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Can remittances drive inclusive human development in sub-Saharan Africa?

Yves Koffi Yao
Université Félix Houphouët-Boigny

Auguste Konan Kouakou
Université Félix Houphouët-Boigny

Abstract

This paper analyses the effect of remittances on inclusive human development in sub-Saharan Africa. It considers the conditional effects of ICT, dual nationality, and financial development within this relationship. Estimates were derived using Population-Averaged Generalised Estimating Equations, Fixed Effects Instrumental Variable, and Method of Moments-Quantile Regression on a panel of 31 countries over the period 2010-2017. The findings indicate that remittances positively contribute to inclusive human development. The interaction between remittances, financial development, and ICT further enhances this impact, as does dual citizenship. These results are robust and suggest that ICT through collaboration between migrants and their country of origin, laws favouring multiple citizenship, an efficient financial system and a business-friendly institutional environment, optimises the effect of remittances on inclusive development in sub-Saharan Africa.

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Contact: Yves Koffi Yao - koffiyvesyao@gmail.com, Auguste Konan Kouakou - augustekk@gmail.com.
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1. Introduction

International migration and remittances are recognised as a key source of financing for the Sustainable Development Goals (SDGs) in developing countries and a social protection strategy for migrants and their families (Cuadros-Meñaca, 2020; De Vasconcelos et al., 2017). In African countries, where access to credit markets remains very limited, remittances account for up to 23.67% of GDP and approximately 60% of the income of poor recipient households (Bahadir et al., 2018; De Vasconcelos et al., 2017; Nguimkeu, 2024; Rapoport & Docquier, 2006; Sobiech, 2019; World Bank, 2024).

Poverty and inequality, however, persist globally, particularly in sub-Saharan Africa, underscoring the failure of socio-economic policies, including capitalism (Alvaredo et al., 2018; Piketty, 2015). According to Oxfam's 2019 report, in 2018, the wealth of billionaires increased by 12%, equating to a daily rise of $2.2 billion. Conversely, the wealth of the world's 3.8 billion poorest people declined by 11% in the same period. This growing disparity between the richest and the poorest threatens efforts to combat poverty (Lawson et al., 2019).

In 2023, the share of national income of the top 10% was 52.80% worldwide (WID, 2024) (WID, 2024). The situation is more alarming in sub-Saharan Africa. This sub-region is home to more than half of the world's population living below the poverty line. Its poverty rate fell from 54.62% in 1990 to 36.45% in 2022, but remains the highest compared with other regions of the world (World Bank PIP, 2024). Although poverty rates in Sub-Saharan Africa are falling, the number of poor Africans is higher today than it was in 1990 (Beegle et al., 2017; Chen et al., 2018). Sub-Saharan Africa is also the most unequal region globally, with seven of the ten most unequal countries in the world. Inequality has worsened, as evidenced by the rise in the Gini index from 42.72% in 2008 to 51.26% in 2018 (World Bank PIP, 2024). Furthermore, in 2023, the share of national income of the top 10% was 54.96%. South Africa leads this inequality ranking with 65.39%, followed by Namibia (64.19%), Mozambique and Eswatini (59.86%), Botswana (59.26%), Angola (58.00%), Zambia (56.18%), and the Republic of Congo (55.92%) (WID, 2024).

These facts indicate that economic growth in Sub-Saharan Africa is not inclusive, as poverty remains very high and inequalities continue to rise. Such inequalities contribute to political instability, social unrest, and increased emigration, as large segments of the population are excluded from meaningful participation in socio-economic activities (Ianchovichina & Lundstrom, 2009; Van Gent, 2017). Migration, however, serves both as a consequence of these challenges and as a potential solution by diversifying livelihoods and fostering more inclusive development. In this paper, we aim to answer the following questions: What is the effect of remittances on inclusive human development in sub-Saharan Africa? And what are the underlying mechanisms that explain this effect?

The main objective of this study is to estimate the effect of remittances on inclusive human development in sub-Saharan Africa. Additionally, it seeks to explore the mechanisms through which remittances influence inclusive development. These mechanisms include institutional and technological factors such as ICT, financial development, and multiple citizenship, which can enhance or facilitate transnational activities and strengthen ties between migrants and their families across borders, fostering more inclusive development.

This paper adds to the existing literature in several important ways. First, while Chin et al. (2021) show that remittances foster inclusive growth and reduce poverty in low- and middle-income Asian economies albeit with threshold and short-term nonlinearities. Our study focuses instead on inclusive human development, using the Inequality-Adjusted Human Development Index (IHDI). This multidimensional indicator enables us to capture improvements in health, education and income jointly with their distribution, thereby going beyond the income-based or poverty-centred approaches commonly used in previous research.

Second, unlike Ofori et al. (2023), who examine whether financial development conditions the effect of remittances on inclusive growth and find no significant contribution of remittances to inclusiveness in Africa, our analysis reveals that remittances do, in fact, promote inclusive human development in Sub-Saharan Africa. By incorporating not only financial development but also ICT penetration and dual citizenship as conditioning variables, we provide a broader and more detailed assessment of the channels through which remittances translate into inclusive outcomes.

Third, in contrast with both studies, our empirical strategy combines Population-Averaged Generalised Estimating Equations (PA-GEE), Fixed-Effects Instrumental Variables (FE-IV) and the Method of Moments-Quantile Regression (MM-QR). This allows us to jointly address unobserved heterogeneity, endogeneity and distributional heterogeneity; three dimensions often treated separately in the literature. As a result, our analysis captures not only the average effect of remittances but also how their effect varies across the distribution of inclusive human development. The remainder of the article is structured as follows. Section 2 presents the methodology. Section 3 reports the results and their interpretation, while Section 4 offers a discussion. Section 5 provides robustness checks, and Section 6 concludes the study.

