The Impact of Remittances and Financial Development on Income Inequality: Evidence from Low- and Middle-Income Economies Using a Dynamic Panel Threshold

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Abstract

This article studies the connection between income inequality, financial development, and remittances for a sample of low- and middle-income nations. Few studies have examined how remittances and financial development simultaneously affect inequality; much of the research that has been done in this area focuses on the relationship between remittances and inequality or the relationship between financial development and inequality. The combined effect of these two on inequality has not, however, been explored in any of the recent studies. We add to the literature in a number of ways. The study used an econometric panel threshold with macroeconomic data during the period 1990 to 2020. We analysed whether remittances and financial development work in conjunction or as a substitution for to reduce inequality. We discovered evidence that, in nations with higher levels of inequality, remittances substitute financial development. However, in nations with less severe inequality, remittances complement financial development to reduce inequality. Second, we found that the impact of remittances on substitution is greater than their complementing effect. Finally, we found that financial development and remittances have various effects because of the conditional distribution of disparities, even though prior research has claimed that these two factors have homogenous effects on inequalities.

Keywords: *Inequality, Remittances, Financial Development, Panel Threshold.*

Introduction

Many studies have been conducted on the possibility that capital transfers might either increase or lessen inequality. Tokhirov et al. (2021), Taylor et al. (2008), Acosta et al. (2005), Acosta et al. (2009), and Acosta et aux collègues (2007). The ways in which fund transfers impact inequality are the subject of debate. Although some studies suggest that fund transfers increase inequality by reducing domestic income and increasing beneficiaries' free time (Taylor, 1992; Acosta et al., 2009), other studies support the idea that fund transfers reduce inequality by improving recipients' financial circumstances and increasing their available income. As previously stated by Randazzo and Piracha (2014), Viet (2008),and Taylor et al. (2005).

Furthermore, recent empirical research demonstrates how remittances support receivers in resolving credit and liquidity problems, particularly in emerging financial systems. Numerous sources (e.g., Rodrigues, 1996; Massey and Parrado, 1998; Cox et al., 1998; Dustmann and Kirchkamp, 2000; De la Brière et al., 2002; Giuliano and Ruiz-Arranz, 2009; Orozco and Fedewa, 2006; Rapoport and Docquier, 2006) argue that remittances help in reducing financial hardships and promote the reduction of inequality.

However, in certain cases, high operating costs and strict lending restrictions encourage remittances through illicit channels, potentially exacerbating inequality (Demirguc-Kunt et al., 2018; Vacaflores, 2012; Randazzo and Piracha, 2014; Jiménez, 2009 . Moreover, there are several ways in which effective financial institutions affect wealth inequality. Inadequate financial markets can affect the way businesses obtain loans and liquidity, which contributes to the building of human capital for future generations, and ultimately leads to disparities in income and wealth.

We examine the link between remittances, financial development, and inequality for a sample of 42 low- and middle-income nations between 1990 and 2022 in order to follow this line of study. We make two primary contributions to the current research on inequality and finance. First, the link between remittances

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and income inequality may vary at different income distribution levels due to the potential for financial development and remittances to have diverse effects on income disparity. In order to do this, we look into how remittances and financial development, dependent on the degree of inequality. Our key conclusion is that the consequences of financial development and remittances vary depending on the conditional distribution of income inequality. Second, the analysis is unusual in that it offers evidence of how remittances affect the conditional distribution of inequality in a wide range of nations via the financial development channel.

In this context, we look at how remittances and financial development interact, as well as how they complement or substitute one another in terms of inequality. This has significant ramifications. Increased remittance inflows can be beneficial for consumption and investment spending in financially weak nations if remittances and financial development are interchangeable. Remittance inflows are used to support financial growth in nations with advanced financial systems, however, because of the complementary relationship between remittances and financial development. Enhancing remittances and advancing the banking sector from a policy standpoint are therefore necessary. We demonstrate how remittances and financial development may be used as alternatives to reduce inequality in more unequal nations, and how they can be used in conjunction to reduce inequality in less unequal countries.

Finally, from a methodological perspective, we use threshold regression approach suggested by Kremer et al. (2013 to examine the moderating effect of financial development, remittances on inequalities

The rest of the paper is structured as follows. Section 2 examines significant research on remittances, financial development, and inequality. The model, data, and empirical technique are all covered in Section 3. Results are presented in Section 4, and a conclusion with policy recommendations is presented in Section 5.

Literature Review

We examine three interconnected lines of literature that are important to the paper: financial development and inequality, remittances and inequality, and remittances and financial development.

