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RESEARCH PAPER

Remittances, Financial Development, and Poverty Reduction in Sub-Saharan Africa

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Abstract

This study specifically investigates the direct effect of financial development and remittances as well as the interaction effect of remittances and financial development (FD) on poverty reduction in various income groups in sub-Saharan Africa. The study employed the Panel ARDL model on data from 31 sub-Saharan countries during the period 1990-2020. The study found that in the long run, both remittances and FD contribute to poverty reduction in sub-Saharan Africa, middle-income, and low-income groups within the region. The study also found that the interaction of remittances and FD does not contribute to the poverty alleviation process. In the short run, both remittances and FD fail to enhance poverty reduction in the region and among the income groups. Likewise, the interaction between remittances and FD does not contribute to poverty reduction in the region and within the income groups. The study found that the levels of income play no role in the relationship between remittances, financial development, and poverty reduction but it has little effect in the short-run. There is a need to make financial institutions more efficient in promoting the inflow of remittances through the formal channel by easing and reducing the cost of the transaction of remittances.

Keywords: Remittances, Financial Development, Poverty Reduction, Sub-Saharan Africa.
JEL Classification: B26, F24, I32, N17.

1. Introduction

This study examines the moderating role of financial development in the nexus between remittances and poverty reduction in sub-Saharan African countries. A study such as this is motivated by the 2030 Sustainable Goals of the United Nations to reduce extreme hunger and poverty, and by issues in research circles. Recent reports from the World Bank (2020) indicate that sub-Saharan African countries

have become home to hunger and extreme poverty, despite global progress in reducing poverty. For instance, three out of the five poorest countries now live in Africa (Christiaensen and Hill, 2019; Bicaba et al., 2017; Dada and Fanowopo, 2020), while close to 40% of the entire population in SSA wallows in abject poverty (World Bank, 2020). According to the Oxford Poverty and Human Development Initiative (2018) and Tewolde and Weldeyohannes (2018), 58% of the SSA population is considered to be multidimensionally poor. A similar trend has been observed in terms of remittances in the region, with over $42 billion received in 2020 as remittances from migrants. In the region, Nigeria, Zambia, Mozambique, and Ghana receive a significant share of remittances. Despite this, the countries with the highest percentage of remittance inflows are also among the most impoverished. While remittances have increased in the region, poverty levels have continued to rise, posing a threat to the achievement of Sustainable Development Goals (SDGs) (Akinlo and Dada, 2021); therefore, understanding the role of remittances in poverty reduction in SSA is critical.

Additionally, both theoretical and empirical research have remained inconclusive regarding remittances' impact on growth and welfare. In addition to spurring economic growth, remittances also reduce poverty by increasing capital formation, providing additional income for consumption, and smoothing consumption patterns, particularly during periods of shock that have a multiplier effect on both aggregate demand and output (Yang and Martinez, 2006; Acosta et al., 2008; Azizi, 2018; Konte, 2018; Dada and Akinlo, 2022); and reducing poverty levels (Inoue, 2018; Inoue and Hamori, 2016; Azizi, 2021). Additionally, remittances have been identified as one of the stable sources of foreign currency that could be used both to correct the balance of payments difficulties and for development projects (Ratha et al., 2011; Huay and Bani, 2018). Although international remittances contribute to economic growth and human welfare, they also pose several developmental challenges. The inflow of remittances may cause the exchange rate of the receiving country to appreciate in real terms, as well as increasing inflation, which can worsen output levels and employment conditions. It is pertinent to note that these factors adversely affect the poor. This channel is known as the "Dutch disease effect" (Acosta et al., 2009; Catrinescu et al., 2009; Mughal, 2013; Majeed, 2014). As a result of migration, growth and poverty can become worsened if skilled workers leave the country (both highly skilled and semi-skilled) resulting in brain drains (Adams, 2003; Docquier et al., 2007; Chauvet et al., 2013). The result may be that remittances are used for immediate consumption instead of productive activities (Vacaflores, 2018; Abduvaliev and

Bustillo, 2019). Furthermore, remittances could make beneficiary households lazy, dampening long-run growth (Mehedintu et al., 2019). This channel is known as the labor market participation channel.

Having a strong financial sector can reduce the negative impact of remittances on welfare through inflation, exchange rate appreciation, and labor market participation channels. To solve these problems, effective communication and effective cooperation between remittances and financial development (hereafter, FD) is essential. The FD could serve as a conduit to offset the negative effects of remittances, particularly poverty (Giuliano and Ruiz-Arranz, 2009; Majeed, 2014; Akobeng, 2016). In addition to protecting poor households from exogenous shocks, a well-developed financial sector can also assist them in directing their surplus funds to profitable investments. The financial sector may be able to pool remittances into large deposits, which can then be used to fund productive activities and projects with a high return (Levine, 2005; Donou-Adonsou and Sylwester, 2016). Furthermore, it facilitates transactions by serving as an intermediary between sender and receiver and allows the poor to benefit from financial services and opportunities, especially through specialized financial institutions (Nyamongo and Misati, 2011; Aggarwal et al., 2011; Kaidi et al., 2019; Sharimakin and Dada, 2020; Olaniyi et al., 2022). Furthermore, financial development could serve as a tool to reduce the high cost of sending remittances to the home country (World Bank, 2021)[1]. For instance, it is estimated that in 2019, an average of 8.9% was used to send money to sub-Saharan Africa, a value higher than the global average of 6.8% as well as the Sustainable Development Goal 10 target of 3%. Several empirical studies have examined FD's role in the remittance-growth nexus (Aggarwal et al., 2011; Demir-güç-Kunt et al., 2011; Bangake and Eggoh, 2020, and Olayungbo and Quadri, 2019), but not much attention has been paid to the role FD plays in the relationship between remittances and poverty.

The argument is that economies with a strong financial sector are more likely to have banking regulations and services that make it simple and affordable for people to send money home, which would increase the impact of remittances on eradicating poverty. When the financial sector can foster an atmosphere that encourages the flow of remittances and also pools remittance funds for investment, there will be a rise in remittance inflow with a potential poverty reduction. In contrast, financial institutions in economies with weaker financial sectors would not be able to promote easy remittances inflow or reduce the cost of remittances

[1]. Remittance costs are calculated as the fee migrant would pay as a percentage of a $200 transfer

transfer, which can decrease the impact of remittances on poverty reduction. We build on other studies to argue that the FD is a necessary condition for the magnitude of the impact of remittances on poverty reduction since a strong financial sector can raise household investment levels through easy remittance transfers. Thus, we explore how the effect of remittances varies, if at all when interacting with FD in sub-Saharan Africa. Also, previous studies have not considered whether the level of economic development influences the relationship between remittances, FD, and poverty reduction. There is evidence that countries with high Gross National Income (GNI) may be able to deal with poverty more effectively than low-income countries since they have more resources available to develop infrastructure and social welfare packages to assist the poor and the jobless. A country's economic development can have a significant impact on the quality and efficiency of poverty reduction programs and infrastructure development. As a result, countries that do not have adequate resources may not be able to effectively combat poverty. Therefore, the study expands the sample to include sub-samples based on income level (middle-income and low-income countries), providing a more detailed picture of the dynamics and differences among the various income groups in SSA. Moreover, the sub-samples of the sample provide a homogeneous panel that enables policymakers to formulate and design appropriate policies related to remittances, FD, and poverty levels in the region.

