2014).

Remittances have a complex and bidirectional effect on financial institutions development. On the supply side, they enhance the pool of loanable funds by bolstering deposit levels within financial institutions, thereby broadening recipients access to diverse financial services. On the demand side, however, remittances may suppress borrowing behavior, particularly when recipients prioritize consumption or saving through informal mechanisms. Such patterns may attenuate the potential of remittances to stimulate credit expansion and deepen financial intermediation (Aggarwal & Peria, 2006).

The financial institutions constitute a fundamental pillar of the financial sector and play an indispensable role in the broader development process. It underpins economic growth by mobilizing savings, facilitating capital allocation, and enhancing risk diversification through financial intermediation (Levine, 2005; Pattillo, Gulde, Carey, Wagh, & Christensen, 2006). Within the African context, the financial institutions are integral to economic resilience and transformation, particularly through their support for micro, small, and medium-sized enterprises (MSMEs), trade finance, and inclusive financial access (African Development Bank, 2014). By enabling credit access and promoting financial inclusion, The sector contributes to employment generation and poverty alleviation (Appiah-Otoo, Chen, Song, & Dumor, 2022). Moreover, African financial institutions are key players in sovereign debt markets, with domestic debt holding increasing from 10.3% in 2010 to 17.5% in 2023 (European Investment Bank, 2024). The sector is also progressively engaging in sustainable finance, supporting green growth and climate adaptation initiatives (African Development Bank Group, 2020).²

Over the past decade, the African financial sector has undergone substantive structural reforms that have markedly improved its performance and developmental impact. These reforms have facilitated the expansion of financial institutions, the deepening of credit markets, and the proliferation of financial services through technological innovation and product diversification (Honohan & Beck, 2007). As a result, key financial indicators have shown notable progress. In 2021, the median ratio of liquid liabilities to GDP in African countries reached 31%, reflecting a 5-percentage-point increase from 2011. Similarly, the deposit-to-GDP ratio rose from 20% to 25%, and private credit to GDP improved from 14% to 15.5% over the same period. Financial inclusion has also advanced considerably, with 49% of Adults in sub-Saharan Africa owning bank accounts in 2024—more than doubled the proportion recorded in 2011 (BECK, Cull, Mare, & Valenzuela, 2023).³

The nexus between remittances and financial institutions development remains insufficiently examined within the African context. Existing empirical studies predominantly concentrate on Sub-Saharan Africa, frequently neglecting North African economies, despite their substantial remittance inflows. Egypt, for instance, received 28.3 billion \$ in remittances in 2022, positioning it among the top recipients on the continent. To date, two notable studies have explored this relationship. Abor, Amidu, Sarpong-Kumankoma, and Issahaku (2021) utilized a two-stage least squares (2SLS) approach to examine remittances influence on various dimensions of financial institutions development – namely depth, breadth, stability, and efficiency – using indicators such as bank credit, financial credit, domestic credit, board money, number of accounts and branches, interest margin, and Z-score. Their findings showed a positive relation between remittances and banking sector development in a sample of 35 African countries from 1996 to 2013. Similarly, Adekunle, Tella, Subair, and Adegboyega (2022) examined the impact of remittances on credit to private sector across 53 African countries from 1986 to 2017, applying the Pooled Mean Group estimation (PMG) technique. They also found a positive association.

Building on this literature, the present study examines the impact of remittances on financial institutions development across 30 African countries – explicitly incorporating North African economies – over the period

²To see more, https://www.afdb.org/sites/default/files/documents/departamental-annual-reports/afdb-climatechangeandgreengrowthdepartment-annualreport2019_0.pdf

³To see more, <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099755208142498760/1du188f10cd71ae72148f11b63b16ef304800a43>

2010 to 2022. Using the dynamic Generalized Method of Moments (GMM) estimator, the analysis adopts domestic credit to private sector and the IMF's financial institution index as proxies for financial institutions development, which captures depth, access, and efficiency. The latter of which has also been used by [Pal \(2023\)](#). By including North African countries and employing a multidimensional measure of financial institutions development, this study contributes a novel and comprehensive perspective to the growing literature on remittances and financial institutions in Africa.

The remainder of this study is organized as follows: Section 2 provides a review of the relevant literature. Section 3 analyzes remittance trends and key indicators of financial institutions' development across African countries. Section 4 outlines the data sources and methodological framework. Section 5 presents and discusses the empirical findings. Finally, last section concludes the study with key insights and policy implications.

2. Literature Review

The relationship between remittances and financial institutions development has been a subject of interest for scholars, yet the empirical findings remain mixed. A substantial body of literature has explored this nexus, with several studies identifying a positive association between remittance inflows and various dimensions of financial institutions development. For instance, [Adekunle et al. \(2022\)](#); [Baah-Kumi \(2015\)](#); [Gani and Sharma \(2013\)](#) and [Ikpesu, Akinola, and A. Ikpesu \(2022\)](#) employed credit provided to private sector as a proxy for banking sector development. [Adekunle et al. \(2022\)](#) analyzed data from 53 African countries spanning from 1986 to 2017 using the Pool Mean Group (PMG) estimation technique, and found that remittances had a positive impact on credit provided to private sector. Similarly, [Baah-Kumi \(2015\)](#) showed that remittances positively influenced domestic credit provided to the private sector in a sample of 30 sub-Saharan Africa countries over the period 1990-2012. Using a sample of 57 low- and middle-income countries, [Gani and Sharma \(2013\)](#) also demonstrated a significant positive correlation between remittance inflow and credit provision. In contrast, [Ikpesu et al. \(2022\)](#) found a negative relationship between remittances and banking sector development in 34 SSA countries from 2000 to 2016. They attributed this adverse effect to the prevalence of informal remittance channels, driven primarily by high transaction cost charged by formal financial institutions. In addition, the present-oriented use of remittances may reduce household reliance on formal credit markets and, in turn, dampen credit demand.

Beside domestic credit to private sector, alternative measures have been used to explain banking sector development in the literature. For example, [Reena Aggarwal, Demirgüç-Kunt, and Peria \(2011\)](#) employed bank deposits as a proxy for banking sector development in their analysis of 109 developing countries over the period 1975 to 2007. Their finding suggests that remittances contribute positively to the depth of the banking sector by promoting both aggregate deposit levels and credit provision. In contrast, [Brown, Carmignani, and Fayad \(2013\)](#) used credit provided to private sector and bank accounts to measure banking sector development across 138 countries from 1970 to 2005. They report a negative association between remittances and banking sector development, indicating that remittance inflows had no significant influence on credit availability in the sampled countries.