Financial Development and Inequality

Regarding the relationship between inequality and financial development, the theory offers contradictory data. For example, Banerjee and Newman (1993) and Galor and Zeira (1993) assert due to the limited access of the poor to investment opportunities, weak financial development that restricts access to credit will increase inequalities. However, there are theoretical predictions that financial development can reduce inequality by boosting economic growth. For example, Greenwood and Jovanovic (1989) contend that the inequality-narrowing hypothesis is explained by an inverted U-shaped link between income inequality and financial development.

Both the inequality-widening and inequality-narrowing theories are predicted by empirical research. For example, the inequality-narrowing hypothesis is not well supported by the findings of Jauch and Watzka (2016), Kunieda et al. (2014), Furceri and Loungani (2015), and Gharleghi and Jahanshahi (2020). Only highest-income groups may profit from financial development in these situations, giving them more access to financial services and so increasing inequality. In fact, the reforms of capital accounts and the integration of financial markets further exacerbate inequalities by benefiting the rich.However, a number of authors demonstrate that financial development helps to lower inequality. indeed, Beck et al. (2007), Demirguc-Kunt et al. (2008), Kappel (2010), Naceur and Zhang (2016), Pal and Pal (2012), Khandker (2003), Zhang and Posso (2019), Park and Mercado (2015), Destek et al. (2020), and Koh et al. (2019) indicate that financial development reduces inequality.

Remittances and Inequality

According to theory, as the information costs related to migration gradually decline, income inequality may be reduced via the spread of migration over time and the easing of liquidity restrictions (Stark et al., 1986; Rapoport and Docquier, 2006). For example, Rapoport and Docquier (2006) propose that when migration costs decline, the migration-diffusion process, which is primarily available to high-income groups, tends to progressively spread to all income groups. This is true regardless of whether future generations inherit the riches or not. As a result, increased remittance transfers reduce inequality among the beneficiaries. In a similar vein, Stark et al. (1986) forecast that increased migration will lessen inequality by lowering the cost of migrating for low-income households. Within in their studies Stark et al. (1986) , significant remittance inflows typically reduce inequality, particularly by facilitating access to cash.

The actual data on the relationship between remittances and inequality is still mainly equivocal, despite these theoretical expectations. according to Acosta et al., 2008; Portes, 2009; Tokhirov et al., 2021; Acosta et al., 2007, remittances, have a greater effect on alleviating poverty in areas that are poorer, whereas they have little to no effect in highest income nations . However, Akobeng, 2016; Koechlin & Leon, 2007 show that remittances help level the playing field for income in many developing countries when they are accompanied by an efficient banking industry and a high level of education

There is also conflicting information from individual nation research. according to Taylor et al., 2005; Viet, (2008); Randazzo and Piracha (2014), remittances reduce inequality in nations such as Senegal, Mexico, and Vietnam. Furthermore, Shen et al, (2010) show that there is an inverted U-shaped relationship between inequality and remittances over the long term. However, Milanovic, (1987); Adams, (1989); Crouch, (2019); Gonzalez-Konig and Wodon, (2005); D´e et al., (2015) prove that in many instances, remittances also lead to increase inequality. in fact, remittances in these situations worsen inequality for three main reasons: only the rich can access them; wealthy families travel more frequently than poorer families; and the higher income strata of both the migrants and the recipients of remittances have more access to them.

Remittances and Financial Development

Theoretically and according to K. Mallela et al. Chami et al., (2008); Mundaca, (2009), remittances tend to have a complementing impact in financially established markets and a substitutionary effect in financially undeveloped countries, in fact, Chami et al. (2008), show that remittances can raise household spending budgets and reduce credit limitations, especially in underdeveloped financial systems. In this case, remittances substitute financial development. However, remittances that pass via financial intermediaries typically assist in directing remittances toward more advantageous uses, as shown by Mundaca (2009). Remittances have a complementing impact in this situation.

Additionally, empirical studies indicates that remittances might have complementary and substitutionary impacts in certain situations. In contrast, remittances alleviate credit and liquidity constraints in underdeveloped financial markets, making them stand in for low financial development (Dustmann and Kirchkamp, 2000; Massey and Parrado, 1998; Ruiz-Arranz and Giuliano, 2005; Orozco and Fedewa, 2006; Giuliano and Ruiz-Arranz, 2009; Mundaca, 2009). Conversely, remittances have a complementing effect on financial growth, linked to a greater number of financial services, according to López-Córdova et al. (2011) and Aggarwal et al. (2011). Access to financial services is improved and promoted via remittances made through official channels. Regardless of the degree of financial development, recent empirical research also show that remittances foster financial growth in underdeveloped nations generally (Paola Giuliano and Marta Ruiz-Arranz 2005).