This study contributes to the literature in three different ways. First, the study contributes to the literature on remittances and welfare by shedding light on the moderating role of financial development in the relationship between remittances and poverty in sub-Saharan African (SSA) countries. Second, the study focuses on developing countries, SSA. SSA offers an interesting study area being the region with the highest poverty level in the world (Christiaensen and Hill, 2019; World Bank, 2020) and one of the highest remittance-receiving countries in the world (Olayungbo and Quadri, 2019), with weak financial development (Allen et al., 2014; Olaniyi and Oladeji, 2021). Third, the study uses panel data of 31 countries located in SSA (14 middle-income countries and 17 low-income countries), and Pooled Mean Group and Dynamic Fixed Effect estimation techniques were utilized as the estimation techniques to address endogeneity in remittances-welfare literature, and the estimates provide both long-term and short-term data, which are important for policy formulation.

Apart from the introduction, the remaining part of this paper is sectionalized. Section 2 focuses on a brief literature review. Section 3 presents the methodology

and Data. The results and discussion are presented in section 4. Section 5 deals with implications and conclusions.

2. Literature Review

This section provides empirical evidence of the link between remittances, FD, and poverty. This review is done along three strands in the literature; FD-poverty nexus, remittances-poverty nexus, and lastly, remittances-FD-poverty nexus.

2.1 FD- Poverty Nexus

Applying cross-sectional data from 48 developing nations, Imai et al. (2012) conclude that FD especially micro-finance reduces poverty. Kaidi and Mensi (2019) examine the relationship between FD, income inequality, and poverty reduction by accounting for the role of political institutions. Using a panel of 93 democratic countries and 31 autocratic countries, the results from the study suggest that in autocratic countries, FD and democratic institutions reduce inequality and poverty, while the reverse holds for democratic countries.

Sehrawat and Giri (2016) submit that FD reduces poverty in South Asia and Southeast Asia by reducing transaction costs in the economy and motivating the poor to accumulate savings. In the same vein, Sehrawat and Giri (2017) also conclude that FD and economic growth abate poverty levels while income inequality and inflation rates worsen poverty in India using ARDL. However, Fowowe and Abidoye (2013) found that FD failed to reduce poverty and inequality in African countries. Kaidi and Mensi (2017) also submit that FD proxy by banking and stock market indicators fail to reduce poverty level in a sample of 138 countries between 1980 and 2014. Kaidi et al. (2019) concluded that FD does not contribute to poverty reduction, using a sample of 132 countries between 1980 and 2014.

Cepparulo et al. (2016) investigated the role of institutions in the relationship between FD and poverty in developing countries from 1984 to 2012. The interactive term of FD and institutional quality has a reducing effect on poverty as institutions rise. Along the same line, Rashid and Intartaglia (2017) also assess the role of institutions and economic growth in the link between FD and poverty in developing countries. Applying GMM, the study concludes that FD plays a significant role in reducing absolute poverty, while the indirect effect of FD through institutions shows that FD has a greater reducing effect on poverty when the institution is strong. In addition, Perez-Moreno (2011) submits that FD has a different effect on poverty reduction in developing countries.

2.2Remittances-Poverty Nexus

Gupta, Pattillo, and Wagh (2009) explore the role of remittances on poverty and FD in SSA using different estimation techniques. Findings from the study reveal that remittances have a poverty-reducing effect and aid the development of the financial sector in the region. Similarly, Imai et al. (2014) investigate the impact of remittances on growth and poverty in 24 Asia and Pacific countries. The authors conclude that remittances spur growth and reduce the poverty level in the study area. The direct effect of remittances on poverty is also found in the study. However, Jongwanich (2007) found that remittances have a marginal impact on growth and poverty in Asia and the Pacific countries using GMM with account for endogeneity. In addition, Serino et al. (2011) conclude that remittances have a different uneven impact on the poverty quantile of 66 developing countries between 1981 and 2005. Azam et al. (2016) examined the effect of remittances across various income groups in 39 countries between 1990 and 2014. Applying FMOLS, the result suggests that remittances worsen poverty alleviation in upper-middle-income countries.

Anyanwu and Erhijakpor (2010) also submit that remittances lessen poverty in 33 African nations between 1990 and 2005. Furthermore, using macro data, Akobeng (2016) examines the effectiveness of remittances in reducing poverty and inequality in SSA. Controlling for time-invariant country-specific effect and endogeneity, the outcome of the study suggests remittances lessen poverty, but the size depends on the proxy used to measure poverty. Also, remittances reduce income inequality in SSA. Similarly, Azizi (2021) examine the effect of workers' remittances on poverty and inequality in 103 developing countries between 1990 and 2014. Applying instrumental variable regression that addresses the endogeneity issue, the result shows that remittances reduce poverty using different proxies and inequality.

Meanwhile, Huay and Bani (2018) used human capital to mediate the relationship between remittances and poverty in 54 developing countries using GMM. The results from the study suggest that education helps channel the positive effect of remittances to poverty reduction, thus remittances reduce poverty through education. Vacaflores (2018) examines the effectiveness of remittances in reducing poverty and inequality in 18 Latin America between 2000 and 2013. The conclusion from the study reveals that remittances lessen poverty and inequality; while remittances are more felt in countries receiving smaller amounts than countries with a large volume of remittances inflow. Masron and Subramaniam (2018) also corroborate the result of Vacaflores (2018) by examining the effect on

44 developing countries between 2006 and 2014. Further, Masron and Subramaniam (2021) assess the implication of remittances on poverty in 44 developing countries between 2006 and 2014. The outcome of the study suggests that the poverty level tends to be lower in countries with a higher flow of remittances. Hatemi-J and Salah Uddin (2013) focus on the direction of causality between remittances and poverty reduction in Bangladesh from 1976 to 2010. The author's finding suggests a two-way relationship between remittances and poverty reduction.