2. Methodology

To achieve the objectives, it is essential to rely on theoretical and empirical studies analysing the effect of remittances on various aspects of inclusive human development, such as income, education, health, and inequalities. This paper also examines the mechanisms through which remittances influence such development. The methodological framework includes the theoretical foundations of inclusive human development, the presentation of the data, hypothesis testing, the specification of empirical models, and the estimation methods employed.

2.1 Theoretical approach to inclusive human development

The concept of inclusive human development arose from critiques of growth-centred and market-driven development models, which proved insufficient to reduce poverty and inequality. Sen's capability approach shifted the focus from income to people's freedoms and opportunities, leading to the creation of the Human Development Index (HDI). However, the HDI has been criticised for not fully capturing inequalities within its three dimensions (health, education, and income). In response, the UNDP introduced the Inequality-Adjusted Human Development Index (IHDI), which incorporates both achievements and their distribution. The IHDI is derived from Atkinson's (1970) inequality measure and adjusts each HDI dimension by accounting for disparities across the population. It is defined as the geometric mean of the three inequality-adjusted dimension indices:

$$IHDI = (I^*_{Income}.I^*_{Education}.I^*_{Health})^{\frac{1}{3}}HDI = [(1-A_{Income})(1-A_{Education})(1-A_{Health})]^{\frac{1}{3}}HDI \qquad (1)$$

Where $A_x = 1 - \frac{\sqrt[n]{X_1 \ldots X_n}}{\overline{X}}$, $\{X_1, \ldots X_n\}$ represents the underlying distribution in the dimension of interest. The axis is calculated for each variable, including life expectancy, average years of schooling, and household disposable income or per capita consumption. Inequality-adjusted dimension indices are derived from the HDI dimension indices, I_x, by multiplying them by $(1-A_x)$, where A_x is the corresponding Atkinson measure.

This formulation (1) ensures subgroup consistency, meaning that improvements in any subgroup translate into overall improvements in inclusive human development. Building on this framework, inclusive human development is modelled as a function of achievements in health, education, income, and their associated inequalities, while also incorporating remittances to assess their impact. This relationship can be expressed as:

$$IHDI = (Income, Education, Health, Inequalities, Remittances) \quad (2)$$

This approach recognises that remittances may influence multiple dimensions of well-being simultaneously and therefore constitute a potential driver of inclusive human development (Asongu & Le Roux, 2017; Asongu & Odhiambo, 2019; Syrovátka & Schlossarek, 2019).

2.2. Study data and tests

The dataset employed in this study encompasses 31 countries over the period 2010-2017, for which consistent and regular data are available. These data are drawn from multiple reputable sources, including the World Bank databases (WDI, WGI, POVCALNET), the UNDP, the IMF Financial Development Index Database, and the MACIMIDE Global Expatriate Dual Citizenship Dataset.

The dependent variable: IHDI

The IHDI adjusts the HDI for inequality using the Atkinson index. It is fully comparable across countries and years because it relies on harmonised UNDP microdata and identical aggregation rules. Higher IHDI reflects improvements in education, health and income jointly with more equal distributions.

Explanatory variables: remittances

Remittances are expected to enhance inclusive human development, as they are predominantly sent to poorer households and often used for small-scale investments or immediate consumption. Such consumption expenditure is directly linked with improvements in human capital. By increasing the income of recipient families who are typically less advantaged; remittances contribute to their overall well-being (Adams & Page, 2005; Azizi, 2018).

Explanatory variables: control variables

The selected control variables are consistent with the literature on inclusive development, as they capture factors influencing both the levels of human development and their distribution. Economic growth can foster inclusive progress when it is broadly shared and disproportionately benefits the poor, although it may also increase inequality or exclusion if its gains remain concentrated. Life expectancy reflects improvements in health capabilities and is expected to raise the IHDI. Political stability strengthens state capacity and the effectiveness of public policies, whereas instability disproportionately affects vulnerable groups (Catrinescu et al., 2009).

Financial variables, particularly credit and financial development, measure access to, use of, and the efficiency of the financial system, thereby facilitating investment in health, education and productive activities (Rapoport & Docquier, 2006), although weak financial systems may limit these effects. ICT penetration reduces information and transaction costs and promotes financial inclusion (Asongu & Le Roux, 2017). Poverty and inequality are expected to reduce the IHDI, while employment enhances economic participation. The effects of ODA and FDI depend on their sectoral allocation. Inflation erodes the purchasing power of the poorest. Finally, dual citizenship may strengthen transnational ties and amplify the positive effects of remittances (De Haas, 2010).

Pre-estimation diagnostics

To assess sample heterogeneity, we conducted Hausman and Mundlak tests to determine the appropriate model specification between fixed-effects and random-effects. The results indicated that the fixed-effects model was most suitable for our analysis. We also performed tests for heteroscedasticity and serial autocorrelation, both of which were present in the data. These issues require corrections to ensure robust estimation. In addition, we interact some

variables with remittances to capture their conditional effect. To address concerns about the potential endogeneity of remittances, we applied the Wu-Hausman exogeneity test (Wooldridge, 2010), which confirmed the endogeneity of remittances. In short, diagnostic tests highlighted the need for individual fixed-effects models, while also revealing heteroscedasticity, autocorrelation, and endogeneity. The subsequent analysis employs appropriate techniques to address these issues.

2.3. Empirical specifications and estimation techniques

Population-Averaged Generalized Estimating Equations (PA-GEE) model

The Generalised Estimating Equations (GEE) method of Liang and Zege (1986) is a semiparametric approach suitable for panel data, as it accounts for correlation and heteroscedasticity through the Huber/White/Sandwich estimator without requiring assumptions about the error distribution. PA-GEE coefficients reflect average population responses, and the method only requires correct specification of the conditional mean (Campanella et al., 2021). It applies to diverse models and suits our setting, where dual citizenship is binary. The empirical specification is given by:

$$IHDI_{it} = \beta_1 Remittances_{it} + \beta_2 X_{it} + \beta_3 (Remittances_{it} * \Psi_{it}) + \varepsilon_{it} \quad (3)$$

Where X, the matrix of control variables including conditional variables; Ψ the matrix of conditional variables which interact with Remittances such as ICTs and Financial Development.