Data and Econometric Strategy

To discover how financial development and remittances affect income disparity In 2023, Keerti Mallela, Sunny Kumar Singh, and Archana Srivastava construct the following equation:

$$\text{Gini}_{i,t} = \alpha_0 + \alpha_1 \text{Remit}_{i,t} + \alpha_2 \text{DCPS}_{i,t} + \alpha_3 \text{Remit}_{i,t} * \text{DCPS}_{i,t} + \sum_{k=1}^{k} \rho_k X_{k,i,t} + u_{i,t} \qquad (1)$$

Where Gini is a measure of income inequality, Remit is a measure of remittances, DCPS is a measure of financial development, or domestic credit to private sector, and X is a set of control variables that are often used in the research on inequality and finance. These control variables include inflation, secondary education, government size, trade openness, and real GDP per capita growth (Beck et al., 2007 ; Dabla-Norris et al., 2015; Jaumotte et al., 2013; Turegano and Herrero, 2018; Jaumotte, Park, and Mercado, 2017; Albanesi, 2007; Thalassinos et al., 2012; Honohan, 2005). u_{it} is the error term that is presumed to have a normal distribution.

Data

this study focuses on a sample of low- and middle-income economies as identified by the World Bank report. For a number of reasons, we only take low- and middle-income countries into account. Indeed, several low-income countries rely heavily on remittances, and their degree of financial development is relatively lower than that of higher-income countries. These countries get a highest volumes of remittances. This gives us an appropriate number of samples to examine the relationship between remittances, financial progress, and inequality.

The study period spans from 1990 to 2022, dictated by data availability for the variables of interest to ensure a robust panel for a precise evaluation. Since data for certain countries was unavailable in years before to 1990, we chose that year as the starting point for our analysis. Consequently, we curated the panel, excluding countries lacking sufficient data, resulting in a final selection of 42 out of 50 countries. The list of countries used in the study is presented beneath Table 1. All of the variables' data come from the World Bank's WDI database.

Dependent Variable

The degree to which income deviates from perfect equality is known as income inequality, and it is the dependent variable. The Gini coefficient is used to quantify inequality (Gini). In the literature on remittance inequality and financial development inequality, the Gini coefficient is a commonly used indicator of inequality (Beck et al., 2007 ; Jauch and Watzka, 2016; Gonzalez-Konig and Wodon, 2005; Acosta et al., 2008; Gonzalez-Konig & Wodon, 2005, 2005). The Gini coefficient ranges from 0 to 100, where 100 represents perfect unequality and 0 represents perfect equality. Market Gini and disposable Gini are the two forms of Gini coefficients. The disposable Gini coefficient incorporates subsidies and transfers less tax payments, while the market Gini coefficient takes into account an individual's gross income, removing subsidies and transfers (World Bank, 2022).

The World Bank's World Development Indicator (WDI) database provides the Gini coefficient statistics. Since information based on disposable income has more fluctuation, the WDI Gini is primarily built using consumption-based inequality data. The indexes are derived from national surveys that are compiled and published on the World Bank's poverty and inequality platform (PIP). In addition to not being additive, the WDI Gini is not comparable between nations for two reasons. The first is that differing living standard indicators (income vs. consumption) result in different definitions of wellbeing, particularly in low- and mid-income nations. Second, the measuring of income inequality is inaccurate due to household factors such as size, age of members, consumption demands, and income distribution among household members. Since remittance-receiving families are seldom in the tax-paying categories, especially in low- and mid-income countries, that's why we employ the market Gini coefficient because we believe it to be more realistic in the context of our work (Portes, 2009).

Independent Variables

Remittances (Remit) and financial development (DCPS) are our principal variables of interest. The total of workers' compensation and personal transfers is known as remittances. according to the International Monetary Fund's (IMF) Balance of Payment Statistics Yearbook, remittances, with very few exceptions, are the total of three elements: workers' compensation, migrant transfers, and workers' remittances. The current transfers that migrants make to their home country recipients while they are working and living in the host country are known as workers' remittances. Financial items resulting from people moving from one country to another are referred to as migrant transfers. Wages, salary, and benefits for foreign nationals employed in the host nations are all included in workers' compensation.

