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Remittance Inflow, Digital Technology, and Human Development Index in Sub-Saharan Africa

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Abstract

Personal remittances an important source of external finance to many households and countries in Sub-Saharan Africa have been hampered by cost of transfers of these funds, amidst advancement in digital technologies. This study examines the combined effect of remittance inflow and digital technology on human development index in Sub-Saharan Africa. The study employed the conditional panel quantile regression methods and a panel data of forty-five (45) SSA countries covering the period 2010 to 2022 for data analysis. The findings of this study revealed that the effect of remittance and digital technology on human development index varies across SSA countries with base on their human development index (HDI) level. The study also found that the interaction effect of remittance and digital technology on human development index has noticeable variations across the lower HDI (25th quantile), middle HDI (50th quantile) and higher HDI (75th quantile) levels. These effects of remittance and digital technology on human development index together their interaction is higher for countries at the middle HDI level (50th quantile). The study therefore recommends that to boost personal remittance inflow from abroad for improvement in human development index amidst advancement in digital technologies, Sub-Saharan African countries should introduce consumer oriented digital platforms for remittance services which should be adequately protected. The study therefore, concludes that as remittances from abroad are becoming major sources of foreign financial inflows, harnessing the drivers of these remittance inflows is vital for improvement in the human development index in SSA.

Keywords: Digitalization; Human Development Index; Panel Quantile Regression; Remittance.

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1. Introduction

The primary aim of improving living standard in both developed and developing countries is to reduce poverty, enhance healthcare, education, and income growth, and improve overall socioeconomic conditions (Etudaiye-Muhtar, Johan, Lawal & Sakariyahu, 2024). The human development index (HDI) is used to represent regions and countries with superior socioeconomic conditions and serves as a key measure of a country's living standard. A HDI value of 0.70 or above indicates good performance in terms of socioeconomic conditions (Etudaiye-Muhtar, et al., 2024). Most advanced countries in Europe, North America, and parts of Asia and South America have high and very high HDI, whereas Sub-Saharan Africa (SSA) generally ranks low on the index, with exceptions like Botswana, Gabon, Mauritius, Seychelles, and South Africa (UNDP, 2022). According to the UNDP, the average HDI in SSA is significantly lower than the global average (UNDP, 2022).

Emphasis on human development is crucial as it guides policymakers and governments to attract financial inflows that enhance socioeconomic status and overall well-being. To improve their socioeconomic status and quality of life, there has been an increase in migration from low and medium-income countries, such as those in SSA, to developed and advanced countries (United Nations Department of Economics and Social Affairs, 2014). These migrants often remit

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part of their earnings back to their home countries, forming a significant portion of financial inflows that improve socioeconomic conditions and well-being (Mohammed, 2021).

Recently, remittances from Sub-Saharan Africans living abroad have been a key component of the region's foreign financial inflows, (World Bank, 2023). Scholars like Ratha (2019) believe that remittance inflows will soon become the highest contributor of external financial inflows for developing countries. The global trend in remittance inflows peaked in 2020 during the COVID-19 pandemic, surpassing both foreign direct investment and official development assistance combined (World Bank, 2021). Recent global trends by region show that in 2022, remittance inflows to East Asia and the Pacific increased by 0.7% to reach $130 billion; in Europe and Central Asia, it grew by 19% to a record high of $79 billion. It increased by 11.3% to $145 billion in Latin America and the Caribbean, fell by 3.8% to $64 billion in the Middle East and North Africa after strong growth of 12.2% in 2021, and grew by 6.1% to $53 billion in Sub-Saharan Africa. The increase in SSA was driven by strong remittance growth in Ghana (12%), Kenya (8.5%), Tanzania (25%), Rwanda (21%), and Uganda (17%), while remittances to Nigeria, accounting for around 38% of total remittance inflows to the region, increased by 3.3% to $20.1 billion (World Bank, 2023).