Using micro-level data on poverty, Adam (2006) submits that remittances lessen poverty among recipient households in Ghana. Similar results are obtained by Azam and Gubert (2006) for Mali and Senegal and Dejene (2005) for Ethiopia. In another study, Adams and Page (2005) investigate the impact of migration and remittances on poverty and inequality in 71 developing nations. Applying methods that control for endogeneity, the finding from the study suggests that both international migration and remittances significantly reduce the level, depth, and severity of poverty in the developing world. Furthermore, Abduvaliev and Bustillo (2019) examine the effect of remittances on economic growth and poverty in 10 former post-Soviet republics. Submission from the study reveals that remittances boost economic growth and reduce the poverty level.

2.3 Remittances-FD-Poverty Nexus

Focusing on the interactive effect of remittances and FD on the poverty level of 120 developing countries, Inoue (2018) submits that FD and remittances help in combating poverty in developing countries. Furthermore, the author concludes that remittances substitute for FD in reducing poverty. Kousar et al. (2019) investigate the role of FD and remittances on poverty and income inequality in Pakistan using ARDL-bound testing. Findings from the study show that remittances increase both poverty and income inequality both in the short run and long. In another related study, Majeed (2014) examine the moderating effect of FD in the link between remittances and poverty for 65 developing countries between 1970 and 2008. The empirical findings show that the effect of remittances on poverty depends on the level of FD. Countries with strong FD benefit maximally from the poverty reduction effect of remittances and vice-versa.

From the above strands in the literature, it is evident that only a few studies have examined the impact of remittances on poverty in SSA with little study in the region examining the role played by the financial sector in channeling the positive effect of remittances to the well-being except Akobeng, (2016). However, this

study is different from Akobeng (2016) as the study considers different income groups in SSA. This study, therefore, contributes to the body of knowledge in this regard. The following hypotheses are tested in this study.

Hypothesis 1: Remittances and FD have a positive effect on poverty reduction
Hypothesis 2: FD moderates the effect of remittances on poverty reduction in SSA

Hypothesis 3: The effect of remittances, FD, and their interactions on poverty varies across income groups in SSA

3. Methodology and Data

3.1 Sample and Data

The variables and the period for this analysis were selected based on economic theory and data availability. For instance, the data on the Human Development Index from the United Nations Development Program (UNDP) starts from 1990 and data are not available or scanty for some of the sub-Saharan African countries. Based on this, annual data for 31 sub-Saharan African nations from 1990 to 2020 were utilized as the sample. This implies that those countries that lack data and whose data are scanty are excluded from the study.

Poverty reduction is the dependent variable, which is measured by life expectancy (POVL) and the Human Development Index (POVH). The other variables included in the study are remittances and financial development. Two control variables are included in the study. They are trade openness and government expenditure. Data on remittances, financial development, government expenditure, life expectancy, and trade openness are obtained from the World Development Indicator while data on the human development index is obtained from the United Nations Development Program database.

3.2 Measures of Variables

The first measure of poverty reduction is life expectancy. Life expectancy (POVL) is the average number of years a newborn is projected to live if mortality patterns at the moment of birth remain constant in the future is called life expectancy. Life expectancy was employed by Magombeyi and Odhiambo (2018a; 2018b) to measure poverty. The second measure of poverty reduction is the human development index (POVH). The human development index is created by the human development index to show a more comprehensive and long-term approach

to poverty reduction that considers factors such as life expectancy, education, and standard of living. The Human Development Index was employed as a proxy for poverty reduction by Gohou and Soumare (2012) and Uttama (2015). Financial Development (FD) is proxied by domestic credit to the private sector (% GDP). Domestic credit to the private sector indicates the totality of credit made available to the private sector by banks and other financial institutions. Personal remittance (REM) as a percentage of GDP – This includes personal transfers and the compensation of employees. Trade openness (OPEN) – Trade openness is measured by the sum of imports and exports as a percentage of GDP. Government expenditure (GOVE) as a percentage of GDP is the final government consumption expenditure. All the variables except the human development index are obtained from the World Bank Development Indicator. The Human Development Index is obtained from the United Nations Development Program Indicator (UNDP). We present the summary form of definitions of variables, data sources, and a priori expectations in Appendix (Table A1) while summary statistics of the data are presented in Appendix (Table A2). The list of countries is provided in Appendix (Table A3).

3.1 Models and Data Analysis Procedure

We use the panel ARDL model in this study because of its benefits. For example, Pesaran and Shin (1999) established that panel ARDL is appropriate for variables with different integration orders, irrespective of whether they are I(0), I(1), or combining the two. Another benefit of the ARDL model is the ability to estimate the short-run as well as the long-run impacts from a data set with a wide cross-section and time dimensions at the same time. Another advantage of the ARDL model that made it necessary to use it in our study is that it is appropriate for studies with limited sample sizes, such as the one we have. This full sample includes 31 countries and a 31-year time series. However, the middle-income countries consist of 14 countries while the low-income countries consist of 17 countries and both have 31-year time series which are small for typical panel studies but can be accommodated by ARDL models.

The key feature of the pooled mean group (PMG) is that it allows short-run coefficients and intercepts, as well as the speed of adjustment to long-run equilibrium values and error variances, to vary by country, but long-run slope coefficients remain the same across the countries. Pesaran and Smith (1995) proposed the second technique mean group (MG), which involves estimating independent regressions for each nation and calculating the coefficients as

unweighted means of the estimated coefficients. There are no restrictions as a result of this. In the long and short run, it allows all coefficients to change and be heterogeneous. Finally, the dynamic fixed effects (DFE) estimator is similar to the PMG estimator in that it constrains the slope coefficient and error variances to be identical across all nations in the long run. The speed of adjustment coefficient and the short-run coefficient are also restricted in the DFE model to be equal. However, the model features country-specific intercepts. The panel ARDL form of Pesaran and Smith (1999) is presented as:

$$\begin{aligned}\Delta POVR_{it} = \mathrm{A} + \varphi_1 POVR_{it-1} + \omega_i \textstyle\sum_{i=1}^{n} \Delta REM_{it-1} + \sigma_i \sum_{i=0}^{n} \Delta FD_{it-1} + \\ \theta_i \textstyle\sum_{i=0}^{n} \Delta GOVE_{it-1} + \pi_i \sum_{i=0}^{n} \Delta OPEN_{it-1} + \tau_i \sum_{i=0}^{n} \Delta REM * FD_{it-1} + \\ \beta_1 POVR_{it-1} + \beta_2 REM_{it-1} + \beta_3 FD_{it-1} + \beta_4 GOVE_{it-1} + \beta_5 OPEN_{it-1} + \\ \beta_6 REM * FD_{it-1} + \eta_{it} + \varepsilon_{it}\end{aligned} \quad (1)$$

where POVR is poverty reduction, REM is the remittances, FD stands for financial development, GOVE represents government expenditure, OPEN signifies trade openness and REM*FD is the interaction of remittances and FD. φ is the coefficient of the lagged dependent variable, φ_1, ω_i, σ_i, θ_i, π_i, and τ_i are the short-run coefficients, β_1, β_2, β_3, β_4, β_5 *and* β_6 are the long-run coefficients. η_i and ε_{it} are the unobserved country-specific effect and error term respectively. Hypothesis2 is tested by estimating the coefficient τ_i for the short run and β_6 in the long run. If τ_i or $\beta_6 > 0$, the results would mean that FD and remittances are complementary. If τ_i or $\beta_6 < 0$, it would mean that FD and remittances are substitutes. If τ_i or $\beta_6 = 0$, it would mean that the impact of remittances on poverty reduction is independent of FD.