studies of Acosta et al. (2008) and Akobeng (2016) are the famous examples of cross-country remittance inequality studies that scale remittances to GDP for two key reasons: Firstly, it is more accurate to evaluate the remittances' contribution to the nation as a percentage of GDP rather than a ratio of population. so, remittance inflows are more significant in relation to the size of the economy when taken into account as a percentage of GDP. Second, the effect of actual exchange rates on remittances must be taken into account as well, as the article addresses the influence of financial growth. Remittances have a greater effect on the real exchange rate when they are high in relation to the size of the economy than the population (Lopez et al., 2008). These factors have led us to use personal remittances received as a proxy for remittances, expressed as a proportion of GDP (Ofori & Grechyna, 2021: Peprah et al., 2019 & Mduduzi Biyase, Frederich Kirsten, Sandile Mbatha, Bereket Ataro 2024). The WDI database is the source of the remittance data.

Financial development is our next relevant variable, as indicated by the ratio of domestic credit to the private sector to GDP. Financial institutions offer private credit, which includes trade and business credit (World Bank, 2021). The ratio of private credit to GDP shows the availability, disbursement, and intermediation of credit through financial institutions. The other proxies that are employed in the literature, such as the quantity of deposits or liquid liabilities, contrast with this because deposits and liquid liabilities both are used to feed remittances for savings, but not for yield-bearing investments. Therefore, in the current paper, financial development is proxied using the domestic credit to private sector to GDP ratio, in accordance with studies such as Giuliano and Ruiz-Arranz (2009) and Aggarwal et al. (2011). The World Bank's global financial development database is the source of the financial development data.

Control Variables

The study's control variables include GDP per capita wish is measured using 2015 market prices based on a constant US dollar, trade openness (OPN),is the ratio of imports and exports to GDP, government size (GVR Size), which is the percentage of GDP that the government and public sector spend on education, welfare and health, secondary education (EDU), which is the ratio of the number of children in secondary school to the total number of children of that age, and inflation (infl), which is the annual percentage change in the consumer price index. The relevant inequality literature (Rodríguez-Pose and Tselios, 2009; Beck et al., 2007; Zakaria and Fida, 2016; Meschi and Vivarelli, 2007; Rivas, 2007; de Mello and Tiongson, 2006; Dabla-Norris et al., 2015; Keller, 2010; and others) is used to choose the control variables.

Estimation Techniques

We apply the dynamic panel threshold regression approach suggested by Kremer et al. (2013) to identify the potential nonlinear relationship among Remittances, financial development, and income inequality in low and middel income country. Kremer et al. (2013) extended the Hansen (1999) original static panel threshold estimation and the Caner and Hansen (2004) cross-sectional instrumental variable threshold model, where generalized methods of moments (GMM) type estimators are used to deal with endogeneity problem. The model, which is based on threshold regression, has the following form:

$$y_{it} = \mu_{it} + \beta'_1 z_{it} I(q_{it} \leq \gamma) + \beta'_2 z_{it} I(qit > \gamma) + \varepsilon_{it} . \qquad (2)$$

where t stands for the time and i for the country index. The error term is ε_{it}, while the country-specific fixed effect is μ_{it}. The threshold level γ and the threshold variable q_{it} define the regime that is indicated by the indicator function I(.). A vector of explanatory regressors with m- dimensions, z_{it} may include lags in y and other endogenous factors. A subset of endogenous variables z_{2it}, correlated with εit, and a subset of exogenous variables z_{1it}, uncorrelated with ε_{it}, make up the vector of explanatory variables. Additionally, a suitable collection of k≥m instrumental variables, including z_{1it}, is required by the model.

In the first step of model estimation in Eq. (2), individual effects (μ_{it}) must be eliminated using a fixed-effects transformation. Therefore, we use the forward orthogonal deviation method developed by Arellano and Bover (1995), which is provided by:

$$\varepsilon^*_{it} = \sqrt{\frac{T-t}{T-t+1}} \left[\varepsilon_{it} - \frac{1}{T-1} (\varepsilon_{i(t-1)} + \cdots + \varepsilon_{iT} \right] \qquad (3)$$

One benefit of this method is that the adjusted error terms don't serially correlate. This feature makes it possible to apply the estimating procedure created for a cross-sectional model to dynamic panel data models.