In 2023, remittance flows to low and medium-income countries were estimated to have reached $669 billion. By region, the inflows grew for Latin America and the Caribbean (8%), South Asia (7.2%), East Asia and the Pacific (3%), and Sub-Saharan Africa (1.9%). Flows to the Middle East and North Africa fell for the second year, declining by 5.3%, mainly due to a sharp drop in flows to Egypt. Remittances to Europe and Central Asia also fell by 1.4% after gaining more than 18% in 2022 (World Bank, 2023). These reports highlight that SSA is trailing behind some other regions in remittance inflows and faces an unpredictable and volatile inflow of remittances. Elmi and Ngwenyama (2020) attribute the remittance gap in SSA to several factors, which include high cost remittance transfers caused by the underdeveloped nature of digital technology in the region. According to Elmi and Ngwenyama (2020), remittance inflows in other regions improved following the expansion of internet and smart-phones, leading to digital remittances. However, this is not the same with Sub-Saharan Africa.

Although Sub-Saharan Africa has made significant strides towards digital transformation over the last decade, with hundreds of millions gaining internet access and engaging in various digital activities like mobile payments and transfers, (World Bank, 2024), the region still faces critical challenges in the digital economy. These challenges include underdeveloped digital infrastructure and a lack of accessible and affordable connectivity (Elmi & Ngwenyama, 2020). Consequently, at the end of 2022, 84% of people in SSA lived in areas with 3G service availability and 63% had access to 4G mobile coverage, only 22% were using mobile internet services. Meanwhile, there is also a large gap between broadband coverage and usage, with 61% of people in SSA living within broadband range but not using it, (World Bank, 2024). Affordability is also a significant issue; in 2021, the average cost of one gigabyte of mobile internet as a percentage of monthly per-capita gross national income was 10.5%, much higher than the 2% target recommended by the United Nations Broadband Commission (World Bank, 2024). These challenges contribute to the high costs and fees associated with remittances.

Thus, while remittances have withstood many global challenges, they have yet to claim victory over the challenges of digitalization in SSA which supposed to be a propeller and enabler. As long as the barriers to remittance inflows in SSA remain high, individuals and societies will be denied the funds they need to improve their human development index or they will be forced to rely on informal channels and risk losing their funds altogether. As a result, the paper tries to unravel if the effects of remittance inflows and digital economy on human development index in SSA differ due to their HDI level. It also investigates the interaction effect of remittance inflow and digitalization on human development in SSA. Following the introduction, the literature review is taken up in Section 2. The methodology is presented in Section 3. While section 4 covers the results and associated discussions, the study is concluded in section 5.

2. Literature Review

Remittance flows represent an important source of external inflows in Africa. In recent years, remittances have surpassed other financial flows, including overseas development assistance (ODA), foreign direct investments (FDI), and portfolio investments, to become the largest consistent sources of external inflows in Africa, (AFDB 2022). Remittances are funds transferred from one country to another, either by individuals or businesses for personal support, trade payments or investment purposes, (Adams & John, 2003). These transfers can be performed through banks, agents and specialized fund transfer services, or electronic means.

The human development index is described as an indicator that expresses the living standard of people in a society. It comprises of three indicators of wellbeing such as health living, educational attainment and living standard measured

in gross national income per capita, (UNDP 2021). Thus, the living standard component of HDI is measured based on income (GNI) per capita converted into purchasing power parity (PPP), (Lashmar, 2018).

2.1. Theoretical background

The theoretical review explored the theoretical backgrounds of the key concepts used in the study and some of the empirical findings relating to the study. The theory supporting remittances originates from the work of Lucas and Stark (1985), who developed a theory on the motivations for remittances. This theory identifies two broad motivations: altruism and self-interest. These motivations were further refined by Rapoport and Docquier (2005) into altruism, insurance, investment, and strategic motives. Building on the work of Lucas and Stark (1985), Rapoport and Docquier (2005) proposed three main reasons for remittances: altruism, insurance, and investment. Thus, migrant workers send money or assets to help their families and communities out of altruism.