Moreover, liquid liabilities (M2) has been widely utilized as a proxy for banking sector development in previous literature, including those by [Basnet, Koirala, Upadhyaya, and Donou-Adonsou \(2021\)](#); [Coulibaly \(2015\)](#); [Fromentin \(2017\)](#); [Fromentin \(2018\)](#) and [Tarus \(2015\)](#). [Basnet et al. \(2021\)](#) examined the impact of remittances on banking sector development in five South Asian countries from 1980 to 2017. Their findings revealed that a 1% increase in remittance inflows led to more than 10% rise in both the domestic credit provided to private sector and liquid liabilities. Additionally, they identified a bidirectional causal relationship between remittance inflows and banking development. Likewise, [Fromentin \(2017\)](#) examined the impact of remittances on banking sector development using a sample from 102 countries for emerging and developing countries over the period 1974 to 2014. The study concluded that remittances significantly promoted both the domestic credit to private sector and liquid liabilities. In a subsequent study, [Fromentin \(2018\)](#) analyzed panel data from 32 countries and found a bidirectional relationship between remittances and banking sector development. Further, when dividing the sample into two homogeneous subgroups, the analysis showed that remittances had a positive effect on domestic credit to private sector and liquid liabilities in countries with high remittance inflows, and had no impact in countries with lower remittances to GDP. [Tarus \(2015\)](#) examined the effect of remittances on banking sector development across 23 sub-Saharan African countries from 1994 to 2009. The results indicated a positive influence of remittances on banking sector development. In contrast, [Coulibaly \(2015\)](#) using data from 1980-2010 for 19 SSA countries, found that when liabilities are assumed as a proxy for banking sector development, remittances have a positive impact on banking development only in four countries (Nigeria- Senegal- Sierra Leone and Sudan) and liabilities impact positively on remittances only in Gambia. While using credit to measure banking sector depth, it has been found that remittances contribute positively to credit only in Sudan and do not affect remittances in any other country.

Domestic credit to the private sector, liquid liability, and bank deposits were used by [Denoon-Stevens \(2013\)](#); [Yao \(2019\)](#) and [Williams \(2016\)](#) to measure the development of the banking sector. [Yao \(2019\)](#) indicated that remittances positively influenced WAEMU countries' banking sector development from 1992 to 2016. [Williams \(2016\)](#) used unbalanced panel data from 45 sub-Saharan African countries from 1970 to 2013.

demonstrated that A 10% increase in remittances leads to a 0.43% increase in domestic private credit. In Constant, [Denoon-Stevens \(2013\)](#) found that remittances had a negative and insignificant impact on SADC's credit to the private sector, bank deposits, and near money from 1990 to 2011.

Domestic credit to the private sector to GDP, Bank deposits to GDP, credit to GDP, and liquid liability as measures of banking sector development used by [Azizi \(2020\)](#) employed a panel of 124 developing countries from 1990 to 2015. The study found that a 10% increase in remittances as a percentage of GDP leads to a 1.7% increase in domestic credit to the private sector, a 1.9% increase in bank credit, a 1.2% increase in household credit, and a 0.8 % increase in liquid liabilities.

[Odhiambo and Musakwa \(2024\)](#) used panel data from 26 SSA countries to examine the impact of remittances on banking sector development for 2013-2017. They found that remittances positively affect banking sector development when using liquid liabilities and bank deposits as a measure for banking sector development. When deposit money bank assets measure banking sector development, remittances do not have any profound effects on the development of the Banking sector.

[Abor et al. \(2021\)](#) used 2SLS to examine the impact of remittances on the banking sector's depth, breadth, stability, and efficiency. They measured banking sector development using bank credit, financial credit, domestic credit, board money, number of accounts and branches, interest margin, and Z-score, respectively. They found that remittances enhanced banking sector development in 35 African countries from 1996 to 2013.

[Pal \(2023\)](#) illustrated, using the financial institution index in India and China from 1984 to 2018 and adapting the ARDL estimator, that remittances positively affect the financial institution index.

3. The Trend of Remittances and Financial Institutions Development Indicators in Africa

3.1. Trends in Remittances in Africa

Remittances are an important source of external finance for developing countries, especially for African countries without access to international capital markets ([Chitambara, 2019](#)). Remittances to Africa reached 91.1 billion \$ in 2023. A rise in remittances to the region supported several African countries facing food insecurity, supply chain disruptions, droughts, floods, and debt servicing challenges. Several of these factors have intensified with Russia's invasion ([Ratha et al., 2023](#)). [Figure 1](#) shows that Remittances to Africa exceed the FDI and ODA flows and are more stable. In 2023, FDI to Africa reached 38.6 billion \$, and ODA reached 74.7 billion \$.

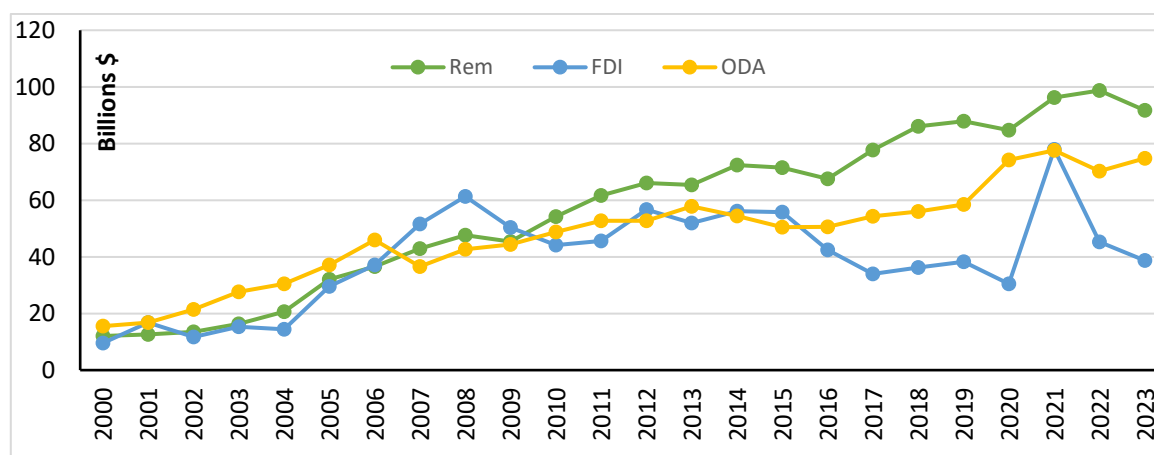


Figure 1. Remittances, foreign direct investment, and official development assistance flows to African countries. (Billions \$).
Source: World Development Indicators (WDI) (2022).

[Figure 2](#) illustrates the largest recipients of remittances in Africa in 2023, valued in US dollars, including Egypt is first with 19.54 billion \$, Nigeria is second with 19.53 billion \$, and Morocco, Ghana, Kenya, Zimbabwe, Senegal, Tunisia, Somalia, Algeria, Sudan, Congo-Dem, Uganda, Mali. In some countries, remittances are the main source of foreign exchange. For example, Remittances to Kenya exceed tourism, tea, coffee, horticulture, and tea exports ([Ratha et al., 2023](#)). According to the World Bank, Egypt is the largest recipient of remittances in Africa, as the volume of remittances in Egypt reached 31.49 billion \$. However, in the last two years, it is decreased to 28.33 and 19.53 billion \$ in 2022 and 2023, respectively.