Three different estimators can be used to estimate Equation (1). The first estimator is the mean MG model which was developed by Pesaran and Smith (1995). The second estimator is the PMG estimator which was proposed by Pesaran et al. (1999). The third estimator is the DFE. However, we will make use of PMG and DFE estimators in this study. Hausman, on the other hand, will be used to choose the best results. The Hausman test is commonly used to investigate if the differences between these estimators are significant. The null hypothesis is that there is no significant difference between PMG and DFE estimations. The PMG estimator is preferred if the null hypothesis is not rejected since it is efficient. We exclude the MG because of its necessary condition for consistency and validity which requires a sufficiently large time-series dimension of the data. According to

Samargandi et al. (2019), the cross-country dimension should also be large (at least 20–30) countries, a condition our low-income and middle-income countries cannot satisfy. Also, as stated by Favara (2003), for small N, the MG estimator is sensitive to outliers and small model permutations.

In the ARDL model, it is expected that the lag structure of the ARDL needs to be determined by some consistent information criterion. Therefore, in this study, we select the lag structure using the Schwartz Bayesian criterion. For the full sample, middle-income countries and low-income countries, we imposed lag structure (1, 1, 1, 1, 1, 1), (1, 1, 0, 1, 0, 1), and (1, 1, 1, 0, 1, 1) respectively for poverty reduction, FD, remittances, government expenditure, trade openness and the interaction term. Finally, aside from analyzing the full sample, we consider middle-income countries and low-income countries to investigate if income levels influence the relationship between remittances, FD, and poverty reduction. All 48 countries in Sub-Saharan Africa were divided into four groups by the World Bank. Low-income countries are in the first group, lower-middle-income countries are in the second group, upper-middle-income countries are in the third group, and high-income countries are in the fourth group. According to the classification, the region's low-income group includes 27 countries. We have 14 countries in the lower-middle-income group, and 6 countries in the upper-middle-income group. The high-income group is made up of just 1 country. The lower-middle-income and upper-middle-income groups are combined to form middle-income countries. We exclude upper-income countries because only one country belongs to this income group in sub-Saharan Africa.

4. Results and Discussion

4.1 Unit Root

It is necessary to perform the unit root test to determine the order of integration and avoid spurious results. We perform a unit root test by employing panel unit root tests such as Levin et al. (2002), Im et al. (2003), ADF-Fisher, and PP-Fisher Chi-square statistics. Levin et al. (2002) t-statistic assumes a homogeneous or common unit root process according to Maddala and Wu (1999) and Choi (2003). However, Im et al. (2003) W-statistic, ADF-Fisher, and PP-Fisher Chi-square statistics assume a heterogeneous or individual unit root process. From Table 1, where we present the results of the unit root test, it is obvious that some variables are stationary at a level while some are stationary at first difference. For instance, government expenditure is stationary at a level while other variables are stationary at first difference. The unit root results show that the panel ARDL model is

appropriate for this study as it is suitable for the combination of I(0) and I(1) variables.

Table 1. The Result of the Unit Root Test

	Method	At level		At first difference	
		Intercept	Trend	Intercept	Trend
POVL	Levin et al.	3.356	4.905	-22.989***	-16.528***
	Im et al.	6.886	-1.049	-21.524***	-16.778***
	ADF-Fisher	40.043	90.829	499.248***	612.063***
	PP-Fisher	45.839	71.095	71.514***	294.550***
POVH	Levin et al.	1.269	-0.998	-4.909***	-3.682***
	Im et al.	8.341	2.921	-9.887***	-8.704***
	ADF-Fisher	14.705	39.199	218.496***	195.664***
	PP-Fisher	33.149	51.508	657.594***	652.289***
FD	Levin et al.	0.274	-12.150***	-16.546***	-12.697***
	Im et al.	0.902	-5.013***	-14.196***	-11.460***
	ADF-Fisher	68.440	340.606***	295.362***	269.982***
	PP-Fisher	56.716	343.400***	482.383***	526.431***
REM	Levin et al.	-3.584***	3.9E+15	-11.049***	-9.498***
	Im et al.	-1.864**	-0.680	-14.415***	-12.638***
	ADF-Fisher	87.187***	74.621**	320.372***	266.864***
	PP-Fisher	114.171***	95.711***	594.107***	1563.17***
GOV	Levin et al.	-3.295***	-2.642***	-14.155***	-11.112***
	Im et al.	-3.588***	-3.018***	-16.759***	-13.371***
	ADF-Fisher	103.354***	94.189***	367.370***	274.570***
	PP-Fisher	111.459***	92.671***	648.639***	764.504***
OPEN	Levin et al.	1.171	2.955	-6.028***	-3.896***
	Im et al.	-0.121	1.689	-13.088***	-10.820***
	ADF-Fisher	60.797	58.561	302.907***	244.052***
	PP-Fisher	93.960***	101.666***	572.150***	1309.68***

Source: Research finding.

Note: ***, **, and * indicate 1%, 5%, and 10% levels of significance.

4.2 Cointegration Test

To investigate whether a long-run relationship exists or not among the variables, we perform a cointegration test using the panel cointegration test proposed by Pedroni (1999; 2004). Based on the evidence from the literature, Pedroni cointegration is the most popular panel cointegration test and consists of seven tests. The results of the cointegration test are presented in Table 2. From Table 2, four out of the seven tests rejected the null hypothesis of no cointegration while the remaining three tests accepted it. Since the number of tests that rejected the null hypothesis of no cointegration is greater than those that accepted it, we

concluded that there is cointegration among the variables. Also, the panel ADF and group ADF which are regarded as the most reliable statistics according to Pedroni (2004) and Asongu et al. (2016) are among the significant tests.

Table 2. Panel Cointegration Result

Test	Statistics	Prob.	Weighted Statistics	Prob.
Within Dimension				
Panel-v	-1.955	0.975	-4.162	1.000
Panel-rho	2.382	0.991	2.842	0.998
Panel-pp	-6.647***	0.000	-6.083	0.000
Panel-Adf	-4.547***	0.000	-4.044	0.000
Between-Dimension				
Group-rho	3.706	0.999		
Group-pp	-9.142***	0.000		
Group-Adf	-3.711***	0.000		

Source: Research finding.
Note: *** indicates 1% levels of significance.