Additionally, remittances can be classified as investments when individuals remit to their home country to purchase properties, stocks, equity, or invest in physical capital. According to theoretical postulates, altruism is the foremost reason why migrants send money home. Although the motivations for remittances are complex, altruism remains the predominant factor, making it a useful benchmark when linking remittances and human development. However, this motivation theory on remittances does not directly address well-being and human development, highlighting the need to review the capability theory.

The capability theory, proposed by Sen (1980), is crucial for defining, understanding, and measuring well-being. It emphasizes using the Human Development Index (HDI) as a key measure of well-being, arguing that quality of life should reflect people's capabilities and capacities rather than their earnings or income (Clark, 2005). Through educational attainments, these capabilities can be linked to digital innovations, impacting economic growth and human development. However, the technology diffusion theory focused on the diffusion of technological products in order to promote digitalization propelled by factors such as knowledge and financial transfers, (Corrocher, et al, 2023). Thus, the diffusion of technology into financial transfers is also depicted by the theory of financial innovation, as described by Silber (1983). The theory of financial innovations posits that innovations in financial transactions became necessary to remove regulatory restrictions and costs imposed on financial transactions.

2.2. Empirical literature

Studies have explored the nexus between remittances and financial development. Ikpesu (2024) investigated the combined impact of migrant remittances and financial market development on growth in Sub-Saharan Africa (SSA) from 2000 to 2020. Using dynamic pooled mean group analysis with data from 27 SSA countries, the study found a positive and significant interactive effect of migrant remittances and financial market development on growth in SSA.

Similarly, Odhiambo and Musakwa (2024) examined the relationship between remittance inflows, financial development, and the role of government regulatory quality and effectiveness in 26 SSA countries from 2013 to 2017. Employing the Generalised Method of Moments (GMM) estimation technique, the study revealed that remittance inflows positively impact bank-based financial development. However, governance reduces the positive relationship between remittances and financial development when financial development is measured by liquid liabilities and bank deposits. The study also found that remittances have no significant impact on the assets of commercial banks, but their interaction with government effectiveness positively affects financial development in SSA.

A study by Jemiluyi and Keke (2023) explored the mediating effect of digital technology on the relationship between remittance inflows and financial development in 35 SSA countries from 2011 to 2020. Using the Generalized Method of Moments for analysis, the study showed that digital technology enhances the impact of remittance inflows on financial development in SSA. Similarly, Jemiluyi and Keke (2024) examined the relationship between digital technology and remittance inflows in 35 SSA countries using panel data from 2011 to 2020. Proxied by internet usage and mobile cellular subscription, the study found a significant positive relationship between internet usage, mobile cellular subscription, and remittance inflows in SSA.

Mlambo and Ntshangase (2021) investigated the causality relationship between remittance inflow and mobile technology in five SADC countries (Democratic Republic of Congo, Eswatini, Lesotho, Mozambique, and Zimbabwe) using data from 2005 to 2018. Using Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) techniques, the study revealed a unidirectional causality relationship between remittances and mobile subscriptions, indicating that remittances influence mobile subscriptions but not vice versa.

Other studies have linked remittance inflows to economic growth and human development as well as the moderating role of institutional quality. This was the focus of the study by (Delessa, Alemu & Bane, 2024) that examined the relationship between capital inflow, remittances, and economic growth, as well as the moderating role of institutional and macroeconomic stability in SSA from 2005 to 2019. Using the Dynamic OLS panel-based cointegration approach, the study revealed a positive correlation between per capita income and remittances when interacted with macroeconomic policy in SSA. Also, Muhammed (2021) analyzed the relationship between remittances, institutions and human development in SSA from 2004 to 2018. Using the system Generalized Method of Moments, the study revealed that remittances significantly influence human development in SSA. It also found that the interaction between institutions and remittances stimulates human development, implying that remittances enhance human development in countries with weak institutional structures but decrease as a source of capital for human development in countries with well-developed institutions.