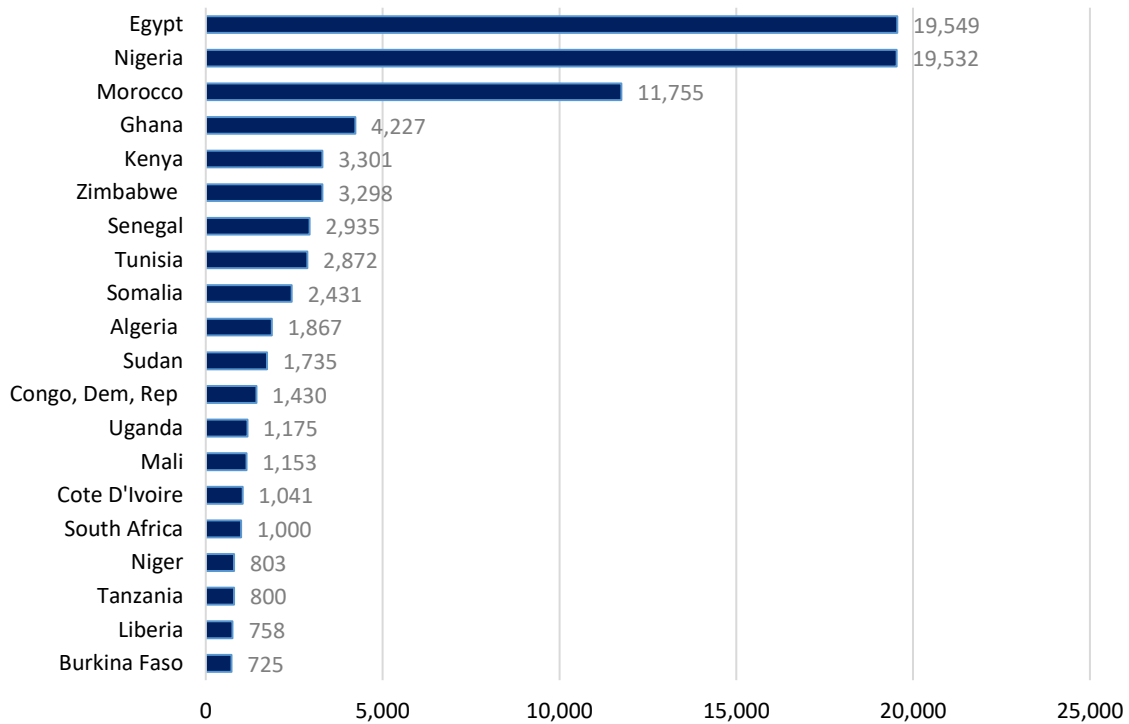


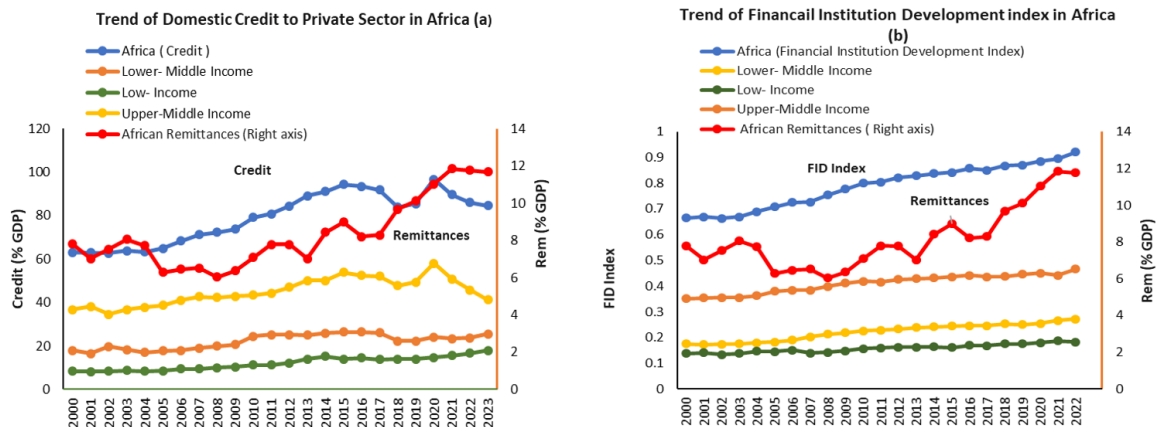
Figure 2. Remittances, top 20 African countries in 2023.

Source: World Development Indicators (WDI) (2022).

Part (c) in Figure 3,4 shows that the low-income group has higher remittance flows as a percentage of GDP than the other three income groups in African countries. In 2023, the average remittances in low-income countries reached 6 %, constituting 52% of African aggregate remittances, Lower-middle-income (5.1 %, 44%), and upper-middle-income (0.50 %, 4%).

3.2. Trends of Financial Institutions Development Indicators in Africa

According to the World Bank, Africa's financial institutions have grown significantly from 2000 to 2023, with the domestic credit to the private sector ratio increasing by 48.2% in 2023. Although the financial sector in Africa has grown considerably in recent years, it has not been able to match the growth in other developing countries (Asante, Takyi, & Mensah, 2023) as the institutional level is low in most African countries (Aluko & Ajayi, 2018). In addition, according to the International Monetary Fund, the financial institution index increased over that period, from 9.3 in 2000 to 14.04 in 2023.



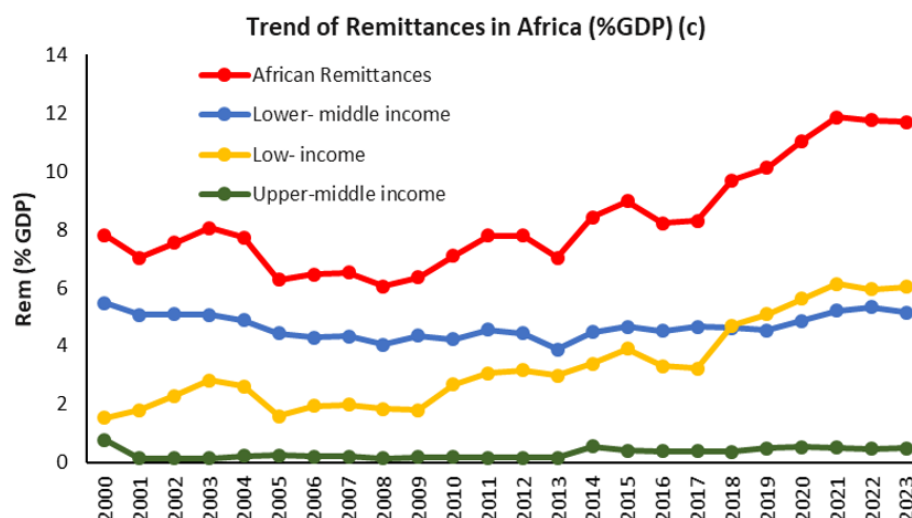


Figure 3 (a-b-c). Trends of domestic credit to the private sector, financial institution index, and remittances in Africa (2000-2023). Source: World Development Indicators (WDI) (2022) and International Monetary Fund (IMF) (2025).