4.3 The effect of remittances, FD, and their interaction on Poverty Reduction

Table 3 shows the results of the full sample, which included 31 countries in sub-Saharan Africa. The findings of the PMG and DFE estimators are presented in the Table. The Hausman test is also presented for selecting the most efficient and consistent estimator. In the long run, the PMG model shows that FD has a positive and significant effect on poverty reduction, while the DFE model shows the same result. This shows that, in the long run, FD helps to reduce poverty. This finding is similar to those found by Dhrifi (2020) and Dada and Akinlo (2021) in their research. In both the PMG and DFE models, remittances assist to alleviate poverty. The coefficient of remittances is significant at 1% and 5% in the PMG and DFE models respectively. Studies like Vargas-Silva et al. (2009), Imai et al. (2014), Azam et al. (2016) and Inoue and Hamori (2016) found that remittances contribute to poverty reduction. This implies that our long-run full sample result supports hypothesis 1, that remittances promote poverty reduction. In the PMG model, the coefficient of the interaction term is significantly negative, but in the DFE model, it is insignificant. Based on this finding, it shows that as the interaction of FD and remittances is increasing, poverty reduction is reducing. This shows that FD and remittances act as substitutes in poverty reduction. This long-run result rejects Hypothesis 2, that FD negatively moderates the effect of remittances on poverty

reduction in sub-Saharan Africa. Government expenditure significantly enhances poverty reduction in the PMG model while its effect is not significant in the DFE model. This finding supports Mehmood and Sadiq (2010) who found that government expenditure reduces poverty. Likewise, trade openness is central to poverty reduction as indicated in the PMG model. The sign of the coefficient of trade openness is positive and significant at 1%. This indicates that as trade openness is increasing, poverty reduction is also increasing. This finding is consistent with Acheampong et al. (2021) who found that trade openness reduces poverty in sub-Saharan Africa. As we said earlier, we will test the efficiency of the PMG estimator over the DFE estimator through the Hausman test. The probability of the Hausman test is insignificant indicating that the null hypothesis of the homogeneity restriction on the regressors, in the long-run, is accepted. As a result, the PMG estimator appears to be more efficient than the DFE estimator.

In the short-run, the coefficient of FD is insignificant in the PMG model but negative and significant at 5% in the DFE model. This shows that FD fails to contribute to poverty reduction in short-run. Remittances produce no effect on poverty reduction in the short-run as its coefficient is not significant in both PMG and DFE models. Unlike in the long-run, government expenditure does not contribute to poverty reduction as its coefficient is negative and significant in the DFE model and insignificant in the PMG model. The coefficient of trade openness is not significant in the PMG and DFE models, meaning that it has no effect on poverty reduction in the short-run. The interaction terms also produce no effect on poverty reduction as its coefficient is not significant in both PMG and DFE models. This shows that our short-run result of interaction term supports Hypothesis 4, that the effect of remittance on poverty reduction is independent of FD in sub-Saharan Africa.

Table 3. The Full Sample Results

	Pooled Mean Group (PMG)		Dynamic fixed effects (DFE)	
Variable	**Coef**	**Std. Error**	**Coef**	**Std. Error**
Long-run coefficient				
FD	0.078**	0.354	1.029***	0.167
Remittances	38.486***	10.231	1.871**	0.635
Government expenditure	6.302***	1.727	-0.394	0.255
Trade Openness	1.169***	0.346	-0.063	0.042
FD. Remittances	-1.045***	0.287	-0.034	0.027
Short-run Coefficient				
ΔFD	0.008	0.002	-0.223**	0.036
ΔRemittances	0.058	0.175	0.032	0.080
ΔGovernment expenditure	0.006	0.010	-0.087**	0.028
ΔTrade Openness	-0.001	0.003	-0.004	0.005
ΔFD. Remittances	-0.544	0.401	-0.003	0.003
ECM(-1)	-0.0001	0.002	-0.087***	0.013
Constant	0.463	0.526	4.158***	0.761
Country	31		31	
Observation	774		774	
Hausman test			2.46	
p-value			0.782	

Source: Research finding.

Note: ** and *** imply significance at 5% and 1%, respectively. The long-run results are presented in the first panel, while the short-run results and adjustment speed (ECM(-1)) are presented in the second panel. The Hausman test shows that the PMG estimate is more consistent and efficient than the DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is Poverty reduction, FD, remittances, government expenditure, trade openness, and the interaction term. The full sample, annual data 1990–2020.

To determine if the level of income plays a role in the relationship between remittances, FD, and poverty reduction, the models are re-estimated for middle-income countries and low-income countries according to classification by the World Bank. The results for the middle-income countries are presented in Table 4. In the long run, both the PMG and DFE indicate that FD enhances poverty reduction. Likewise, from the PMG and DFE results, remittances contribute to poverty reduction. This indicates that Hypothesis 1 is supported in middle-income countries, that remittances contribute to poverty reduction in the long run. The interaction term has a negative sign in the PMG model while it has a positive sign in the DFE model. However, since the Hausman test indicates that the PMG estimator is more efficient compared to DFE, our conclusion will be based on the

PMG model. This implies that Hypothesis 2, that FD moderates the effect of remittances on poverty reduction is rejected in middle-income countries in the long run. The negative coefficient of government expenditure in both PMG and DFE models shows that as government expenditure increases, poverty rates in middle-income countries. Acheampong et al. (2021) found a similar result in sub-Saharan Africa. This might be due to insufficient capital to provide the infrastructures like good roads, electricity, health care facilities, and water supply which can reduce poverty. Most of the sub-Saharan African countries depend on foreign aid, grants, and assistance to meet their capital expenditure which can significantly increase employment levels and output thereby reducing poverty. It can also be due to the pattern of spending of government. If government spending tends towards recurrent expenditure without paying attention to the high percentage of unemployed people by supporting them through social welfare packages, the effect of the government expenditure on poverty reduction might not be felt.

On the short-run results, FD has no effect on poverty reduction from both PMG and DFE estimations in middle-income countries. The coefficient of the remittances is negative and significant at 1% in the PMG model while in the DFE model, it is insignificant. Hypothesis 1 that remittances have a positive effect on poverty is rejected in middle-income in the short-run is rejected. The interaction term (REM*FD) does not affect poverty reduction in the PMG model. However, in the DFE model, the interaction of remittances and FD reduces poverty reduction. The coefficient of government expenditure is insignificant in PMG and DFE models. This indicates that government expenditure does not affect poverty reduction in middle-income countries. From the PMG model, the coefficient of trade openness is insignificant but it is negative and significant in the DFE model.