Acknowledging the different income and human development levels, (Kamalu, Ibrahim & Ahmad, 2022), investigated the effect of remittance inflows on human development in Organization of Islamic Cooperation (OIC) member countries from 1990 to 2018. The study employed the dynamic common correlated effects (DCCE) and cross-sectional autoregressive distributive lags (CS-ARDL) for analysis, and the results showed that remittance inflows boost human development. Kamalu and Ibrahim (2022) also examined the effect of remittances across different levels of human development in 66 developing countries from Africa, Asia, Europe, Latin America, the Pacific, and the Middle East. Using panel quantile regression, the study found that remittance inflows promote human development in developing countries with low, medium, and high human development, with a more significant impact in countries with high human development. Thus, suggesting that developing countries should develop their financial sectors to encourage more remittances. Bibi and Ali (2021) examined the impact of remittances on human development in developing countries, using annual cross-section data for 2014 from 100 developing countries, including Afghanistan, Pakistan, Turkey, Bangladesh, Iraq, and China. Their study revealed that remittances have a positive but non-significant impact on human development in the selected developing countries.

However, effect of remittance inflows on human development vary depending on the level of human development and digital innovations. The paper acknowledges the fact that the level of human development differs in among the SSA countries, as a result, the study adds to literature by simultaneously investigating the effect remittance inflow and digital technology on human development in SSA. In addition, makes a methodological contribution to the existing literature with the introduction of the interaction between remittance inflow and digitalization to ascertain whether digitalization complements the effect of remittance on human development in SSA or it serves as a substitute base on their levels of HDI.

3. Methods

3.1. Model Specification

In analyzing the interaction effect of remittance inflow and digitalization on different levels of HDI in Sub-Saharan Africa, the study employed the Quantile regression for panel data (QRPD). The specified quantile regression is the one that captures conditional distribution instead of conditional mean distribution, as introduced by (Koenker & Bassett, 1978). The model for the conditional quantile of the dependent variable (y_i) given the independent variables (x_i) is specified following the work of (Xu et al. 2017):

$$Q_{y_i}(\tau / x_i) = x_i{}^{\tau} \beta_{\tau} . + \varepsilon_{it} \quad \text{.....1}$$

where $0 < \tau < 1$, Q_{y_i} (τ/x_i) represents the τ^{th} the conditional quantile of y_i, while x_i is the independent variable. β_τ is the estimated coefficient and show how the independent variable x_i impact on the conditional τ^{th} quantile of the conditional distribution of the dependent variable y_i, ε_{it} is the random error with its distribution of conditional quantile equal to zero. Thus, the quantile is given:

$$Quant_{\tau}(\tfrac{y_{i,t}}{x_{i,t}}) = \beta_{\tau} x_{i,t} \quad \text{.....2}$$

Modifying the model of (Kamalu, Ibrahim & Ahmad, 2022), equation 2 is transformed to include the major variables used in the study;

$$Q_{hdi_i}(\tau / x_i) = \beta_{1\tau} REMT_{i,t} + \beta_{2\tau} FBS_{i,t} + \beta_{3\tau} INTUSE_{i,t} + \beta_{4\tau} FDI_{i,t} + \beta_{5\tau} GDPPC_{i,t} + \beta_{6\tau} (REMT * FBS)_{i,t} + \varepsilon_{i,t} \quad \text{.....3}$$

i=1,……., 45, t= 1, ……, 19.

Where HDI_{it} represents human development index, $REMT_{it}$ represents remittance inflow, FBS_{it} is the fixed broadband subscription and $INTUSE_{it}$ is the internet use. The control variables are FDI representing foreign direct investment while $GDPPC_{it}$ is the GDP per capita. The panel quantile equation specified in equation 3 do not take into consideration the presence of fixed effects or random effects, rather the quantile versions of traditional panel data is estimated as pooled OLS estimators. This is to incorporate the dynamic nature of the variables, which allows the use of lag of the variables as instruments. The general process of the quantile equation specified in equation 3 is to use varying values of τ bound between 0 and 1 which yields the regression quantiles for varying distributions of HDI given the remittance and digitalization variables. The study estimation is carried out using the 0.25, 0.50, 0.75 and 0.95 quantiles, i.e., τ = (0.25, 0.5, 0.75 and 0.95). These quantiles represent countries with lower level HDI, medium level HDI, high level HDI and very high level HDI. SSA has Mauritius and Seychelles in the very high HDI group, thus, the country is grouped as the highest quantile in the high HDI quantile group.