Fixed Effects Instrumental Variable (FE-IV) model

We employ the method FE-IV as diagnostic tests indicate endogeneity in remittances due to reverse causality, simultaneity and measurement errors linked to informal transfers. Fixed effects control for unobserved heterogeneity, while endogeneity is addressed by instrumenting remittances with their lagged values (Arellano & Bover, 1995; Blundell & Bond, 1998; Giuliano & Ruiz-Arranz, 2009; Sobiech, 2019). This FE-IV approach ensures consistent and unbiased estimates of the effect of remittances on inclusive human development (Wooldridge, 2013b, 2013a). The empirical specification is:

$$IHDI_{it} = \beta_1 Remittances_{it} + \beta_2 Z_{it} + \alpha_i + \upsilon_t + \varepsilon_{it} \quad (4)$$

Where: α and υ: represent individual fixed effects and time fixed effects. Here the time fixed effect is not necessary as we are in the context of a short panel.

Method of Moments-Quantile Regression (MM-QR)

Quantile regressions are well suited to analysing inequality, non-linearities and extreme values (Chen et al., 2024; Keho, 2016). We therefore use the Method of Moments-Quantile Regression (MM-QR) of Machado and Silva (2019) , which improves on traditional quantile methods by not requiring specification of the probability density function and by remaining robust to misspecification, skewness and outliers. It also avoids quantile crossing and addresses endogeneity issues. The model implies:

$$Q_{IHDI}(\tau|X_{it}) = \alpha_i(\tau) + X'_{it}\beta(\tau) + \mu_{it} \quad (10)$$

where $\alpha_i(\tau)$ denotes the quantile-τ fixed effect, capturing how individual characteristics affect different points of the conditional distribution.

3. Results

We begin by presenting the descriptive statistics for the variables in our study, followed by the econometric estimates that demonstrate the effect of remittances on variations in inclusive human development in sub-Saharan Africa.

Table 1. Descriptive analysis of model variables

Variable	Description of the variables	Mean	Std. Dev.	Min	Max
IHDI	Inequality-adjusted Human Development Index (%)	32.54	9.62	15.3	69.27
Remittances	Remittances (in log)	19.16	1.8	12.23	23.81
Growth	GDP growth rate (%)	4.69	3.42	-20.6	20.72
Credit	Credit provided by the financial sector (%GDP)	30.6	33.97	-16.13	185.47
FinDev.	Financial development index (%)	15.45	11.32	3.4	62.67
MobilePhone	Mobile phone subscriptions (% total population)	73.32	32.93	18.32	161.99
GenderInequality	Gender inequality index (%)	57.1	8.96	35	74
Poverty	Poverty Headcount (%)	42.31	20.39	.3	85.19
ODA	Official development assistance (%GDP)	7.59	7.7	.09	70.88
FDI	Foreign direct investment (% GDP)	5.55	11.61	-6.06	103.34
Employment	Employment (in log)	15.26	1.31	12.02	17.83
Stability	Political Stability and Absence of Violence [-2.5; 2.5]	-.51	.75	-2.3	1.01
Change	Official exchange rate	963.79	1593.27	1.43	9088.32
Inflation	Inflation rate (%)	5.95	5.7	-4.29	32.38
LifeExpectancy	Life expectancy at birth	60.02	4.93	48.22	74.51
DualCitizenship	Countries accepting dual citizenship (1=yes, o=no)	.59	.49	0	1
NoDualCitizenship	Countries refusing dual citizenship (1=yes, o=no)	.41	.49	0	1

Source: authors, based on study data

The descriptive statistics show that the IHDI remains low in Sub-Saharan Africa, with an average of 32.5%, confirming substantial internal inequalities in health, education and income. Remittances display a mean value of 19.16 (in logs) with considerable variation, indicating highly heterogeneous inflow levels across countries. This dispersion suggests that remittances may play a differentiated role in human development depending on national contexts.

Financial development (FinDev) remains weak, with an average of 15.45%. By contrast, mobile phone penetration is relatively high (73.3%), reflecting significant diffusion of ICTs that may amplify the impact of remittances through enhanced financial inclusion. Finally, 59% of countries in the sample allow dual citizenship, an institutional factor that may strengthen transnational ties and increase remittance flows.

Table 2: Correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) IHDI	1.00								
(2) Remittances	-0.16	1.00							
	(0.01)								
(3) Growth	-0.16	0.10	1.00						
	(0.01)	(0.10)							
(4) Inequality	-0.66	0.19	0.14	1.00					
	(0.00)	(0.01)	(0.05)						
(5) Poverty	-0.62	0.09	0.01	0.38	1.00				
	(0.00)	(0.18)	(0.89)	(0.00)					
(6) FinDev	0.54	0.08	-0.15	-0.57	-0.48	1.00			
	(0.00)	(0.19)	(0.02)	(0.00)	(0.00)				
(7) MobilePhone	0.67	0.10	-0.12	-0.41	-0.66	0.57	1.00		
	(0.00)	(0.10)	(0.05)	(0.00)	(0.00)	(0.00)			
(8) DualCitizenship	0.16	-0.13	-0.05	-0.26	-0.24	-0.01	0.14	1.00	
	(0.01)	(0.03)	(0.42)	(0.00)	(0.00)	(0.84)	(0.03)		
(9) Stability	0.50	-0.39	0.00	-0.46	-0.42	0.31	0.33	0.08	1.00
	(0.00)	(0.00)	(0.96)	(0.00)	(0.00)	(0.00)	(0.00)	(0.19)	

P-value in parentheses

Source: authors, based on study data

The table 2 highlights several important relationships among the key variables of inclusive human development. The IHDI displays strong positive correlations with financial development and mobile phone or ICT penetration, confirming that access to financial services and digital technologies supports the enhancement of human capabilities. Dual citizenship is also positively correlated with the IHDI, suggesting that more open transnational linkages may foster inclusive dynamics.