Table 4. Results of Middle-Income Countries

	Pooled Mean Group (PMG)		**Dynamic fixed effects (DFE)**	
Variable	**Coef**	**Std. Error**	**Coef**	**Std. Error**
Long-run results				
FD	0.371***	0.021	0.119***	0.022
Remittances	0.875***	0.051	0.229**	0.112
Government expenditure	-0.045***	0.021	-0.259***	0.062
Trade Openness	0.009*	0.004	0.010	0.012
FD.Remittances	-0.017***	0.022	0.015***	0.005
Short-run Results				
ΔFD	-0.002	0.002	0.001	0.001
ΔRemittances	-0.035***	0.012	-0.005	0.005
ΔGovernment expenditure	0.006	0.005	0.003	0.003

ΔTrade Openness	0.002	0.001	-0.001**	0.001
ΔFD.Remittances	-0.003	0.002	-0.003*	0.0001
ECM(-1)	-0.027***	0.004	-0.032***	0.001
Constant	1.281***	0.232	1.775***	0.095
Country	14		14	
Observation	353		353	
Hausman test			0.12	
p-value			0.999	

Source: Research finding.

Note: *, **, and *** imply significance at 10%, 5%, and 1%, respectively. The long-run results are presented in the first panel, while the short-run results and adjustment speed (ECM(-1)) are presented in the second panel. The Hausman test shows that the PMG estimate is more consistent and efficient than the DFE estimation. The lag structure is ARDL (1, 1, 0, 1, 0, 1) and the order of variables is Poverty reduction, FD, remittances, government expenditure, trade openness, and the interaction term. The middle-income countries, annual data 1990–2020.

In both the PMG and DFE models, the results for low-income countries in Table 5 show that FD has a positive and significant effect on poverty reduction. This means that, in the long run, financial progress helps to reduce poverty. Remittances also help to alleviate poverty, as its coefficient is positive and significant in both the PMG and DFE models. Hypothesis 1 appears to be supported in low-income nations in the long run, based on this study. This suggests that individual FD and remittances are critical for poverty reduction. In PMG and DFE models, the coefficient of the interaction term is significant and negative. This indicates that the interaction between remittances and FD does not lead to long-term poverty reduction. This implies our hypothesis 2, that FD moderates the effect of remittances on poverty reduction is rejected. Like in middle-income countries, government expenditure fails to reduce poverty reduction. Trade openness has a positive sign and is significant, meaning that it reduces poverty. Other research, such as those by Christiaensen et al. (2003), Sakr (2012), and Kis-Katos and Sparrow (2015), have found that trade openness reduces poverty in the long run. The Hausman test, like the other results in the previous tables, shows that the PMG estimator is more efficient than DFE. In both PMG and DFE estimations, none of the variables is significant in the short run.

Table 5. Results of Low-income Countries

	Pooled Mean Group (PMG)		**Dynamic fixed effects (DFE)**	
Variable	**Coef**	**Std. Error**	**Coef**	**Std. Error**
Long-run Results				
FD	0.622***	0.044	0.438***	0.083
Remittances	0.986***	0.209	1.486***	0.281
Government expenditure	-0.076**	0.035	-0.391***	0.098
Trade Openness	0.050***	0.011	0.129***	0.024
FD. Remittances	-0.024***	0.008	-0.038***	0.013
Short-run Results				
ΔFD	-0.001	0.009	0.008	0.005
ΔRemittances	0.005	0.043	0.008	0.013
ΔGovernment expenditure	-0.002	0.007	0.002	0.004
ΔTrade Openness	-0.001	0.001	0.002	0.001
ΔFD. Remittances	-0.054	0.063	-0.001	0.001
ECM(-1)	-0.010*	0.006	-0.031***	0.002
Constant	0.494*	0.271	1.479***	0.086
Country	17		17	
Observation	409		409	
Hausman test			0.14	
p-value			0.999	

Source: Research finding.

Note: *, **, and *** imply significance at 10%, 5%, and 1%, respectively. The long-run results are presented in the first panel, while the short-run results and adjustment speed ECM(-1) are presented in the second panel. The Hausman test shows that the PMG estimate is more consistent and efficient than the DFE estimation. The lag structure is ARDL (1, 1, 1, 0, 1, 1) and the order of variables is Poverty reduction, FD, remittances, government expenditure, trade openness, and the interaction term. The low-income countries, annual data 1990–2020.

The study found that in the long run, FD contributes to poverty reduction in the full sample and among the income groups. This is possible because FD makes it possible for lower-income households to obtain loans and set up smaller businesses that boost their income (Appiah-Otoo and Song, 2021; Jalilian and Kirkpatrick, 2002; Naceur and Zhang, 2016). This finding suggests that the financial sector is a major tool for poverty reduction in the long run. According to Zahonogo (2017), FD can help the poor in the diversification of their sources of income through self-employment, hence reducing poverty. Because the financial sector makes financial resources available to the poor, they can alleviate financial constraints and engage in productive activities. According to Stiglitz (1998) and Jalilian and Kirkpatrick (2002), FD can contribute to poverty reduction directly by providing the opportunity for the poor to have access to finance and achieve

sustainable development. Indirectly, FD can stimulate poverty reduction through economic growth, and the benefits from the growth are channeled to the poor (De Gregorio, 1996). The inability of FD to enhance poverty reduction in the short run might be due to the small size and underdevelopment of the financial sector in the region, which does not make the sector effective enough to reduce poverty in the short run.

Remittances are a determinant of poverty reduction based on the results of the full sample and income groups in the long run. This finding supports previous studies like Musakwa and Odhiambo (2019), Anyanwu and Erhijakpor (2010), and Gupta et al. (2009), which showed that remittances contribute to poverty reduction in SSA. Remittances serve as an additional source of income for those families who receive them. In addition to providing resources for the poor, it improves living standards through a variety of indirect multiplier effects as well as macroeconomic implications. The short-run effects of remittances are mixed. Remittances have an insignificant effect on poverty reduction in the full sample and low-income countries but have a significant negative effect in middle-income nations.

The interaction of FD and remittances fails to reduce poverty in the full sample and among the income groups in the long run. This finding is consistent with Inoue (2018) who also found a similar result. However, it contradicts Majeed (2014) who found that FD enhances the effect of remittances on poverty reduction. This suggests that FD and remittances are substitutes for reducing poverty rates. In other words, it implies that FD and remittances fail to complement each other to reduce poverty and the expansion of FD will reduce the impact of remittances on poverty reduction and vice versa. This shows that our finding does not support hypothesis 2 that FD enhances the impact of remittances on poverty reduction. On the magnitude of the coefficients of FD and remittances, there is evidence that the effect of remittances on poverty reduction is greater than FD. This finding reveals that a disconnection exists between the inflow of remittances and the financial markets in sub-Saharan Africa indicating that the level of FD and remittances inflow through the informal financial markets is low. It could also indicate that the number of remittance recipients in sub-Saharan Africa who have access to financial services is still minimal in comparison to the bulk of remittances flowing. The uneven distribution of financial institutions in the economy might limit access to financial institutions for some people, notably those living in villages.