In analyzing the interaction effect of remittance inflow and digitalization on human development in SSA, it is expected that β_6 (the interaction term) in the model to be significant as it ascertains if digitalization interacts with remittance to make the difference in the level of HDI among the SSA countries. The interaction term could have a significant positive effect, signifying that digitalization complement remittance inflow, while a negative significant signifies that digitalization downplay the effect of remittance inflow in improving human development in SSA.

3.2. Technique of Data Analysis

The technique of analysis started with the descriptive statistics and the skewness and kurtosis statistics for the normality tests. The quantile estimation is carried out using the four human development index (HDI) levels peculiar to SSA countries, according to the UNDP classifications which are lower HDI, medium HDI, higher HDI and very high HDI. Thereafter, the normality of the series is conducted to check whether the data were suitable for quantile estimation.

3.3. Sources of Data

The sample period for the study is from 2010 to 2022, with data from 46 SSA countries based on the World Bank classification of countries. The period is based on the availability of data for some of the variables in SSA countries. Data on human development index is sourced from the United Nation Development Program, 2022 database, while data for remittance inflow, internet use, FDI, and GDP per capita are sourced from the World Bank (WDI, 2023).

4. Result and Discussions

4.1. Descriptive Statistics

Table1 presents the descriptive statistics of the data used in the study, showing the number of observations, mean, maximum and minimum values of the variables.

Table 1. Descriptive Statistics

Variables	Observation	Mean	Minimum	Maximum
HDI	585	0.5323	0.33	0.817
remittance	572	3.8922	0	27.302
Internet use	526	20.5743	0.58	81.59
FDI	584	4.8258	-17.2922	103.337
GDP per capita	585	3.6297	-36.392	21.45

Source: Authors computation using stata

The mean value of human development index (HDI) for the period covered in the study is 0.53, implying that on average the HDI level in Sub-Saharan Africa is 0.53 which is a low HDI level, with Mauritius having the highest HDI level of

0.817, while Niger has the lowest level of 0.33. Also the average personal remittance received as a percentage of GDP in SSA for the study period is 3.89, while the average internet use is 20.5.
Table 2 presents the correlation matrix of the variables used in the study. The results indicate that the regressors used in this study are not highly correlated as none has a correlation coefficient of 0.8 and above. Consequently, there is no incidence of multicollinearity among the regressors in the estimated models, as the highest coefficient is 0.7591.

Table 2. The Correlation Matrix

Variables	*HDI*	*REMT*	*INTUSE*	*FDI*	*GDPPC*
HDI	1.0000				
REMT	-0.0841	1.0000			
INTUSE	0.5370	0.0663	1.0000		1.0000
FDI	-0.0951	0.1637	-0.0832	1.0000	
GDPPC	-0.0544	-0.0521	-0.2112	0.1061	

Source: Authors' computation

4.2. Panel Quantile Regression

The results of the panel quantile regression showing the interaction of personal remittance received and digital technology alongside the results without interactions across different quantiles groups that represent different levels of human development index in SSA are presented in Tables 3, 4 and 5. Since the countries have different HDI levels which are categorized into low HDI, medium HDI, high HDI and very high HDI according the UNDP ranking, the estimated quantile groups are the 25th, 50th, and 75th quantiles. These quantile levels were selected to reflect Sub-Saharan African countries HDI levels with majority of the countries at the lowest HDI level and middle HDI level.