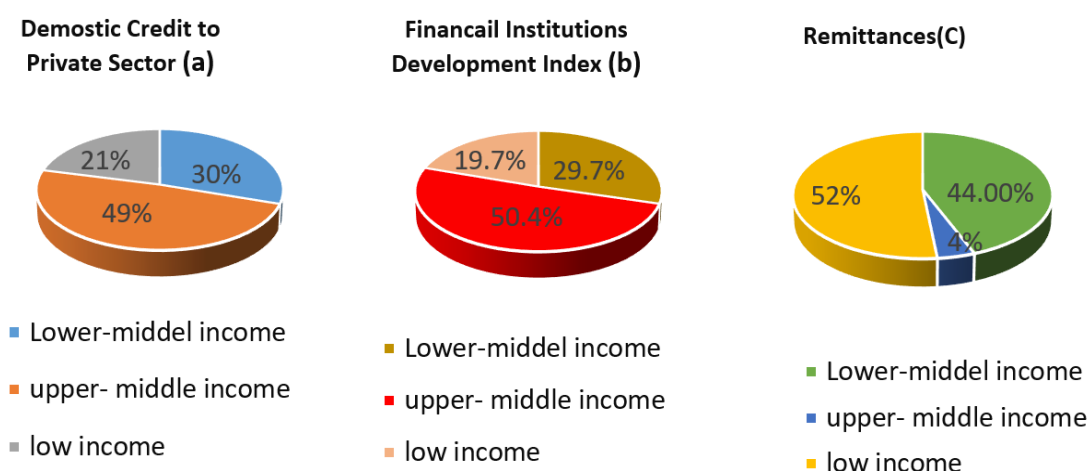


Figure 4 (a-b-c). Share of each group's income in African remittances, credit, and FID Index (2023). Source: World Development Indicators (WDI) (2022) and International Monetary Fund (IMF) (2025).

Figures 3 and 4 in parts a and b show trends in each group's average domestic credit to the private sector and financial institutions index from 2000 to 2023. The average domestic credit to the private sector in 2023 reached 84.5% of the GDP, up from 63% in 2000. The average financial institution index increased from 0.66 to 0.93 from 2000 to 2023. Upper-middle-income is a higher-income group in the proxy of the financial institutions. In 2023, the average domestic credit to the private sector in upper-middle-income countries reached 41.2% of the GDP, constituting 49% of African aggregate credit to the private sector. Lower-middle-income (25.4% of GDP, 30 percent), and low-income (17.8% of GDP, 21 percent). While the average financial institution index in upper-middle-income reached 0.47 (50.4 %), lower-middle-income (0.27, 29.7 %), and low-income (0.18, 19.7 %).

4. Theoretical Framework, Data, and Methodology

4.1. Theoretical Framework

Following Aslam and Sivarajasingham (2020) and Reena Aggarwal et al. (2011) the baseline model is as follows:

$$FID_{it} = F(Y_{it}, Inf_{it}) \quad (1)$$

Where FID is Financial Institutions Development, Y is gross national income, and Inf is inflation.

According to Glytsos (2005) gross national income consists of gross domestic product and workers' remittances. Thus, the function becomes:

$$FID_{it} = F(Rem_{it}, Inf_{it}, GDP_{it}) \quad (2)$$

Where Rem is Workers' Remittances, GDP is the Gross Domestic Product.

The study equation can be written as:

$$FID_{it} = \alpha + \beta_1 Rem_{it} + \beta_2 GDP_{it} + \beta_3 Inf_{it} + \varepsilon_{it} \quad (3)$$

FID stands for financial institutions development, *Rem* for worker remittances, *GDP* for gross domestic product, *Inf* for inflation, α is the constant term, and β_1 , β_2 , and β_3 are coefficients, *i* and *t* represent country and time, respectively, and ε_{it} denotes random error.

Taking natural Log from the equation.

$$\text{Log}(FID_{it}) = \alpha + \beta_1 \text{Log}(Rem_{it}) + \beta_2 \text{Log}(GDP_{it}) + \beta_3 \text{Log}(Inf_{it}) + \varepsilon_{it} \quad (4)$$

4.2. Data

To examine the impact of remittances on financial institutions development, the study uses panel data for 30 African countries are presented in Table A2 (11 low-income countries, 17 lower-middle income, and 2 upper-middle income) from 2010 to 2022. The Sample period and countries are determined by data availability, and data is collected from the World Bank database and the International Monetary Fund. Further details regarding variable definitions and sources are provided in Table A1 and the correlation for all the variables is shown in Figures A1-A6 in the Appendix.

A regression model will run on the full study sample: sample (A) to determine this impact. Then, to test whether the effect of remittances behaves differently in African countries according to their income level, this will be done using a separate regression model for the sample of the low- and lower-middle-income sample (B). In the sample of upper-middle-income countries sample (C), there are only 2 countries; thus, a dynamic GMM estimator cannot be used to estimate the income group because the number of instruments is more than the number of observations. So, in that case, the sample will be discarded sample (C). As the economic characteristics of low-income and lower-middle-income countries are similar, the study combines low- and lower-middle-income countries in one sample (sample B).

This research measures the development of the financial institutions using two proxies: Domestic Credit to the Private Sector (as a percentage of GDP) following the existing literature: Giuliano and Ruiz-Arranz (2009); King and Levine (1993) and Levine (2005) the Financial Institution Development Index, which is an aggregate of three dimensions: financial institutions' depth, access, and efficiency (IMF). The key explanatory variable is the Remittances-to-GDP ratio, which is expected to affect the financial institutions development positively. The control variables include GDP per capita (constant 2015 USD), which is expected to positively affect a country's income and increase demand for financial intermediation (Chowdhury, 2011). Inflation is measured as the annual percentage change in the GDP deflator (Djankov, McLiesh, & Shleifer, 2007).

The descriptive statistics of the variables included in this study are presented in Table 1. The table shows the mean, standard deviation, minimum and maximum values, and total observations for all variables in both samples. The average value of Log (Credit) is 2.71% in sample (A) and 2.69 % in sample (B), with a maximum value of 4.51% in columns (2) and a minimum value of -5.34% in both samples. The mean Log (FID) values were -1.54 and -1.55, with a minimum value of -2.80 and -2.77, a maximum value of -0.57 and -0.54. The average, minimum, and maximum of Log (Rem) values were (1.68%, 1.75%), (0.68%, 0.69%), and (3.37%, 3.33%), respectively. The mean value of Log GDP is 7.18 \$ and 7.07\$, with a maximum value of 8.86 \$ and 8.31\$, and a minimum value of 5.56 \$ in both samples. The mean Log (Inf) value was 3.11% and 3.17%, with a maximum value of 4.27% and 4.29%, and a minimum value of -0.90% and 0.55%.

Table 1. Descriptive statistics of variables in the study.