The threshold value must be estimated in three steps: The endogenous variables y_i and $t-1$ are first estimated as a function of the instruments using a reduced form regression, which replaces the endogenous variable with the projected value. Second, we use least squares to estimate equation (2) with a specified threshold γ, where $y_{i,t-1}$ is substituted with the first step's anticipated values. Lastly, the ideal threshold value—the one with the smallest $S(\gamma)$ is found using the least sum of square residuals $S(\gamma)$. Once the threshold value has been established, the GMM estimator may be used to calculate the slope coefficient. In accordance with Caner and Hansen (2004), $\Gamma\{\gamma: LR(\gamma) \geq C(\alpha)\}$ is used to estimate the confidence interval for γ, where $C(\alpha)$ is the asymptotic distribution of the likelihood ratio indicator of LR (γ) at the 95% level.

Using the dynamic panel threshold model, we define the following threshold model to examine how remittances and financial development on income inequality:

$$\text{Gini}_{it} = \mu_{it} + \beta'_1 \text{FDR}_{it} I(\text{FDR}_{it} \leq \gamma) + \delta_1 \text{FDR}_{it} I(\text{FDR}_{it} \leq \gamma) + \beta'_2 \text{FDR}_{it} I(\text{FDR}_{it} > \gamma) + \theta z_{it} + \varepsilon_{it}$$
(4)

In our application, FDR_{it} represents the regime-dependent regressors as well as the threshold variable. With the assumption that slope coefficients are independent of regime, z_{it} contributes the vector of partially endogenous control variables. We account for variations in the regime intercept δ_1 in accordance with Kremer et al. (2013). Initial income inequality access is considered as endogenous variable, z_{2ti} = Initial = Gini_{t-1}. The remaining control variables for our application, however, are contained in z_{1it} and include GDP, trade openness (OPN), government size (GVR Size), secondary education (EDU), and inflation (infl).

In accordance with Kremer et al. (2013) and Arellano and Bover (1995), we use dependent variable lags ($\text{Gini}_{t-1}, \ldots \text{Gini}_{t-p}$) as tools. When choosing the number (p) of instruments in limited samples, there is a trade-off between bias and efficiency. While lowering the number of instruments to one (**p = 1**) can prevent over-fitting the instrumented variables, which could result in biased coefficient estimates, using all available lags of the instrumental variable (p = t) can boost efficiency.
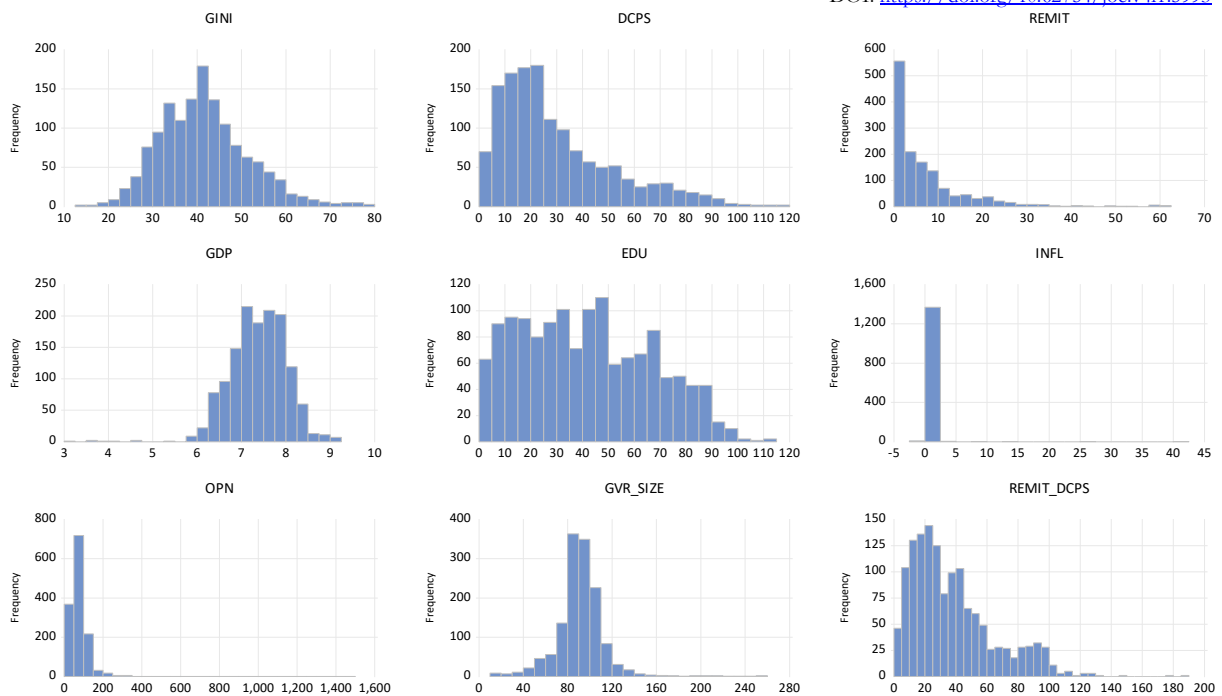
Results and Discussion

Preliminary Tests

This part covers the initial data testing.