Table 3. The 25th, 50th and 75th Quantile Results
Dependent Variable: HDI

	25th quantile			**50th quantile**			**75th quantile**		
Variable:	Coefficient	Std. error	Prob.	Coefficient	Std. error	Prob.	Coefficient	Std. error	Prob.
Remittance	0.00121	0.0003	0.000	0.00166	0.00005	0.000	0.00147	0.00112	0.000
Internet use	0.0021	0.00015	0.000	0.0023	0.00004	0.000	0.00242	0.000165	0.000
FDI	-0.00004	0.0001	0.712	-0.0014	0.00006	0.000	0.00053	0.00059	0.000
GDPPC	0.0011	0.00048	0.024	0.00009	0.00011	0.405	0.00093	0.00146	0.405
Remt*Intuse	-0.000092	0.000009	0.000	-0.000032	0.0000025	0.000	-0.000052	0.000029	0.000
Mcmc diagnostics	0.378		0.322				0.271		

Source: *Author's computation, 2024*

Table 3 presents the 25th, 50th and 75th panel quantile regression results with interactions**.** The results across the 25th, 50th and 70th quantiles in SSA quantiles show that remittance inflow and digitalization have very little effect on human development index in SSA. Notably, remittance and internet use have positive influence on human development index in SSA and the effect of remittance inflow is more substantial in countries at the 50th quantile (middle) HDI level, while that of digitalization is stronger in countries at the high (75th quantile) HDI level. According to Table 3, an increase in remittance inflow raises human development index by 0.12% in the 25th quantile, 0.16% in the 50th quantile and 0.15% in the 75th quantile. The results are in line with the findings of (Kamalu, Ibrahim & Ahmad, 2022; and Kamalu & Ibrahim, 2022) who found that remittances improve human development. However, the results do not tally with the findings of (Bibi & Ali, 2021) who found that remittances have non-significant impact on human development in the selected developing countries.

Also, an increase in internet use raises human development index by 0.21%, 0.23% and 0.24% in the 25th, 50th and 75th quantile levels. Similarly, the effect of the interaction between remittance inflow and internet use is negative and significant suggesting the presence of interaction between remittance inflow and digitalization. The interaction effect is stronger in the middle HDI (50th) quantile group than in the 25th and 75th quantile levels. However, the negative sign signifies that digitalization serves as a substitute for remittance in improving human development in both the lower and

middle HDI countries in SSA. This outcome is not in agreement with the finding of (Muhammed, 2021) who found that the interaction between institutions and remittances enhances human development.

Generally, the results revealed noticeable variations across the 25th, 50th and 75th levels in the effect of remittance inflow and internet use on human development index. The effect of remittance inflow and the interaction between remittance and internet use are stronger in countries in the middle (50th) HDI level, while the effect of digitalization is stronger in countries in the higher (75th) HDI level. This may be attributed to the fact that, majority of the SSA countries are in the lower middle HDI levels in global ranking and thus, have made more efforts in improving remittance inflows. Digital innovation is stronger in the higher HDI level, which implies that countries at high HDI levels have embraced digital economy in improving their human development index.

Foreign direct investment is negative in both the 25th and 50th quantile but non-significant in the 25th quantile and significant in the 50th quantile. It is positive and significant in the 75th quantile. This implies that FDI stimulates human development in the 75th quantile while reducing human development in the 50th quantile.

4.3. The Quantile Regression Normality Tests

Table 5. Shapiro-Wilk, Shapiro-Francia and Skewness Tests

Variables	Shapiro-Wilk test	Shapiro-Francia test	Skewness/Kurtosis
HDI	6.822 (0.00000)	6.345 (0.00001)	40.46 (0.0000)
Remittance	11.150 (0.00000)	10.278 (0.00001)	(0.0000)
Internet use	9.117 (0.00000)	8.459 (0.00001)	63.65 (0.0000)
Mobile phone sub.	5.671 (0.00000)	5.260 (0.00001)	21.40 (0.0000)
FDI	12.681 (0.00000)	11.782 (0.00001)	(0.0000)
GDP per capita	9.716 (0.00000)	9.121 (0.00001)	(0.0000)

Source: *Author's computation, 2024*
S-W test = Shapiro wilk test, S-F test = Shapiro francia test, S/K = skewness and kurtosis test. The numbers in brackets are the probability values.