Variables	Sample (A)					Sample (B)				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	Mean	Max.	Min.	St.Dev	Obs	Mean	Max.	Min.	St.Dev	Obs.
Log(Credit)	2.71	4.51	-5.34	1.57	388	2.69	4.51	-5.34	1.61	364
Log(FID)	-1.54	-0.57	-2.80	0.37	390	-1.55	-0.54	-2.77	0.36	364
Log(Rem)	1.68	3.37	0.68	0.66	390	1.75	3.33	0.69	0.62	364
Log(GDP)	7.18	8.86	5.56	0.80	390	7.07	8.31	5.56	0.70	364
Log(Inf)	3.11	4.27	-0.90	0.32	390	3.17	4.29	0.55	0.26	364

4.3. Methodology

To investigate the impact of remittances on financial institutions development using panel data from African countries (2010-2022), the study applied a dynamic GMM estimator (Arellano & Bond, 1991) since it gives unbiased and consistent estimates. In addition, many econometric models suffer from endogeneity problems. The econometrics models of the study are as follows:

Model(A):

$$\Delta \text{LogCredit}_{it} = B_0 + B_1 \Delta \text{LogCredit}_{it-1} + B_2 \Delta \text{LogRem}_{it} + B_3 \Delta \text{LogGDP}_{it} + B_4 \Delta \text{LogInf}_{it} + \varepsilon_{it} \quad (5)$$

Model(B):

$$\Delta \text{LogFID}_{it} = B_0 + B_1 \Delta \text{LogFID}_{it-1} + B_2 \Delta \text{LogRem}_{it} + B_3 \Delta \text{LogGDP}_{it} + B_4 \Delta \text{LogInf}_{it} + \varepsilon_{it} \quad (6)$$

The dependent variables are Credit and FID Index as proxies of financial institutions development (logged) and lagging the dependent variable for one period. Independent variables are Log (Rem, GDP, Inf). The endogeneity problem that model econometrics may suffer from (Basnet et al., 2021; Donou-Adonsou,

Pradhan, & Basnet, 2020; Fromentin, 2018) can be solved using lagged values of explanatory variables as instrument variables (IV) in GMM. The study uses the second to third lags of remittances, the first lags of GDP, the first to second lags of Inf, and the first and third lags of trade openness as exogenous instrumental variables. In addition, many diagnostic tests are applied, such as the Hansen test to check the instrument's validity, and the Arellano Bond test shows if there is autocorrelation in the error term.

5. Empirical Results and Discussion

The study applied a dynamic GMM estimator to examine the impact of remittances on financial institutions development using panel data from African countries. Two measurements of financial institutions' development, credit to the private sector in the model (A) and financial institution index in model (B), were used to estimate this impact, which was estimated in three steps.

5.1. Remittances, Financial Institutions Development- Full Sample

Table 2 shows the results of model (A). In this table, column 1 presents a simple model that includes credit to the private sector as a dependent variable and its function Log (Rem). The result in these columns indicates that remittances have a positive and significant impact on the credit to the private sector. That remittance contributes 0.060 to private credit in the selected samples of African countries. These results are consistent with previous studies (Reena Aggarwal et al., 2011). In column 2, Log (GDP) is added to the equation; thus, Log (Credit) becomes a function of Log (Rem) and Log (GDP). The estimated coefficient of Log (GDP) is 0.33 (significant at 1%), indicating that GDP is positively and significantly related to credit to the private sector. A 1%-point increase in GDP increases the credit to the private sector by 33 %; this result is in line with previous studies (Kakhkharov & Rohde, 2020) and the estimated coefficient of Log (Rem) is 0.02. In column 3, inflation is added to the equation. The results indicate that the estimated coefficient of Log (Inf) is -0.08, and it is negative and significant at (1%). The results show that inflation correlates negatively and significantly with Credit. A 1 % increase in inflation leads to a decrease in Credit by 8 % points. This result is consistent with previous studies (Githaiga & Kabiru, 2014).

Table 2. Remittances and financial institutions development by using different GMM estimators in the full sample.

Variables	Credit			FID		
	(1)	(2)	(3)	(1)	(2)	(3)
Log(Rem)	0.06*** (13.78)	0.02*** (2.76)	0.03* (1.66)	0.07*** (8.14)	0.01*** (2.92)	0.01* (1.65)
Log(GDP)		0.33*** (13.98)	0.12*** (1.96)		0.98*** (27.98)	0.99*** (25.26)
Log(Inf)			- 0.08*** (-6.91)			- 0.02** (-1.93)
Observations	270	300	270	300	300	300
Hansen J-statistic	29.23	28.04	25.55	27.41	29.62	29.27
P- value	0.40	0.46	0.48	0.49	0.33	0.29
Instrumental rank	30	31	30	30	30	30
Numbers of countries	30	30	30	30	30	30
AR (1), p-value	0.001	0.99	0.06	0.68	0.06	0.05
AR (2), p-value	0.16	0.99	0.12	0.73	0.12	0.11

Note: ***, **, and * denote that the variable is significant at 1%, 5%, and 10%, respectively. Values in parentheses show the absolute value of the t-statistic.

The results of model (B) are shown also in Table 2, and it used the financial institution index (FID) as a proxy to measure financial institutions development. The model is estimated in three steps, column 1 in this table shows that the estimated coefficient of Log (Rem) is .07 and its correlates positively and significant with FID, This results is in agreement with (Abor et al., 2021). Log (GDP) is added to the equation. The results in column 2 indicate that GDP positively and significantly affects financial institutions development. A 1% point increase in GDP increases the FID by 98%. In column 3, Log (Inf) is added to the equation. The results illustrate that the estimated Log (Inf) coefficient is -0.02 (significant at 5%). A 1 % point increase in inflation leads to a decrease in FID by 2 % points.

5.2. Remittances, Financial Institutions Development in a sample of Low- and Lower-Middle Income African countries

To test whether the impact of remittances on financial institutions' development behaves differently in African countries according to their income level, the regression model is re-estimated for (sample B) Table 3. That shows the impact of remittances on financial institutions development in low- and lower-middle-income countries in Africa. Column 1 in Table 3 indicates that the estimated coefficient of Log (Rem) is 0.09, and it has a positive and significant relationship with two financial institutions development measures. In column 2, Log (GDP) is added to the equation, and the results show that Log (GDP) correlates significantly and positively with financial institutions' development. The results in column 3 illustrate that the estimated

parameters of Log (Inf) are - 0.04 and - 0.08, respectively. These results confirm the significant positive correlation between Log (Inf) and financial institutions' development.

The results indicate that remittances have a greater impact on financial institutions' development in (sample B) than in (sample A) and that financial institutions in the lower-middle-income may receive large amounts of remittance deposits.

Table 3. Remittances and financial institutions development by using difference GMM estimators in (sample B).

Variables	Credit			FID		
	(1)	(2)	(3)	(1)	(2)	(3)
Log(Rem)	0.09*** (132.15)	0.08*** (17.52)	0.08*** (16.01)	0.09*** (15.68)	0.05*** (5.32)	0.05*** (8.90)
Log(GDP)		0.11*** (5.93)	0.16*** (6.44)		0.81*** (18.84)	0.85*** (50.34)
Log(Inf)			- 0.04*** (- 6.65)			- 0.08** (-31.24)
Observations	280	280	280	224	224	224
Hansen J- statistic	27.25	26.39	25.71	26.60	26.63	18.67
P- value	0.39	0.38	0.36	0.43	0.42	0.81
Instrumental rank	28	28	28	28	29	29
Number of countries	28	28	28	28	28	28
AR (1), p-value	0.02	0.002	0.02	0.001	0.99	99
AR (2), p-value	0.17	0.13	0.16	0.16	0.99	0.99

Note: ***, **, and * denote that the variable is significant at 1%, 5%, and 10%, respectively. Values in parentheses show the absolute value of the t-statistic.