Descriptive Statistics

Table 2 demonstrates the descriptive statistics of the variables used in this study. Reporting on the variable inequality, the statistics show that the mean value of inequality is 41.55 with a standard deviation of 10.10. However the standard deviations for financial development and remittances are 22.22 and 9.26, respectively, and their mean values are 29.96 and 7.15.

Remittances are a source of economic growth in low- and middle-income nations, as seen by the near means values of the GDP and Remit variables.

Table 2. Descriptive Statistics Of Variables

	Mean	Std, Dev,	Max	Min	Obs
GINI	41,55	10,10	78,60	13,00	1385
DCPS	29,96	22,22	119,41	0,44	1385
REMIT	7,15	9,26	61,82	0,00	1385
GDP	7,38	0,64	9,11	3,25	1385
EDU	41,68	24,99	114,07	0,05	1385
OPN	91,57	123,69	1466,46	10,85	1385
INFL	0,18	1,42	41,45	-0,87	1385
GVR_SIZE	91,68	23,15	259,28	10,72	1385
REMIT_DCPS	37,66	26,87	188,90	0,79	1385

Source: Authors' computation

Table 3 presents the coefficients of correlations among the variables, indicating the presence of low to moderate correlations among the factors. The results showed that there was a low correlation present between the dependent factor, inequality as proxied through Gini index and the proxy determined for all other independents variables. The low correlation among all of the factors indicated that there was no issue of multicollinearity prevalent in the model.

Table 3. Correlation Matrix

	GINI	DCPS	REMIT	GDP	EDU	OPN	INFL	GVR_SIZE	REMIT_DCPS
GINI	1								
DCPS	-0,16	1							
REMIT	-0,03	0,28	1						
GDP	0,01	0,51	0,07	1					
EDU	-0,12	0,27	0,25	0,20	1				
OPN	0,01	0,06	0,06	-0,28	-0,12	1			
INFL	0,09	-0,04	-0,03	-0,01	-0,09	0,00	1		
GVR_SIZE	0,09	0,06	0,65	0,02	0,13	-0,11	-0,11	1	
REMIT_DCPS									1

Source : authors' computation

Cross-Sectional Dependence

We must determine if the panel data shows cross-sectional dependence before applying the unit root tests. First-generation unit root tests can be used if there is no cross-sectional dependency. First-generation unit root controls cannot be applied to panel data that indicates cross-sectional dependence. Here, we employ the cross-sectional dependency-accounting second-generation unit root controls (SURADF, CADF, and CIPS).

This paper looks at bias-corrected scaled LM tests and the existence of panel dependence between nations (Breusch, T.S.; Pagan, A.R. The lagrange multiplier test and its applications to model specifications in econometrics. Rev. Econ. Stud. 1980, 47, 239–253). This test's null hypothesis is "H_0: There is no panel dependency. the findings are shown in Table 5.

Table 5. Cross-Sectional Dependence Test (H0: No Cross-Sectional Dependence)

Test	Statistic	D.F	p-Value
Breusch-Pagan LM	8255.283	861	0.0000
Bias-corrected scaled	162.1275		0.0000
Pesaran scaled LM	178.1884		0.0000
Pesaran CD	20.89386		0.0000

Source: Authors' calculations.

Before determining the threshold, the panel data's smoothness for each variable needs to be evaluated. However, the cross-sections must be independent of one another in order for these unit root tests to be legitimate. We used the Breusch-Pagan LM test, the Pesaran scaled LM test, the Bias-corrected scaled LM test, and the Pesaran CD test, among others, to look for cross-sectional dependence. These tests make the assumption that the cross-sections are unrelated. According to the test findings, which are shown in Table

5, the test results, indicate that the original hypothesis is rejected for all variables. This suggests the presence of a cross-sectional correlation issue across all variables.

As a result, we assert that the findings of the first-generation unit root tests were probably unsuccessful. Since cross-section dependency is present, we employ the second-generation unit root test of Pesaran,2007, CIPS that takes panel heterogeneity and dependence into account.

Panel Unit Root Tests

The study starts by calculating the the cross-sectional dependency (CD) test that was proposed by Pesaran (2004) and the cross-sectionally augmented Im, Pesaran, and Shin (CIPS) approach, which is a second-generation panel unit root test that was introduced by Pesaran (2007) . The results presented in Table 6 reveal that All variables are significant at the level and the first difference to reject the null of non-stationarity. this means that all the variables are significant of order 1.