By contrast, remittances exhibit a negative correlation with the IHDI, a result that runs counter to theoretical expectations. This relationship may reflect the fact that countries receiving the largest remittance inflows relative to the size of their economy are often those with low levels of human development or high levels of inequality and poverty. Nevertheless, this negative sign does not undermine the potential effect of remittances; rather, it underscores the need for appropriate controls and econometric methods to isolate their true impact in the empirical analysis.

The summary statistics show that the variables are in the same order of unity. Some variables are defined in logarithms and others in percentages to facilitate comparisons between means and standard deviations. In this way, reasonable estimated relationships can be expected to emerge.

Table 3. Effects of remittances on inclusive human development: PA-GEE

Dependent variable: IHDI (%)	**Population-Average Generalized Estimating Equations (PA-GEE)**					
Equations	1	2	3	4	5	6
Remittances	0.245**	0.237**	0.237**			
	(0.105)	(0.106)	(0.106)			
Growth	-0.185***	-0.178***	-0.178***	-0.200***	-0.191***	-0.218***
	(0.0596)	(0.0582)	(0.0582)	(0.0573)	(0.0584)	(0.0588)
GenderInequality	-0.255***	-0.236***	-0.236***	-0.277***	-0.268***	-0.305***
	(0.0644)	(0.0633)	(0.0633)	(0.0660)	(0.0622)	(0.0677)
Poverty	-0.189**	-0.180**	-0.180**	-0.200**	-0.194**	-0.212**
	(0.0801)	(0.0798)	(0.0798)	(0.0785)	(0.0829)	(0.0834)
ODA	-0.0827*	-0.0897**	-0.0897**	-0.0856*	-0.0838*	-0.0878*
	(0.0426)	(0.0451)	(0.0451)	(0.0438)	(0.0438)	(0.0452)
FDI	0.00602	0.00680	0.00680	0.00914	0.00585	0.0100
	(0.0144)	(0.0141)	(0.0141)	(0.0144)	(0.0150)	(0.0156)
Credit	0.0994***	0.102***	0.102***		0.102***	
	(0.0362)	(0.0353)	(0.0353)		(0.0376)	
MobilePhone	0.0620***	0.0631***	0.0631***	0.0612***		
	(0.0134)	(0.0135)	(0.0135)	(0.0138)		
DualCitizenship		1.587**				
		(0.685)				
NoDualCitizenship			-1.587**			
			(0.685)			
Remittances*Credit				0.00413***		0.00382**
				(0.00143)		(0.00160)
Remittances*Mobilphone					0.00292***	0.00251***
					(0.000569)	(0.000727)
Constant	44.57***	42.24***	43.83***	51.83***	50.64***	55.22***
	(6.197)	(6.524)	(6.174)	(6.579)	(6.626)	(6.775)
Observations	201	201	201	201	201	201
Wald chi2	368.25	1001.80	1001.80	295.71	262.35	275.68
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*Notes: Standard errors are in parentheses, Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$*

The results show that remittances significantly improve the IHDI, and their effect becomes stronger in countries with a more developed financial sector and wider access to ICTs. Credit and mobile telephony enhance the impact of remittances by facilitating financial inclusion and digital transfer channels. In contrast, gender inequality, poverty, and weakly inclusive growth systematically reduce the IHDI. Dual citizenship status also exerts a strong positive effect by strengthening transnational ties. Overall, the findings confirm that remittances support inclusive human development, and that this effect is closely linked to financial sector development, the expansion of ICTs, and the adoption of laws that favour multiple citizenship.

Table 4. Effects of transfers on inclusive human development: FE-IV

Dependent variable: IHDI (%)	**Fixed Effect Instrumental Variable (FE-IV)**		
Equations	7	8	9
Remittances	0.758*	0.829**	0.729**
	(0.384)	(0.362)	(0.349)
Growth	-0.159***	-0.0962***	-0.100***
	(0.0406)	(0.0337)	(0.0335)
GenderInequality	-0.219***		
	(0.0584)		
Poverty	-0.271***		
	(0.0446)		
ODA		-0.116***	-0.111***
		(0.0412)	(0.0403)
FDI		-0.00422	-0.00290
		(0.0138)	(0.0136)
Credit	0.126***	0.0854***	0.0827***
	(0.0248)	(0.0227)	(0.0223)
MobilePhone	0.0278*		
	(0.0152)		
Change	0.00350***	0.000804**	
	(0.000615)	(0.000379)	
Inflation	-0.126***		
	(0.0440)		
LifeExpectancy		0.769***	0.864***
		(0.227)	(0.227)
Employment		18.52***	19.30***
		(4.355)	(4.224)
Stability			1.032**
			(0.518)
Observations	175	210	210
R-squared	0.695	0.780	0.787

*Notes: Standard errors are in parentheses, Significance: * p < 0.10, ** p < 0.05, *** p < 0.01*

The lagged values of remittances are econometrically valid instruments in our framework. The under-identification tests (p = 0.0000) and the weak-instrument statistics (F-statistics ranging from 34 to 58) indicate a strong correlation between l.Remittances and Remittances, while the exact identification of the model shows no violation of the exogeneity condition. This is consistent with the econometric literature (Arellano & Bover, 1995; Blundell & Bond, 1998)

and with applied work on remittances (Giuliano & Ruiz-Arranz, 2009; Sobiech, 2019), which have used lagged remittances as instruments to address endogeneity.

Thus, a 1% increase in remittances raises inclusive human development by between 0.73% and 0.83%. Compared to the results in Table 2, the impact of remittances is more pronounced, likely due to the correction for endogeneity bias using the FE-IV approach. These findings reinforce the idea that remittances are not merely a form of temporary support but instead make a lasting contribution to reducing inequalities in human development.