5.3. Diagnostic Tests

The diagnostic tests are run to confirm instrument validity, and the error term doesn't correlate serially. Firstly, the Sargan test clarifies whether the instrumental variables group is valid and the model specification is good. Secondly, the Arellano and Bond (AR) test indicates if the error term autocorrelation exists. The results in Tables 2,3 display that the Sargan test p-value is more than 0.05; thus, the null hypothesis is accepted, which indicates that the model is well-specified, and the instruments are valid. The AR2 serial correlation test is more important than the AR1 test (Karim, 2021). Therefore, AR2 results will be the focus. The AR2 value in Tables 2,3 is more than 0.05, thus, there is no second-order serial correlation in residuals, and the null hypothesis cannot have rejected.

5.4. Standardized Coefficients

To determine which proxies of financial institutions' development (Credit, FID) are most affected by remittances in Africa. The estimated coefficients must be transformed into standardized coefficients to use them in the comparison. Then, we re-estimated the regression for two models (both proxies of financial institutions development) in two samples. Table 4 illustrates the standardized coefficients for Log (Rem), Log (GDP), and Log (Inf) for the full sample and (sample B). The Standardized coefficients are estimated by subtracting the value of the observation from the mean and dividing the result by the standard deviation.

Table 4. Standardized coefficient displays the impact of each explanatory variable on financial institutions development.

Variables	Sample A		Sample B	
	Credit	FID	Credit	FID
Log (Rem)	0.06	0.16	0.11	0.12
Log (GDP)	0.08	0.50	0.12	0.28
Log (Inf)	-0.06	0.03	-0.11	-0.01

The results show that remittances have a greater impact on the financial institution index than credit to the private sector in each sample in the study.

6. Conclusion and Recommendation

Remittances represent one of the largest sources of foreign exchange for middle and low-income countries. These flows exceed foreign direct investment and official development assistance in many countries. Remittances are an important source of external finance for developing countries, especially for African countries. This study was designed to determine the effect of remittances on financial institutions development in a sample of 30 African countries (2 upper-middle-income, 17 lower-middle-income, and 11 low-income) over the period(2010-2022) measuring financial institutions development by domestic credit to the private sector to GDP and index consisting of three dimensions namely, size, depth, and efficiency. The empirical analysis adopts a dynamic GMM. This study aimed to investigate whether the impacts of remittances behave

differently at different levels of economic development in other nations. So we estimated a model for the full sample (sample A), and then a separate model was re-estimated for the combined sample of low- and lower-middle-income countries (sample B). At the same time, the sample of upper-middle-income countries was discarded. The results of this investigation show that remittances have a significant and positive effect on financial institutions development in the study samples. A 1% increase in remittances raises the credit to the private sector by 3% and also increases FID by 1%. GDP per capita has a positive effect on the credit and index of financial institutions development by 12% and 99%, respectively. While Inf impacts negatively on Credit by 8% and the index of FID by 2%.

The effect of remittances on the development of financial institutions is weak because these remittances are all directed to consumption, especially in African countries where the marginal propensity to consume is high, as they represent an important source of income. A large portion of workers' remittances abroad are sent through informal channels, therefore, their impact is low. The development and diversification of banking services and the increase in the number of banking branches are weak, and to increase this effect, the following must be borne in mind: Establish policies that encourage transfer through official channels such as Reducing the cost of transfers through these channels, Granting tax exemptions and encouraging exchange rates to enable them to use official channels, Motivate and encourage families receiving remittances from investing part of these remittances instead of directing them all for consumption or hoarding through Offering bonds in small amounts to target these funds, Opening fees-free accounts to make financial transfers, Issuing various banking products and services, Raising the interest rate on deposits in foreign currency to encourage transfer, Expanding the number of bank branches and automated teller machines in remote and rural areas where these transfers are concentrated.

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Appendix.

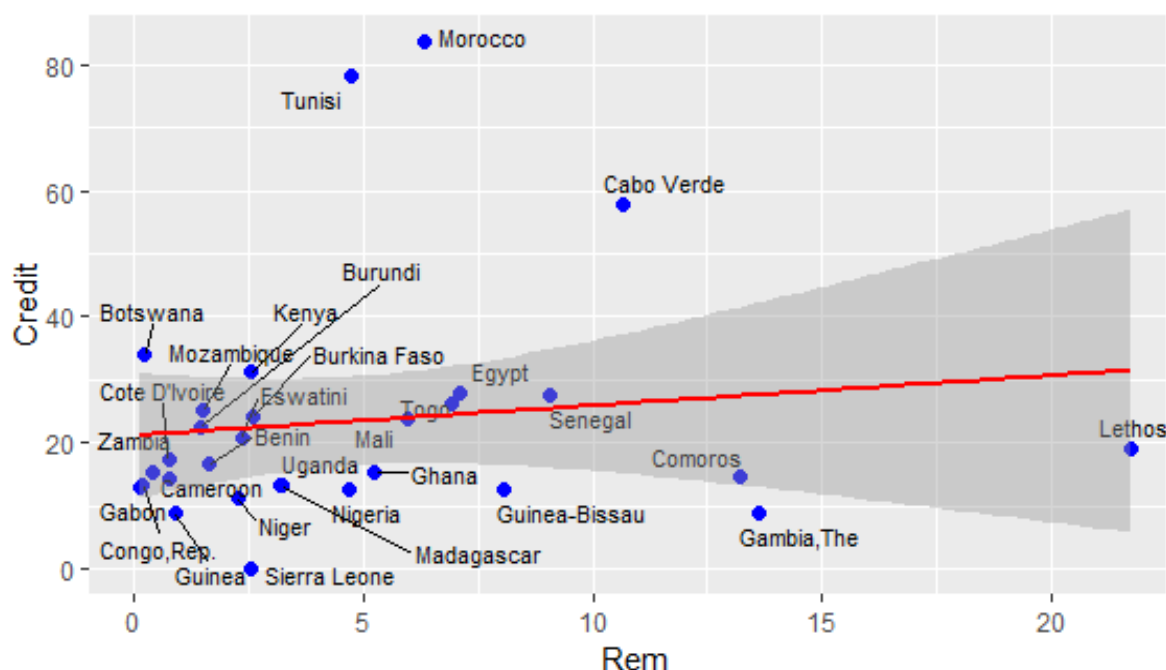


Figure A1. Correlation between credit and rem in the selected sample of African countries.

Source: World Bank (2024a).