Table 6. Cips Test Results

Models estimated	GINI	DCPS	REMIT	GDP	OPN	INF	EDU	GVR_SIZE	
CIPS unit root									
Level	-2.116***	-2.107***	-1.715***	4.58704**	-1.588**	-0.924	-0.939	-1.791	
First-difference	-3.786***	-4.468**				-3.058***	-2.941***	-4.405***	

Note : ***, ** and * represent the significant levels at 1 %, 5 % and 10 % respectively.

Source: Authors' estimations.

Westerlund (2007) Cointegration Test Results

The next step is to investigate the possibility of cointegration among the variables after confirming that they are all stationary at the first difference. This study is carried out using the Westerlund cointegration test, which is based on cross-sectional interdependencies between nations. The results of the Westerlund test, which are shown in Table 7, offer strong proof that the variables have a long-term relationship.

Table 7. Westerlund Test for Cointegration

	Statistic	p-value
Variance ratio	5.9598	0.0000***
Note: ***,**, and * represent the significant levels 1 %, 5 %, and 10 % levels, respectively.		

Source: Authors' estimations.

After verifying that all variables are steady, the next step is determining whether they are cointegrated throughout periods. Table 6 exhibits the outcomes of the cointegration tests performed for this study; these tests were constructed utilizing Westerlund's (2007) technique. The findings of this test indicate that the null hypothesis (H_0: no cointegration) is rejected. The variables under investigation are, in fact, long-run cointegrated.

Threshold Regression Analysis

Table 8 displays the estimated coefficients. The upper section of the table shows the estimated threshold level of financial development (DCPS) and its corresponding 95% confidence interval. The middle section presents the coefficients that reflect the impact of financial development on inequality. Specifically, β_1 and β_2 represent the marginal effects of financial development on inequality in low- and middle-income countries.

The estimated threshold for financial development in these countries is 13.683%, and it falls within the confidence interval. The analysis is conducted in two regimes: the "low regime" corresponds to values of the transition variable (DCPS) below the threshold of 13.683%, while the "high regime" represents values above this threshold.

In the low regime (DCPS below 13.683%), financial development is inversely related to inequality. Specifically, a 1% increase in financial development reduces inequality by 15.5% (β_1 = -0.155). In the high regime (DCPS above 13.683%), the relationship between financial development and inequality remains negative, but the effect is weaker. Here, a 1% increase in financial development reduces inequality by 9.7% (β_2 = -0.097). Thus, while financial development continues to reduce inequality in both regimes, its effectiveness diminishes as the level of financial development increases.

Table 8. Dynamic Panel Threshold Estimation

λ	13.683	
95 % Confidence interval	[12.599, 57.018]	
	Coef	Prob
Lag(Gini)	0.826	0.000***
β1	-0.155	0.004**
β2	-0.097	0.003**
REMIT	-0.080	0.010 **
GVRSize	0.006	0.012**
OPN	-0.008	0.023**
EDU	-0.028	0.007***
INFL	0.089	0.001**
GDP	-3.186	0.031**
REMIT*DCPS	0.095	0.001**
Cons	29.710	0.000***
Obs	1343	
Nber of countries	42	

Source: Authors' estimations.

This analysis offers an economic perspective on the relationship between remittances and inequality, with a particular focus on the moderating role of financial development. The central hypothesis we aim to test is whether the financial depth of a recipient country influences the impact of remittances on income inequality. To address this, we employ a dynamic panel threshold model to assess how remittances affect inequality, conditional on a financial development indicator, and examine the statistical significance of the estimated coefficients. A negative coefficient would imply that remittances are more effective in countries with less developed financial systems, suggesting a substitutive relationship between remittances and financial instruments. Conversely, a positive coefficient would indicate that remittances' growth-enhancing effects are more pronounced in countries with deeper financial markets, supporting the notion of complementarities between remittances and other financial flows.

We estimate the regression specified in Equation 4, and the results, presented in Table 8, indicate that remittances can foster economic growth in countries with more advanced financial systems. This conclusion holds even after controlling for the endogeneity of remittances and financial development using a

Generalized Method of Moments (GMM) approach. Notably, the results are robust across various sensitivity tests concerning financial indicators.