Inequality and poverty reduce the IHDI, reflecting persistent social and economic barriers. Financial development (credit) and access to mobile telephony (ICT) enhance the effect of remittances. Political stability, life expectancy, and employment also support human development, while non-inclusive growth constrains the IHDI. Overall, these results indicate that remittances, combined with robust financial systems and ICT, significantly promote inclusive human development.

Table 5: Effects of remittances on inclusive human development: MM-QR

Dependent variable: IHDI (%)	**Method of Moments-Quantile Regression (MM-QR)**					
Equations	10	11	12	13	14	15
Quantile	0.25	0.50	0.75	0.25	0.50	0.75
Remittances	0.569**	0.607***	0.641***			
	(0.257)	(0.183)	(0.244)			
Growth	-0.267**	-0.290***	-0.310***	-0.219**	-0.235***	-0.247***
	(0.108)	(0.0769)	(0.102)	(0.0898)	(0.0589)	(0.0774)
GenderInequality	-0.433***	-0.452***	-0.470***	-0.347***	-0.296***	-0.257***
	(0.0744)	(0.0531)	(0.0706)	(0.0792)	(0.0524)	(0.0683)
Poverty	-0.340***	-0.320***	-0.301***	-0.266***	-0.263***	-0.260***
	(0.0737)	(0.0526)	(0.0698)	(0.0707)	(0.0463)	(0.0609)
Remittances*Mobilphone				0.00199**	0.00272***	0.00328***
				(0.000905)	(0.000603)	(0.000780)
Remittances*FDI				0.0124**	0.0108***	0.00958**
				(0.00518)	(0.00340)	(0.00446)
Observations	201	201	201	201	201	201

*Notes: Standard errors are in parentheses, Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$*

At this stage, we examine whether there is a non-linear relationship between remittances and the quantiles of inclusive human development. The IHDI in our sample ranges from 15.3% to 69.27%. The analysis reveals that remittances have a positive and significant effect across all quantiles of the conditional distribution of inclusive human development, with the effect being more pronounced at higher quantiles. This can be attributed to the fact that countries with higher levels of development tend to have more efficient institutions, a favourable business environment, and a robust financial system, all of which amplify the impact of remittances on development. Moreover, the positive interaction between remittances and the overall financial development index indicates that financial development enhances the contribution of remittances to inclusive human development.

4. Discussions

The results from the various estimations indicate that remittances contribute significantly to inclusive human development in sub-Saharan Africa. The PA-GEE estimates show that remittances enhance the IHDI by improving income, education, and health for poor households, in line with Adams and Page (2005), Anyanwu and Erhijakpor (2010), Atake (2018), Azizi (2018, 2021) and Rapoport and Docquier (2006), who demonstrate their effect on reducing poverty and inequality. Economic growth, however, remains largely non-inclusive, as shown by Hussein et al. (2018). The negative effects of poverty and gender inequality, driven by high poverty rates and rising disparities, confirm this outcome (WID, 2024; World Bank, 2025). Positive interactions between remittances, financial development, ICTs, and laws favouring dual citizenship support the findings of Avato et al. (2010), Asongu et al. (2019), Asongu and Le Roux (2017), De Haas (2010), and Katigbak (2020), highlighting the role of maintaining transnational links through financial systems, ICT advancements, and dual citizenship policies.

Fixed Effect Instrumental Variables (FE-IV) estimates provide complementary insights: the non-significant but negative effect of FDI and the significant negative impact of foreign aid suggest that, unless directed towards productive sectors benefiting the poor or properly utilised, FDI and aid may not foster inclusive development. These results align with Andersen et al. (2022), Asongu (2016), and Asongu and Nwachukwu (2017). Political stability, employment, and life expectancy strengthen the absorption of remittances, while inflation adversely affects the IHDI. Finally, MM-QR estimates from Machado and Silva (2019) confirm that the positive effect of remittances is stable across the IHDI distribution. The positive interactions with financial development and ICTs are consistent with Bettin and Zazzaro (2012), Keho (2024), Nyamongo et al. (2012), and the New Economics of Labour Migration (NELM) theory (Stark & Bloom, 1985). These positive interaction effects suggest complementarity between these variables, indicating that financial development and ICT reinforce the impact of remittances. Overall, remittances reduce inequalities in education, health, and income, promoting inclusive human development under favourable conditions.

5.Robustness checks

In the robustness checks, we apply the MM-QR method of Machado and Silva (2019). This approach estimates conditional effects on the overall mean, on dispersion, and across different points of the distribution, including the deciles used here. It complements the GEE, FE-IV, and earlier MM-QR estimations by testing the stability of the coefficients across the deciles of the IDHI. The findings confirm the robustness of the effects, showing that remittances influence the IDHI consistently across the distribution.

Table 6: MM-Quantile Regression Estimates: Overall, Dispersion, and Decile Effects

IHDI	Location	Scale	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Growth	-0.288***	-0.0232	-0.254*	-0.262**	-0.272**	-0.281***	-0.290***	-0.300***	-0.308***	-0.313***	-0.325***
	(-3.75)	(-0.56)	(-2.42)	(-2.73)	(-3.17)	(-3.50)	(-3.78)	(-3.91)	(-3.85)	(-3.77)	(-3.47)
Inequality	-0.451***	-0.0199	-0.421***	-0.428***	-0.437***	-0.444***	-0.452***	-0.461***	-0.468***	-0.472***	-0.482***
	(-8.49)	(-0.69)	(-5.80)	(-6.46)	(-7.38)	(-8.02)	(-8.54)	(-8.68)	(-8.45)	(-8.23)	(-7.45)
Poverty	-0.321***	0.0206	-0.351***	-0.344***	-0.335***	-0.328***	-0.319***	-0.310***	-0.303***	-0.299***	-0.288***
	(-6.10)	(0.72)	(-4.88)	(-5.25)	(-5.71)	(-5.98)	(-6.10)	(-5.91)	(-5.53)	(-5.27)	(-4.51)
Remittances	0.605***	0.0388	0.548*	0.561*	0.578**	0.592**	0.607***	0.625***	0.639***	0.646**	0.666**
	(3.29)	(0.39)	(2.18)	(2.45)	(2.82)	(3.10)	(3.32)	(3.41)	(3.34)	(3.26)	(2.98)
_cons	62.33***	1.243	60.51***	60.93***	61.49***	61.92***	62.41***	62.97***	63.41***	63.65***	64.29***
	(13.40)	(0.49)	(9.51)	(10.50)	(11.85)	(12.78)	(13.47)	(13.55)	(13.07)	(12.68)	(11.34)
N	201										