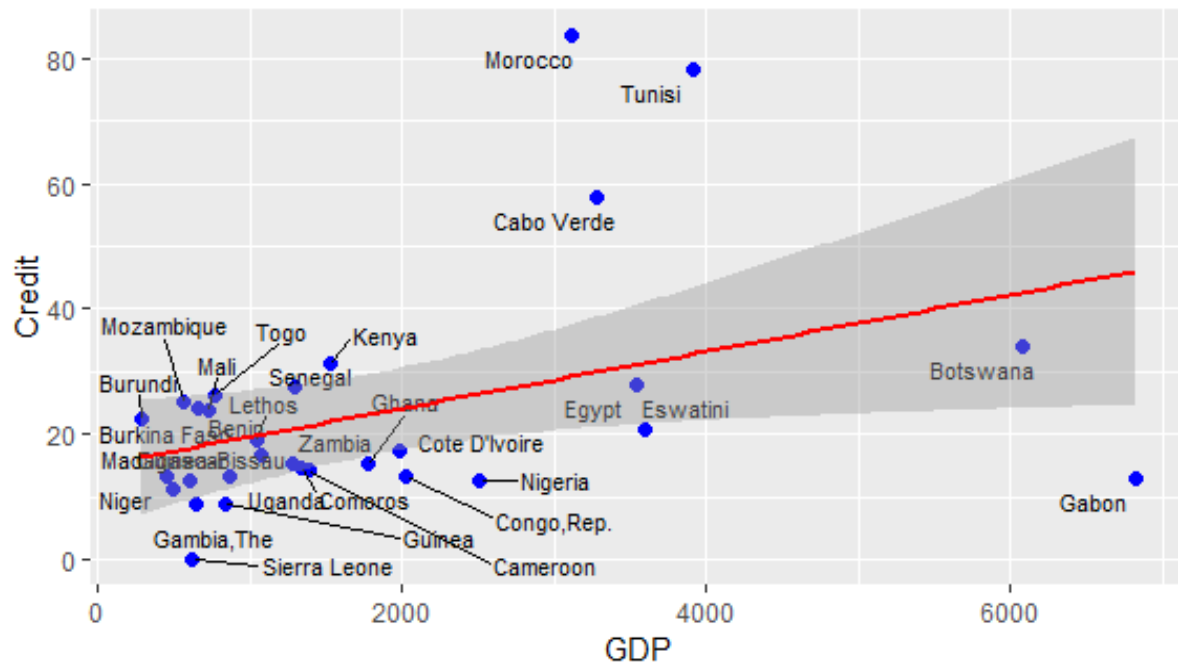


Figure A2. Correlation between credit and GDP in the selected sample of African countries.

Source: World Bank (2024a)

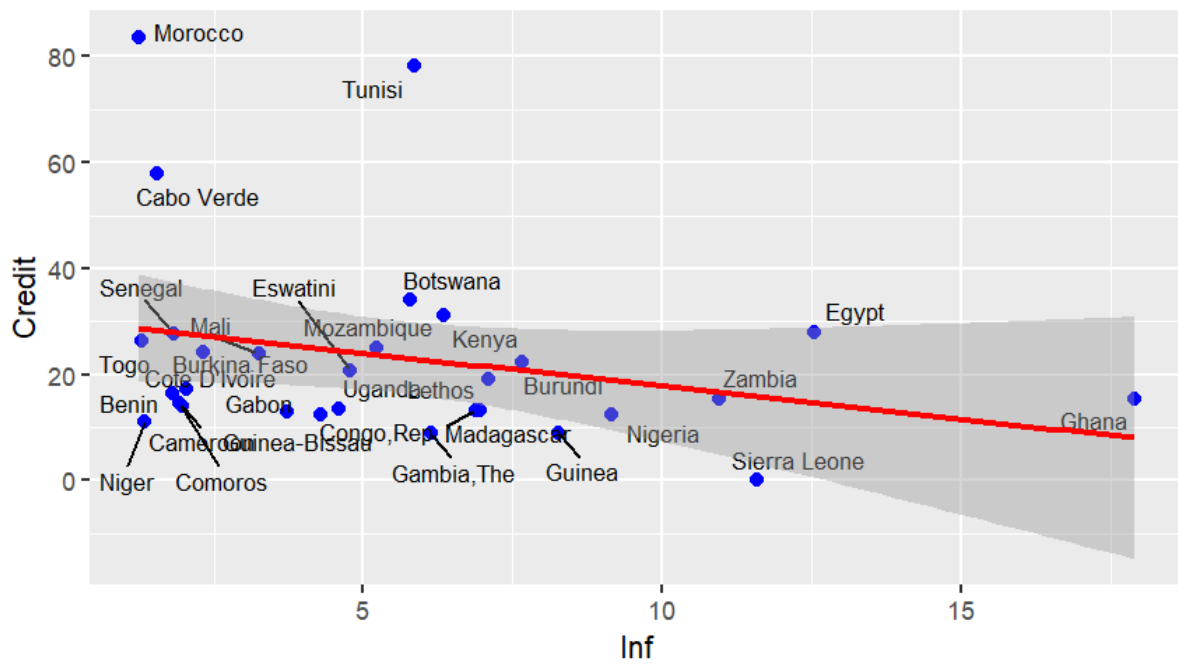


Figure A3. Correlation between credit and Inf in the selected sample of African countries.

Source: World Bank (2024a).

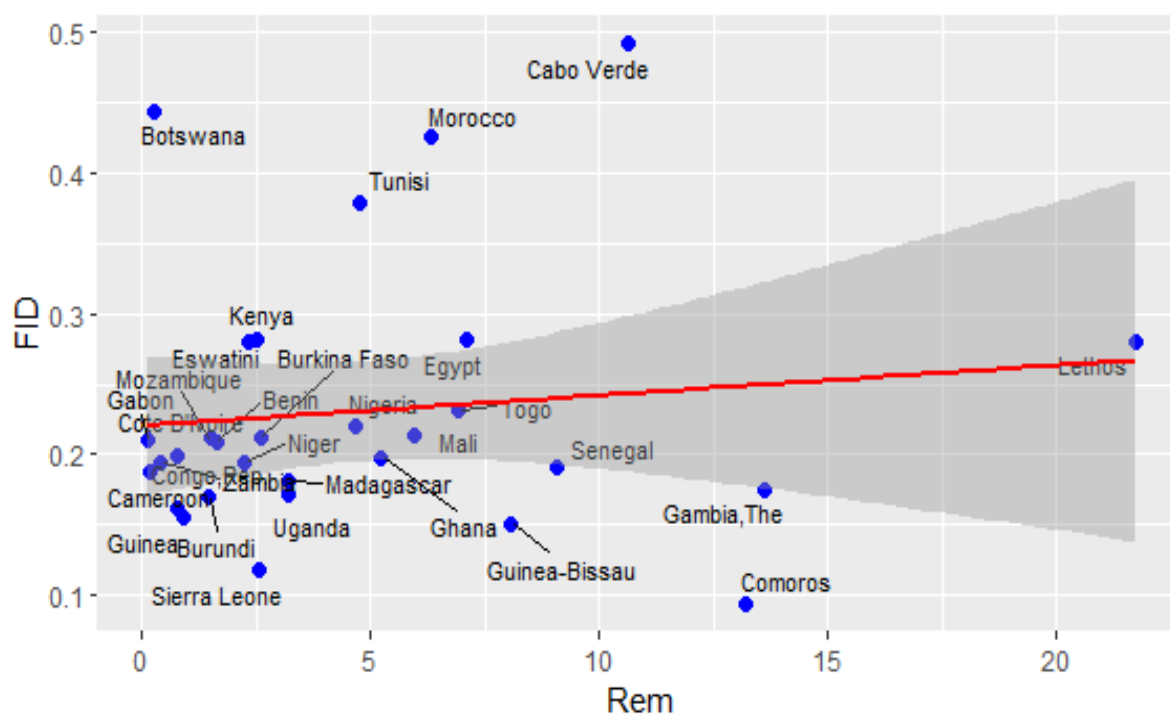


Figure A4. Correlation between FID and rem in the selected sample of African countries.