To validate the use of the quantile regression in the study, the Shapiro-Wilk and Shapiro-Francia tests are carried out as depicted In Table 5, the results of Shapiro-Wilk and Shapiro-Francia tests show that all the variables are statistically significant, which revealed that our variables are not normally distributed.

5. Conclusions

Personal remittances have become one of the major sources of external financial inflow to many developing countries including Sub-Saharan African countries. However, personal remittances to many households and societies in SSA have been hampered by cost of transfers of these funds, amidst the advancement of digital technologies for various activities including financial transfers. Although the role of digitalization in remittance inflows has not been widely explored in empirical literature, this study examines the combined effect of remittance inflow and digital technology on human development index in Sub-Saharan Africa. The study employed the conditional panel quantile regression methods and a panel data of forty-five (45) SSA countries covering the period 2010 to 2022 for data analysis.

The findings of this study show that the effect of remittance and digital technology on human development index varies across SSA countries with lower HDI, middle HDI and high HDI. The result of the study also reveals that the combined effect of remittance and digital technology on human development index has noticeable variations across the lower HDI (25th quantile), middle HDI (50th quantile) and higher HDI (75th quantile) levels. However, the effect of remittance and digital technology on human development index together their interaction is higher for countries at the middle HDI level (50th quantile). The study therefore, concludes that as remittances from abroad are becoming major sources of foreign financial inflows, harnessing the drivers of these remittance inflows is vital for improvement in the human development index in SSA ravaged by high poverty rate.

The study therefore recommends that to boost personal remittance inflow from abroad for improvement in human development index amidst advancement in digital technologies, Sub-Saharan African countries should introduce consumer oriented digital platforms for remittance services which should be adequately protected. This will be followed by improvements in the financial and payment system digital infrastructures that are accessible to the Diasporas and the domestic receivers, thereby boosting remittance inflows across Sub-Saharan Africa, which will lead to improvement in living standard.

References

Adams, R. H., Jr., & John, P., (2003), International migration, remittances, and poverty in developing countries, *World Bank policy research working paper*, 3179 (Washington).

African Development Bank, (2022). *Development without borders: Leveraging the African diaspora for inclusive growth and sustainable development in Africa*. Lecture delivered by Dr. Akinwumi Adesina, President, African Development Bank Group and Moussa Faki Mahamat, Chairperson of the African Union Commission at the Global Community of Practice (G-CoP) Policy Dialogue Series, December, 1st, 2022.

Bibi, C. & Ali, A. (2021). Do remittances impact human development in developing countries? A panel analysis of selected countries? *MPRA publications*, No. 114864: 1-26. Available at, https://mpra.ub.uni-muenchen.de/114864.

Clark, D. A. (2005). Sen's capability approach and the many spaces of human well being. *Journal of Development Studies*, 41(8), 1339–1368. Available at: https://www.bristol.ac.uk/poverty/pse/conf_pap/mex01_jrb.pdf.

Corrocher, N., Moschella, D., Staccioli, J. & Vivarelli, M. (2023). Innovation and the labor market: Theory, evidence and challenges. *GLO Discussion Paper*, No. 1284, Global Labor Organization (GLO), Essen.

Delessa, K., Alemu, T. & Bane, J. (2024). Remittances inflow and economic growth nexus in Sub-Saharan Africa: Do institutional quality and macroeconomic stability matter? *Heliyon*, 10(e25690): 1-11.

Elmi, M. A., & Ngwenyama, O. (2020). Examining the use of electronic money and technology by the diaspora in international remittance system: A case of Somali remittances from Canada. *The Electronic Journal of Information Systems in Developing Countries*, 86(5). https://doi.org/10.1002/isd2.12138.