IHDI	location	Scale	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Growth	-0.233***	-0.0140	-0.213*	-0.217**	-0.222**	-0.228***	-0.235***	-0.239***	-0.245***	-0.249***	-0.255***
	(-3.94)	(-0.42)	(-2.54)	(-2.80)	(-3.12)	(-3.61)	(-4.02)	(-4.15)	(-4.15)	(-4.02)	(-3.75)
Inequality	-0.302***	0.0454	-0.367***	-0.354***	-0.339***	-0.318***	-0.296***	-0.283***	-0.265***	-0.251***	-0.233***
	(-5.76)	(1.56)	(-4.94)	(-5.17)	(-5.40)	(-5.66)	(-5.69)	(-5.54)	(-5.07)	(-4.57)	(-3.87)
Poverty	-0.263***	0.00323	-0.268***	-0.267***	-0.266***	-0.264***	-0.263***	-0.262***	-0.260***	-0.259***	-0.258***
	(-5.64)	(0.12)	(-4.04)	(-4.36)	(-4.76)	(-5.32)	(-5.71)	(-5.78)	(-5.62)	(-5.32)	(-4.83)
Rem* Phone	0.00264***	0.000651	0.00171*	0.00189*	0.00210**	0.00241***	0.00272***	0.00290***	0.00317***	0.00337***	0.00363***
	(4.41)	(1.95)	(2.02)	(2.41)	(2.92)	(3.73)	(4.55)	(4.95)	(5.30)	(5.37)	(5.28)
Rem* FinDev	0.0110**	-0.00143	0.0130**	0.0126**	0.0122**	0.0115**	0.0108**	0.0104**	0.00982**	0.00937**	0.00881*
	(3.21)	(-0.75)	(2.68)	(2.82)	(2.97)	(3.15)	(3.20)	(3.13)	(2.89)	(2.62)	(2.25)
_cons	55.37***	-1.720	57.84***	57.36***	56.80***	55.99***	55.16***	54.68***	53.98***	53.44***	52.76***
	(14.45)	(-0.81)	(10.64)	(11.43)	(12.38)	(13.69)	(14.56)	(14.67)	(14.16)	(13.33)	(12.02)
N	201										

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Overall, the MM-quantile estimations indicate that all the location coefficients, which capture the average effect of the explanatory variables on the level of the Inclusive Human Development Index (IDHI), are statistically significant. In contrast, all the scale coefficients, which measure the effect of the variables on the dispersion of the IDHI, are not significant. This implies that the variables primarily influence the average level of the IDHI rather than its dispersion.

The MM-quantile results show that remittances exert a positive and significant effect on the IDHI across all quantiles. This effect strengthens as one moves from the lower to the upper quantiles, indicating that countries already exhibiting relatively higher levels of human development benefit even more from remittances. This pattern suggests increasing marginal returns to remittances in the formation of human capabilities. By contrast, GDP per capita displays a negative and statistically significant coefficient across the distribution. This result reflects the non-inclusive nature of growth in the region, characterised by persistently high poverty rates and rising inequalities (Alvaredo et al., 2018; Piketty, 2015; WID, 2024). Inequality and poverty also maintain negative effects across all quantiles.

When interactions between remittances and the financial development indicator are introduced, the results reveal a positive and significant effect across all quantiles. These coefficients indicate that the impact of remittances on the IDHI increases when financial systems are more developed in terms of access, usage, and efficiency. Mobile telephone subscriptions (ATM) also exhibit a positive and significant effect across all quantiles. They capture access to information technologies and transnational links, including digital transfer channels. Their positive interaction with remittances reflects strong complementarity: ICT facilitates the rapid and low-cost receipt of transfers, enhances their security, and improves their effectiveness. The direct effects of GDP, inequality, and poverty weaken once these interactions are introduced, showing that financial development and ICT account for a substantial share of the overall influence of remittances.

Taken together, the results demonstrate that remittances are a driver of inclusive human development, but their effectiveness depends considerably on financial development and ICT. This finding highlights the need for policies that strengthen financial inclusion mechanisms alongside migration and social policies in order to maximise the impact of remittances on human development.

6. Conclusion

This paper analyses the effects of remittances on inclusive human development in sub-Saharan Africa, with a particular focus on the conditional influences of ICT, dual citizenship, and financial development. The empirical analysis employs PA-GEE, FE-IV, and the Method of Moments-Quantile Regression on a panel of 31 countries between 2010 and 2017. The findings reveal that migrant remittances contribute positively to inclusive human development. Specifically, remittances enhance all quantiles of inclusive development, with increasingly pronounced effects at the upper quantiles of the IHDI. Furthermore, the interaction between remittances, financial development, and ICT reinforces their impact, as does dual citizenship. These results, which are robust to issues of heteroscedasticity, autocorrelation, endogeneity, and alternative methodological approaches, confirm that remittances strengthen capabilities, reduce inequalities in human development, and foster inclusive development. These results highlight the importance of promoting broad ICT penetration through affordable access and use, adopting laws that support multiple citizenship, fostering a more competitive and inclusive financial system, and ensuring a stable and sound institutional and economic environment in order to maximise the positive effects of remittances. At the end of this study, it would be worthwhile for future research to examine a larger sample encompassing countries at all levels of development in order to generalise the results and the related economic policy recommendations.

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Conflict of interest

The authors declare that they have no conflict of interest.