In the long run, government expenditure does not enhance poverty reduction in the middle and low-income groups while in the short run, it does not affect poverty reduction. This finding contradicts studies like Kwon and Kim (2014) and Mosley et al. (2004) who found that government expenditure reduces poverty. However, this finding is in line with Anderson et al. (2018) and Acheampong et al. (2021). This might be due to insufficient capital on the part of the government to implement policies and provide infrastructures such as electricity, health facilities, potable water supply, and good roads which can easily link villages to towns for easy transportation of farm products. Most of the governments in sub-Saharan Africa depend on foreign aid and loans to execute capital projects which can have a major effect on poverty reduction. Acheampong et al. (2021) and Ibrahim and Alagidede (2018) stated that government spending in most SSA countries is associated with higher income inequality and poor economic growth which worsen poverty. However, the long-run result of the full sample indicates that government expenditure contributes to poverty reduction. Government expenditure can reduce poverty directly and indirectly according to Dahmardeh and Tabar (2013). Government expenditure can enhance poverty reduction directly through benefits like job creation, subsidies, and social welfare programs received by the poor from the government. Government expenditure can indirectly reduce poverty when government expenditure in infrastructures, agriculture, health, and education boost economic activities and output.

Trade openness contributes to poverty reduction in the long run, which implies that trade openness is very important for poverty reduction. According to Onakoya et al. (2019), trade openness can attract additional domestic and foreign investment which increases the rate of capital accumulation and thereby reduces poverty rates. Jhingan (2005) stated that one of the ways of tackling poverty is for countries to open their economies to international trade so that more capital can be injected. The failure of trade openness to contribute to poverty reduction in the short run may be ascribed to the incapacity of the region to take full advantage of trade liberalization by diversifying production and exports.

On whether the income level influences the effect of remittances, FD, and their interactions on poverty reduction, we found that income levels do not influence the effect of FD on poverty reduction both in the long-run and short-run irrespective of poverty indicators used. The income levels influence the effect of remittances on poverty reduction in the short run. This is because remittances failed to reduce poverty rates in the middle-income group but had no effect in the low-income group when poverty reduction is measured by life expectancy. The

levels of income do not influence the effect of the interaction term in the long-run and short-run.

4.4 Robust Check

We provide robust checks by using the Human Development Index to proxy poverty reduction. The result is presented in Table 6. However, we present the results of the PMG for the full sample, middle-income countries and low-income countries only. The result of the DFE is not presented for two reasons. First, the Hausman test indicates that PMG is better than DFE. Second, the variables in the DFE estimation are insignificant. However, the result of the DFE is available on demand.

Starting with the long-run results, FD reduces poverty in the full sample, middle-income group, and low-income group. This indicates that the effect of FD on poverty reduction remains the same even when we use the human development index to measure the poverty reduction indicator. Remittances help to alleviate poverty in the full sample, as well as in middle- and low-income nations. Like in previous Tables, remittances and FD are substituted in reducing poverty as the interaction of remittances and FD fails to stimulate poverty reduction in the full sample, middle-income group, and low-income countries. This indicates that our finding rejects hypothesis 2 that FD moderates the effect of remittances on poverty reduction. Government expenditure reduces poverty when the poverty reduction is proxied by the Human Development Index in the full sample and among the income groups. Trade openness enhances poverty reduction in the full sample and among the income groups. In the short run, the coefficient of FD is insignificant across the models, indicating no effect of financial development on poverty reduction. Remittances have no effect on poverty reduction in the full sample and middle-income group while its effect is significant and negative in the low-income group. The interaction term produces no effect on poverty reduction as its coefficient is insignificant in any of the models. The coefficient of government expenditure is insignificant in the full sample and middle-income group, but its effect is negative and significant in the low-income group.

The results in Table 6 also indicate that the levels of income play no role in the effect of financial development on poverty reduction in both the short and long run. The levels of income do not affect the effect of remittances on poverty reduction in the long run but it influences the relationship between remittances and poverty reduction in the short-run. Finally, the effect of the interaction term is not affected by levels of income in the short-run and long-run.

Table 6. Results of Panel ARDL (Dependent variable: Human Development Index)

	Pooled Mean Group (PMG)		**Pooled Mean Group (PMG)**		**Pooled Mean Group (PMG)**	
	Full Sample		**Middle-Income Countries**		**Low-Income Countries**	
Variable	**Coef**	**Std. Error**	**Coef**	**Std. Error**	**Coef**	**Std. Error**
Long-run Results						
FD	0.002**	0.001	0.007*	0.004	0.011***	0.001
Remittances	0.044***	0.014	0.299**	0.127	0.021***	0.004
Government expenditure	0.032***	0.005	0.038***	0.014	0.011***	0.002
Trade Openness	0.003***	0.001	0.006*	0.003	0.001***	0.004
FD. Remittances	-0.003***	0.001	-0.010**	0.005	-0.002***	0.002
Short-run Results						
ΔFD	0.001	0.002	0.001	0.002	0.002	0.003
ΔRemittances	-0.003	0.007	0.006	0.173	-0.003**	0.001
ΔGovernment expenditure	-0.002	0.003	0.001	0.004	-0.004*	0.002
ΔTrade Openness	9.070	0.001	-0.001	0.006	-9.050	0.001
ΔFD. Remittances	0.020	0.021	-0.001	0.001	-0.001	0.001
ECM(-1)	-0.007	0.009	-0.031	0.001	-0.037	0.036
Constant	0.004	0.003	0.001	0.009	0.011**	0.007
Country	31		14		17	
Observation	718		340		375	
Hausman test	0.00		0.00		0.28	
p-value	1.000		1.000		0.998	

Source: Research finding.

Note: *, **, and *** implies significance at 10%, 5%, and 1% respectively. The long-run results are presented in the first panel, while the short-run results and adjustment speed (ECM(-1) are presented in the second panel. The Hausman test shows that PMG estimate is more consistent and efficient than DFE estimation.

The lag structure for full sample is ARDL (1, 1, 1, 0, 1, 1), middle-income countries (1,0,1,0,0,0,0) and low-income countries (1, 0, 0, 0, 0, 0) and the order of variables is Poverty reduction, FD, remittances, government expenditure, trade openness and the interaction term. The low-income countries, annual data 1990–2020.