Etudaiye-Muhtar, F. O., Johan, S., Lawal, R. & Sakariyahu, R. (2024). Fintech, human development and energy poverty in sub-Saharan Africa. *Journal of International Financial Markets, Institutions and Money*, 91(101931): 1-15.

Ikpesu, O. A. (2024). Interactive effect of migrant remittances and financial market development on growth in Sub-Saharan Africa. *International journal of professional business review*, 9(3):1-9.

Jemiluyi, O. O. & Keke, L. (2024). Remittance inflows in a digital economy: A Sub-Saharan African experience. *Journal of Infrastructure, Policy and Development*, 8(4): 1-13. https://doi.org/10.24294/jipd.v8i4.2838.

Jemiluyi, O. O., & Jeke, L. (2023). How Catalytic Is Digital Technology in the nexus between migrants' remittance and financial development in Sub-Saharan African Countries? *Economies*, 11(74):1-12. https://doi.org/10.3390/economies 1103007.

Kamalu, K. & Ibrahim, W. H. B. W. (2022). International remittances and human development in developing countries: A panel quantile regression moment approach. *Studies of applied econometrics*, 40(1):1-18.

Kamalu, K., Ibrahim, W. H. B. W., & Ahmad, A. U. (2022). The effect of remittance on human development in the organization of Islamic Cooperation Member Countries: Evidence from DCCE AND CS-ARDL. *Iranian journal of management studies (IJMS)*, 15(2): 405- 424.

Koenker, R., & Bassett Jr, G. (1978). Regression quantiles. *Econometrica: Journal of the Econometric Society*, 33-50.

Lashmar, H. (2018). *The human development index-a better indicator for success. Sustainable Development solutions network: A global initiative for the United Nation*s, United Nations Association-United Kingdom. https;//sdg-action.org/the-human-development- a-better-indicator-for-success.

Lucas, R. E. B., & Stark, O. (1985). Motivations to Remit: Evidence from Botswana. *The Journal of Political Economy*, 93(5), 901-918.

Mlambo, C. & Ntshangase, B. (2021). The nexus between remittances and mobile technology: evidence from Southern Africa. *Academy of accounting and financial studies journal*, 25(5), 1-16.

Mohammed, U. (2021). Remittances, institutions and human development in Sub-Saharan Africa. *Journal of Economics and Development*, 24(2): 142-157.

Odhiambo, N. M. & Musakwa, M. T. (2024). Remittance inflows and financial development in Sub-Saharan African countries: Does governance matter? *Heliyon*, 10(e269530): 1-8.

Rapoport, H., & Docquier, F. (2006). The economics of migrants' remittances. *Handbook of the economics of giving, altruism and reciprocity*, 2, 1135-1198.

Ratha, D. (2019). *Remittances on track to become the largest source of external financing in developing countries*. Available at: https://blogs.worldbank.org/peoplemove/remittances-track-become-largest-source-external-financing-developing-countries.

Sen, A. (1980). Equality of What? *The Tanner Lecture on Human Values*, I, 197–220.

Silber, W. L. (1983). The Process of Financial Innovation. *The American Economic Review*, 73,89-95.

United Nations Development Programme. (2021). *Human development report 2021: Human development for everyone*. Retrieved from http://hdr.undp.org/sites/default/files/2021_ human_development_report.pdf.

World Bank, (2023, December 18). *Remittance flows continue to grow in 2023 albeit at slower pace*. Available at,https://www.worldbank.org/en/news/press-release/2023/12/18/remittance-flows-grow-2023-slower-pace-migration-development brief.

World Bank, (2024, January 18). *Digital Transformation Drives Development in Africa*. Available at; https://www.worldbank.org/en/results/2024/01/18/digital-transformation-drives-development-in-afe-afw-africa.

World Bank. (2021). *Defying predictions, remittance flows remain strong during COVID-19 crisis.* Available online: https://www.worldbank.org/en/news/press-release/2021/05/12/defying-predictions-remittance-flows-remain-strong-during covid-19-crisis.