References

Adams, R. H., & Page, J. (2005). Do international migration and remittances reduce poverty in developing countries? *World Development*, *33*(10), 1645-1669. https://doi.org/10.1016/j.worlddev.2005.05.004

Alvaredo, F., Chancel, L., Piketty, T., Saez, E., & Zucman, G. (2018). *World inequality report 2018*. Belknap Press of Harvard University Press.

Andersen, J. J., Johannesen, N., & Rijkers, B. (2022). Elite Capture of Foreign Aid : Evidence from Offshore Bank Accounts. *Journal of Political Economy*, *130*(2), 388-425. https://doi.org/10.1086/717455

Anyanwu, J. C., & Erhijakpor, A. E. O. (2010). Do international remittances affect poverty in Africa? *African Development Review*, *22*(1), 51-91. https://doi.org/10.1111/j.1467-8268.2009.00228.x

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, *68*(1), 29-51. https://doi.org/10.1016/0304-4076(94)01642-D

Asongu, S. A. (2016). Reinventing foreign aid for inclusive and sustainable development : Kuznets, Piketty and the great policy reversal. *Journal of Economic Surveys*, *30*(4), 736-755. https://doi.org/10.1111/joes.12109

Asongu, S. A., Biekpe, N., & Tchamyou, V. (2019). Remittances, ICT and doing business in Sub-Saharan Africa. *Journal of Economic Studies*, *46*(1), 35-54. https://doi.org/10.1108/JES-06-2017-0146

Asongu, S. A., & Le Roux, S. (2017). Enhancing ICT for inclusive human development in Sub-Saharan Africa. *Technological Forecasting and Social Change*, *118*, 44-54. https://doi.org/10.1016/j.techfore.2017.01.026

Asongu, S. A., & Nwachukwu, J. C. (2017). Foreign Aid and Inclusive Development : Updated Evidence from Africa. *Social science quarterly*, *98*(1), 282-298. https://doi.org/10.1111/ssqu.12275

Asongu, S. A., & Odhiambo, N. (2019). Doing business and inclusive human development in Sub-Saharan Africa. *African Journal of Economic and Management Studies*, *10*(1), 2-16. https://doi.org/10.1108/AJEMS-05-2018-0132

Atake, E. H. (2018). The impacts of migration on maternal and child health services utilisation in Sub-Saharan Africa : Evidence from Togo. *Public health*, *162*, 16-24. https://doi.org/10.1016/j.puhe.2018.05.010

Atkinson, A. B. (1970). On the measurement of inequality. *Journal of economic theory*, *2*(3), 244-263.

Avato, J., Koettl, J., & Sabates-Wheeler, R. (2010). Social security regimes, global estimates, and good practices : The status of social protection for international migrants. *World Development*, *38*(4), 455-466. https://doi.org/10.1016/j.worlddev.2009.10.003

Azizi, S. (2018). The impacts of workers' remittances on human capital and labor supply in developing countries. *Economic Modelling*, 75,377-396. https://doi.org/10.1016/j.econmod.2018.07.011

Azizi, S. (2021). The impacts of workers' remittances on poverty and inequality in developing countries. *Empirical Economics*, *60*(2), 969-991. https://doi.org/10.1007/s00181-019-01764-8

Bahadir, B., Chatterjee, S., & Lebesmuehlbacher, T. (2018). The macroeconomic consequences of remittances. *Journal of International Economics*, 111,214-232. https://doi.org/10.1016/j.jinteco.2018.01.010

Beegle, K., Christiaensen, L., Dabalen, A., & Gaddis, I. (2017). *La pauvreté dans une Afrique en essor* (World Bank Publications).

Bettin, G., & Zazzaro, A. (2012). Remittances and financial development : Substitutes or complements in economic growth? *Bulletin of Economic Research*, *64*(6), 509-536. https://doi.org/10.1111/j.1467-8586.2011.00398.x

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, *87*(1), 115-143.

Campanella, F., Serino, L., Mustilli, M., Crisci, A., & D'Ambra, A. (2021). The evaluation of performance in the European public e-health services sector by Generalized Estimating Equations. *Socio-Economic Planning Sciences*, *73*, 100813. https://doi.org/10.1016/j.seps.2020.100813

Catrinescu, N., Leon-Ledesma, M., Piracha, M., & Quillin, B. (2009). Remittances, institutions, and economic growth. *World Development*, *37*(1), 81-92. https://doi.org/10.1016/j.worlddev.2008.02.004

Chen, S., Jolliffe, D. M., Lakner, C., Lee, K., Mahler, D. G., Mungai, R., Nguyen, M. C., Prydz, E. B. r, Sangraula, P., Sharma, D., Yang, J., & Zhao, Q. (2018). September 2018 PovcalNet Update What's New. *The World Bank*. https://ideas.repec.org/p/wbk/wbgpmt/2.html

Chen, S., Liu, N., Zhang, H., & Zhou, Y. (2024). Estimation of wage inequality in the UK by quantile regression with censored selection. *Journal of Econometrics*, 105733. https://doi.org/10.1016/j.jeconom.2024.105733

Chin, L., Saydaliev, H. B., & Sirag, A. (2021). Leveraging Remittances to Promote Inclusive Growth and Reduce Poverty : Evidence from Low- and Middle-Income Asian Economies. In F. Taghizadeh-Hesary, N. Panthamit, & N. Yoshino (Éds.), *Poverty Reduction for Inclusive Sustainable Growth in Developing Asia* (p. 101-121). Springer. https://doi.org/10.1007/978-981-16-1107-0_5

Cuadros-Meñaca, A. (2020). Remittances, health insurance, and pension contributions : Evidence from Colombia. *World Development*, *127*, 104766. https://doi.org/10.1016/j.worlddev.2019.104766

De Haas, H. (2010). Migration and Development : A Theoretical Perspective. *International migration review*, *44*(1), 227-264. https://doi.org/10.1111/j.1747-7379.2009.00804.x