Key findings from our analysis reveal that in countries with underdeveloped financial systems, remittances tend to exacerbate inequality, suggesting that remittances alone may not be sufficient to alleviate disparities. However, in nations with a reasonably developed financial infrastructure, remittances can be more effectively channeled to reduce inequality. Our results suggest that the marginal effect of remittances on inequality diminishes as financial development advances, with remittances and financial systems acting as substitutes to mitigate inequality. On the other hand, in financially sophisticated economies, remittances play a complementary role, significantly reducing inequality by addressing unmet credit and insurance needs that the formal financial market may fail to provide.

Conclusion

This study explores the relationship between inequality, financial development, and remittances, yielding several important findings with significant policy implications. First, we demonstrate that the effects of financial development and remittances on inequality are conditional on the distribution of inequality within a country. More crucially, the impact of remittances depends on the level of financial development in recipient countries. Our findings align with existing empirical and theoretical literature, which suggests that remittances contribute to reducing inequality (Stark et al., 1986; Harmáček and Syrovátka, 2021). Similarly, we confirm that in countries with more advanced financial systems and lower inequality, the financial system itself plays a crucial role in promoting further reductions in inequality (Greenwood and Jovanovic, 1989; Jung and Cha, 2021).

Moreover, our results reveal that in more unequal countries, remittances serve as a substitute for financial development, whereas in less unequal countries, they complement and enhance the effects of financial systems. These findings are consistent with theoretical and empirical literature on the complementary and substitutive roles of remittances (Mundaca, 2009; Dustmann and Kirchkamp, 2000; Akçay and Karabulutoğlu, 2021). In conclusion, while remittances have a diminished impact in countries with advanced financial systems, they continue to support financial development. In contrast, in nations with underdeveloped financial systems, remittances act as a substitute for credit, helping to stimulate investments in credit instruments.

An important implication of this study is that remittances represent a crucial source of income and credit for poorer and more unequal countries with limited financial infrastructure. Access to credit—whether through formal financial instruments or informal remittance flows—is critical for reducing inequality. This effect is particularly significant in countries with underdeveloped financial systems, where remittances not only provide income but also facilitate immediate access to credit. In such economies, remittances help to address both the availability and accessibility of credit, making them vital for alleviating inequality. Countries with weaker financial systems rely more heavily on remittances, which become essential sources of both income and credit, further contributing to inequality reduction.

Our findings have important policy implications. First, when assessing the impact of remittances on inequality, it is essential to consider whether remittances and financial development act as substitutes or complements. In low- and middle-income countries, the financial system may mitigate the impact of remittances by complementing existing financial infrastructure. However, in nations with underdeveloped financial systems, investments funded by remittances in credit instruments can substantially reduce inequality through a substitution effect. This suggests that policies aimed at improving access to credit through financial development can be particularly effective in countries with high inequality.

Second, our results highlight the importance of considering how remittances and financial development interact across different levels of inequality. We also emphasize the indirect yet crucial role of remittances in driving consumption and investment. While remittances provide essential supplementary income for households, they are often invested in sectors such as real estate, construction, and the manufacturing of intermediate goods (Adams, 1991; Azad, 2005; Gelb et al., 2021). These investments can stimulate job

creation and reduce inequality across various sectors, ultimately contributing to higher per capita income and broader economic growth. Policymakers should develop targeted strategies that incentivize investment in these sectors, offering financial incentives to promote the productive use of remittance inflows.

Funding Statement

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Appendix

Table 1. List of Countries in the Sample

Country Name	Country Code	Country Name	Country Code
Angola	AGO	Kyrgyz Republic	KGZ
Bangladesh	BGD	Lao PDR	LAO
Benin	BEN	Lebanon	LBN
Bhutan	BTN	Lesotho	LSO
Bolivia	BOL	Mauritania	MRT
Cabo Verde	CPV	Micronesia, Fed. Sts.	FSM
Cambodia	KHM	Morocco	MAR
Cameroon	CMR	Nepal	NPL
Congo, Rep.	COG	Nicaragua	NIC
Cote d'Ivoire	CIV	Pakistan	PAK
Djibouti	DJI	Papua New Guinea	PNG
Egypt, Arab Rep.	EGY	Philippines	PHL
Eswatini	SWZ	Samoa	WSM
Ghana	GHA	Senegal	SEN
Guinea	GIN	Solomon Islands	SLB
Haiti	HTI	Sri Lanka	LKA
Honduras	HND	Tajikistan	TJK
India	IND	Tanzania	TZA
Jordan	JOR	Tunisia	TUN
Kenya	KEN	Uzbekistan	UZB
Kiribati	KIR	Vanuatu	VUT

Source : authors' computation