Source: World Bank (2024c).

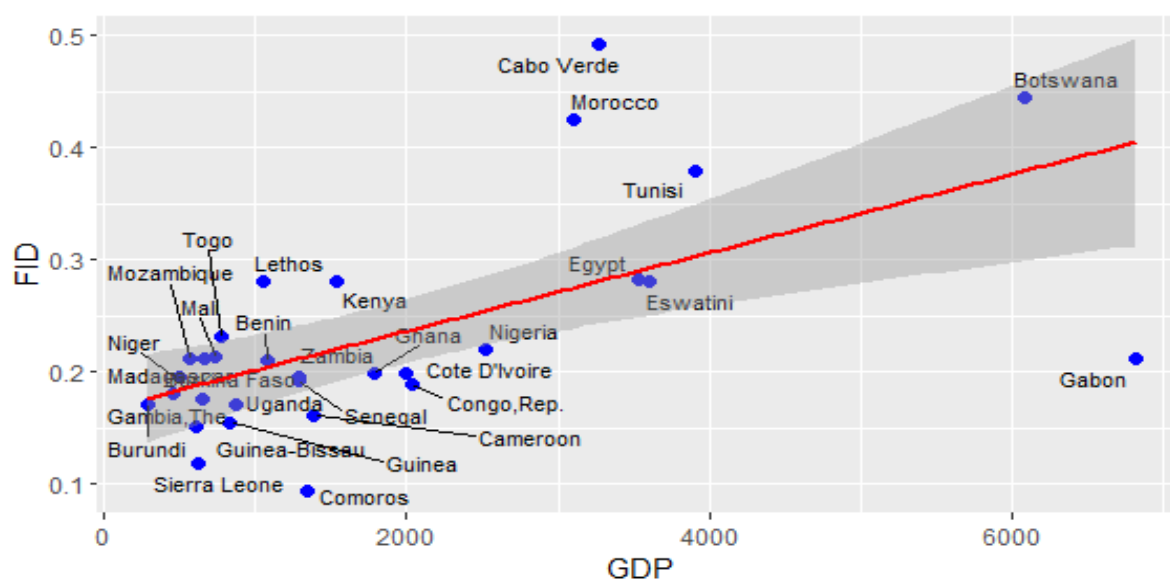


Figure A5. Correlation between FID and GDP in the selected sample of African countries.

Source: World Bank (2015).

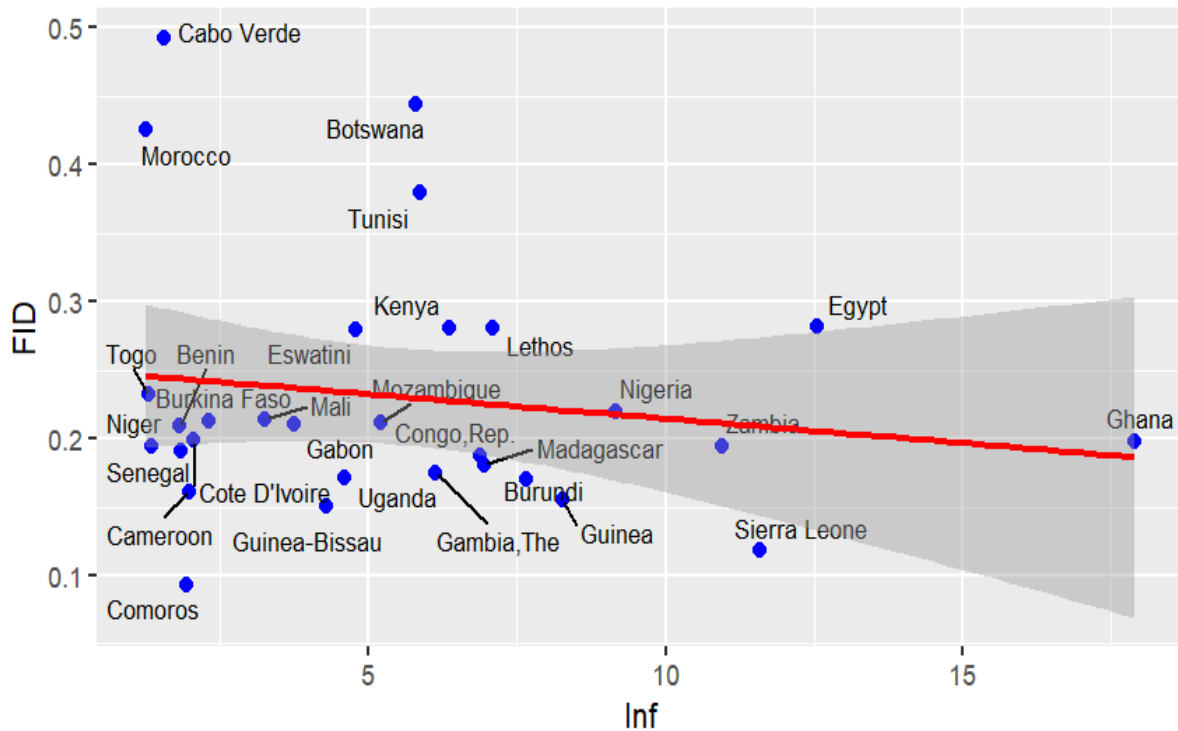


Figure A6. Correlation between FID and Inf in the selected sample of African countries.

Source: World Bank (2024b).

Table A1. Description of variables.

Variables	Notation	Description	Data Source
Workers remittances	Rem	Personal remittances as a percentage of GDP	WDI
Domestic credit to the private sector	Credit	Credit (% GDP)	WDI
financial institutions development	FID	A composite measure of the financial institutions encompassing depth, access, and efficiency	IMF
GDP per Capita	GDP	GDP per capita in constant (2015 USD \$)	WDI
Inflation	Inf	GDP deflator (Annual %)	WDI

Note: WDI is the World Development Indicator, IMF, the International Monetary Fund.

Source: By Author, using WDI.

Table A2. A list of African countries in the study.

Upper-middle income	Lower-middle income	Low-income
Botswana	Benin	Guinea-Bissau
Gabon	Kenya	Burkina Faso
	Lesotho	Burundi
	Cabo Verde	Madagascar
	Cameroon	Mali
	Comoros	Mozambique
	Congo, Rep	Niger
	Nigeria	Sierra Leone
	Cote D'Ivoire	Togo
	Senegal	Gambia, The
	Egypt	Uganda
	Eswatini	
	Tunisia	
	Morocco	
	Ghana	
	Zambia	
	Guinea	