De Vasconcelos, P., Ponsot, F., Terry, D. F., & Vásquez, B. (2017). *Sending Money Home : Contributing to the SDGs, one family at a time*. International Fund for Agricultural Development (IFAD). https://www.ifad.org/documents/48415603/49751961/sending-money-home_e.pdf/856938dd-079b-8efa-e97e-411762eb6299?t=1726641850745

Giuliano, P., & Ruiz-Arranz, M. (2009). Remittances, financial development, and growth. *Journal of development economics*, *90*(1), 144-152. https://doi.org/10.1016/j.jdeveco.2008.10.005

Hussein, K. A., Mukungu, A., & Awel, Y. M. (2018). Les moteurs de la croissance inclusive en Afrique. *Commission Economique pour l'Afrique (CEA)*. https://repository.uneca.org/handle/10855/24284

Ianchovichina, E., & Lundstrom, S. (2009). Inclusive growth analytics : Framework and application. *The World Bank*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1410472

Katigbak, E. O. (2020). Transnationalism. *International Encyclopedia of Human Geography*, 395-400.

Keho, Y. (2016). *Non-linear effect of remittances on banking sector development : Panel evidence from developing countries*. http://repository.embuni.ac.ke/handle/123456789/1732

Keho, Y. (2024). Impact of remittances on domestic investment in West African countries : The mediating role of financial development. *SN Business & Economics*, *4*(2), 20. https://doi.org/10.1007/s43546-023-00621-2

Lawson, M., Chan, M.-K., Rhodes, F., Parvez-Butt, A., Marriott, A., Ehmke, E., Jacobs, D., Seghers, J., Atienza, J., & Gowland, R. (2019). *Public good or private wealth?* Oxfam GB for Oxfam International. https://www.oxfam.org.au/wp-content/uploads/2019/01/bp-public-good-or-private-wealth-210119-en.pdf

Liang, K.-Y., & Zege, S. L. (1986). Longitudinal data analysis using generalized linear models. *Biometrika*, *73*(1), 13-22.

Machado, J. A. F., & Silva, J. M. C. S. (2019). Quantiles via moments. *Journal of Econometrics*, *213*(1), 145-173. https://doi.org/10.1016/j.jeconom.2019.04.009

Nguimkeu, P. (2024). Credit Constraints and Delayed Entrepreneurship. *Journal of Economic Behavior & Organization*, *224*, 156-180. https://doi.org/10.1016/j.jebo.2024.05.023

Nyamongo, E. M., Misati, R. N., Kipyegon, L., & Ndirangu, L. (2012). Remittances, financial development and economic growth in Africa. *Journal of economics and business*, *64*(3), 240-260. https://doi.org/10.1016/j.jeconbus.2012.01.001

Ofori, I. K., Gbolonyo, E. Y., Toyo Dossou, M. A., Nkrumah, R. K., & Nkansah, E. (2023). Towards inclusive growth in Africa : Remittances, and financial development interactive effects and thresholds. *Journal of Multinational Financial Management*, *68*, 100798. https://doi.org/10.1016/j.mulfin.2023.100798

Piketty, T. (2015). About capital in the twenty-first century. *American Economic Review*, *105*(5), 48-53. https://doi.org/10.1257/aer.p20151060

Rapoport, H., & Docquier, F. (2006). The economics of migrants' remittances. *Handbook of the economics of giving, altruism and reciprocity*, *2*, 1135-1198. https://doi.org/10.1016/S1574-0714(06)02017-3

Sobiech, I. (2019). Remittances, finance and growth : Does financial development foster the impact of remittances on economic growth? *World Development*, 44-59,113. https://doi.org/10.1016/j.worlddev.2018.08.016

Stark, O., & Bloom, D. E. (1985). The New Economics of Labor Migration. *The American economic review*, *75*(2), 173-178.

Syrovátka, M., & Schlossarek, M. (2019). Measuring development with inequality : How (should) aggregate indicators of development account for inequality? *Ecological Economics*, 164,106320-164,106320. https://doi.org/10.1016/j.ecolecon.2019.04.032

Van Gent, S. (2017). Beyond buzzwords : What is «inclusive development». *Synthesis report, INCLUDE Secretariat. Hague, Netherlands*. https://includeplatform.net/wp-content/uploads/2017/09/Beyond-buzzwords.pdf

WID. (2024). World Inequality Database. *WID - World Inequality Database*. https://wid.world/data/

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data, Second Edition*. MIT press. http://213.55.90.4/admin/home/Dmu%20Academic%20Resource/Postgraduate%20Studies/Accounting%20and%20finance/WOOLDRIDGE%20ECONOMETRIC%20ANALYSIS.PDF

Wooldridge, J. M. (2013a). Models with endogenous explanatory variables and heterogeneity. *IZA Summer School in Labor Economics*.

Wooldridge, J. M. (2013b). Panel Data Models with Heterogeneity and Endogeneity. *Michigan State University, Programme Evaluation for Policy Analysis*, 1-64.

World Bank. (2024). *World Bank Open Data*. World Bank Open Data WDI. https://data.worldbank.org

World Bank. (2025). *June 2025 Update to the Poverty and Inequality Platform (PIP)* (No. 44). https://documents1.worldbank.org/curated/en/099510306052516849/pdf/IDU-eb272b02-ecd1-4633-9e37-9297e20a711c.pdf

World Bank PIP. (2024). *Poverty & Inequality Indicators*. https://pip.worldbank.org/home

Annexes

Countries in this study

1	South Africa	12	Guinea-Bissau	22	Nigeria
2	Angola	13	Kenya	23	Uganda
3	Burkina Faso	14	Lesotho	24	Rwanda
4	Burundi	15	Liberia	25	Democratic Republic of Congo
5	Benin	16	Madagascar	26	Congo Republic
6	Cameroon	17	Malawi	27	Sierra Leone
7	Comoros	18	Mali	28	Senegal
8	Côte d'Ivoire	19	Mauritius	29	Tanzania
9	Gabon	20	Namibia	30	Togo
10	Ghana	21	Niger	31	Zambia
11	Guinea				