5. Implications of Findings and Conclusion

5.1 Implications of Findings

In the long run, FD helps to reduce poverty in sub-Saharan Africa and among the income groups, according to this study. This finding implies that FD is crucial to poverty reduction in the region in the long-run. Therefore, there is a need to increase the deepening of the financial sector for better performance. Also, more effort and effective policies are required to transform the financial sector as the sector is still underdeveloped compared to other regions across the world. This will enable the sector to be more effective in channelling funds to the poor for investment and thereby reducing the level of poverty more. Policies that will allow financial institutions to make more funds available for the poor to finance small-scale businesses or increase the access of the poor to funds can as well further reduce the poverty level. The increase in the deepening of the financial sector could be a means through which FD will enhance poverty reduction in the short-run. The inability of FD to enhance poverty reduction in the short-run might be due to the lack of deepening and underdeveloped state of the financial sector in the region.

The study also found that remittances enhance poverty reduction in sub-Saharan Africa and among the income groups in the long-run. As a result, we can conclude that remittances provide a stable source of finance for sub-Saharan African countries by raising the earnings of families whose members relocate to other countries to work, hence reducing poverty. The government might need to introduce and implement policies that can facilitate the easy inflow of remittances for more poverty reduction. When people have more finance, they are more likely to save and invest, which can lead to an improvement in their level of living. The government can initiate a partnership between international banking services and remittance transfer operators to establish official channels for easy and lower costs of transferring remittances. A decrease in the cost of sending remittances could enhance households' disposable income, resulting in additional poverty reduction. Additionally, there is a need to establish entrepreneur and career development centers whereby non-migrant families can be trained in business skills. This will likely stimulate non-migrant families to use their remittances for the establishment of small businesses that will further lower poverty.

In addition, the study found that the coefficient of the interaction term is negative. This indicates that remittances and FD fail to complement each other in the poverty reduction process indicating that the effect of remittances on poverty reduction may be weak as the financial sector is expanding, and vice-versa. However, based on the fact that FD and remittances enhance poverty reduction

individually, this finding has an important policy implication in the sub-Saharan African region. First, since the sub-Saharan African region is one of the largest recipients of remittances but with a low level of FD, there might be a need for the region to promote the inflow of remittances through the formal channel by easing and reducing the cost of the transaction of remittances to alleviate poverty. Second, if the region's financial sector is well-developed but remittance inflow is low, there may be a need to boost financial depth by increasing access to and use of formal financial services.

Similarly, our result suggests that trade openness is important for alleviating poverty in SSA since it can enhance capital inflow and foreign investment. Therefore, policymakers in SSA must promote sound trade policies that will attract more funds and foreign investment that will increase employment opportunities and hence reduce poverty.

Though our findings show that the effect of government expenditure on poverty reduction depends on the proxy of poverty used, this study recommends that government expenditure should be pro-poor in the region. That is government expenditure should aim at reducing poverty in SSA. For instance, government spending on transfers and subsidies needs to be carefully planned to reach the intended population.

5.2 Conclusion

In this study, we examined the moderating role of FD in the relationship between remittances and poverty reduction in sub-Saharan Africa during the period 1990-2020. We estimate models in which the poverty reduction is explained by FD, remittances, and their interaction term in the full sample consisting of 31 countries, the middle-income group consisting of 14 countries and the low-income group consisting of 17 countries. Levin et al. (2002), Im et al. (2003), ADF-Fisher, and PP-Fisher Chi-square statistics unit root tests are employed to check the order of integration of the variables while panel cointegration test proposed by Pedroni (1999, 2004) are used to confirm the existence of long-run relationship. The results of unit root tests revealed that none of the variables is I(2) while the cointegration test confirms the existence of long-run relationship. The relationship among the variables is considered among the income groups to see if the level of income is influencing their relationship. To achieve the objectives of this study, we employ the advanced econometric technique to assess the individual impact of FD, remittances and their interactions on poverty reduction. The error correction-based

autoregressive distributed lag ARDL(p,q) model was used, which includes three separate tests: MG, PMG, and DFE estimators.

Our findings show that FD significantly contributes to poverty reduction in the long-run in the full sample and among the income groups whereas in the short-run FD fails to reduce poverty. Furthermore, our findings show that remittances enhance poverty reduction in the long-run in sub-Saharan Africa and among the income groups but in short-run remittances could not stimulate poverty reduction. The interaction of FD and remittances does not contribute to poverty reduction both in the long-run and short-run suggesting that FD and remittances are playing a complementary role in reducing poverty.

Appendix

Table A1. Definition of Variables, Data Sources and Priori Expectations

Variables	Symbols	Descriptions	Expected Signs	Source
Life Expectancy	POVL	Life expectancy at birth, total (years)		WDI
Human Development Index	POVH	A composite indicator that measures average accomplishment in terms of life expectancy, education, and living standards.		UNDP
Financial Development (FD)	FD	The totality of credit made available to the private sector by banks and other financial institutions	Positive	WDI
Remittances	REM	Personal remittances received (% of GDP)	Positive	WDI
Government Expenditure	GOVE	General government final consumption expenditure (% of GDP)	Positive	WDI
Trade openness	OPEN	Trade openness (the ratio of exports plus imports to GDP)	Positive	WDI

Source: Research finding.

Note: UNDP is the United Nations Development Program. WDI is the World Development Indicator.

Table A2. Summary Statistics of the Variables

Variable	Obs	Mean	Sta.Dev	Min	Max
POVL	930	55.643	7.750	26.17	74.51
POVH	862	0.471	0.121	0.19	0.8
FD	942	18.675	23.890	0.40	160.12
REM	901	4.089	13.134	0.01	167.43
GOV	931	14.356	6.210	0.91	43.48
OPEN	961	65.080	35.773	9.96	225.02

Source: Research finding.

Table A3. The List of Countries

Full Sample		**Middle-income countries**	**Low-income countries**	
Benin	Madagascar	Botswana	Benin	Zimbabwe
Botswana	Mali	Gabon	Burkina Faso	
Burkina Faso	Mauritius	Mauritius	Central afr rep	
Cameroon	Mozambique	South Africa	Chad	
Central afr rep	Niger	Cameroon	Gambia	
Chad	Nigeria	Congo Rep	Guinea	
Congo Rep	Rwanda	Coite d voire	Guinea Bissau	
Coite d voire	Senegal	Estiwani	Madagascar	
Estiwani	Seychelles	Ghana	Mali	
Gabon	Sierra Lone	Kenya	Mozambique	
Gambia	South Africa	Lesotho	Niger	
Ghana	Sudan	Mauritania	Rwanda	
Guinea	Tanzania	Nigeria	Senegal	
Guinea Bissau	Togo	Sudan	Sierra Lone	
Kenya	Zimbabwe		Tanzania	
Lesotho			Togo	

Source: Research finding.

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