FINANCIAL INCLUSION, INEQUALITY AND HUMAN DEVELOPMENT IN SUB-SAHARAN AFRICA.

Okoro Kelechi Okoro[1], Ebere Ume Kalu[2], Emmanuel Ikechukwu Omeje[3], Ibiam Oti[4]

[1, 2, 3.] Department of Banking and Finance. University of Nigeria, Enugu Campus. Enugu. Nigeria.

[4.] Department of Accounting. Michael Okpara University of Agriculture, Umudike. Abia State. Nigeria

Abstract

The aim of the paper is to examine how financial inclusion and inequality affect human development in Sub-Saharan Africa between the years 1990-2024. The paper uses panel data on human development index, adult formal account ownership, adult access to regulated institutional credit, formal banking inclusion of enterprises, enterprise access to outstanding regulated credit, POS density, ATM density and income inequality. The study analyzes both short-run adjustments and long-run equilibrium relationships between the variables via the use of the Panel Autoregressive Distributed Lag model, which utilizes the Pooled Mean Group estimator. The empirical findings indicate that adult formal account ownership, enterprise banking inclusion and enterprise access to regulated credit have positive and statistically significant long-run effects to human development. But adult access to credit, POS density, ATM density and income inequality have a negative effect on human development over time, indicating that financial access and infrastructure growth do not necessarily lead to the development of inclusive growth where credit access is low, inequality is chronic and financial services are not efficiently correlated to welfare-enhancing activities. The negative and significant error correction term proves the existence of a stable long-run relationship, but the rate of the adjustment is rather low. The paper concludes that financial inclusion policy in Sub-Saharan Africa needs to shift the focus of access expansion to productive use of credit and enterprise funding, digital financial efficiency, financial literacy and inequality reduction. Inclusive financial systems as well as equity-based social and economic policies should be strengthened in order to translate financial inclusion into sustainable human development.

Keywords: Financial inclusion, Inequality, Human development, SSA, Panel estimation

1. Introduction

Financial inclusion has evolved as a critical driver of economic and human development, particularly in emerging economics such as Sub-Saharan Africa (SSA). Financial inclusion has been linked to multiple aspects of development, including poverty alleviation, income equality, and, notably, human development (Demirgüç-Kunt et al., 2020). With the intention of lowering poverty, a number of financial institutions, including commercial banks, cooperatives, insurance brokers, and financial institutions, provide financial goods such loans, insurance, money transfers, pensions, and savings (Thathsarani *et al.,* 2021).

A good number of literature opines that human development, which encompasses improvements in education, health, individuals' skills, productivity and overall well-being of the population, is vital for enhancing productivity and driving sustainable economic growth in SSA (Schultz, 2020; Toure and Diop 2024). However, the region continues to face notable difficulties in achieving widespread financial inclusion, and consequently, in maximizing human development, such as monetary rate fluctuations and inflation, continue to impede progress in SSA. The Human Development Index (HDI), which captures core aspects of human survival rate, adult health and years of quality-adjusted schooling, is increasingly used as an aggregate measure of development (World Bank, 2018).

Financial inclusion facilitates human development by improving access to financial resources for education, healthcare, and entrepreneurial ventures. Access to financial services enables individuals to save for future investments in education and health, manage risks, and participate in income-generating activities, thus enhancing their human capital. As noted by Beck et al. (2019), financial inclusion enhances individuals' abilities to make productive investments in their education and health, contributing to the development of human capital in the long run. In SSA, where a substantial segment of the populace is excluded from the formal financial sector, promoting financial inclusion is critical to breaking the cycle of poverty and improving the socio-economic outcomes of marginalized groups (Aterido et al., 2019; Mensah and Boateng 2024).

In Sub-Saharan Africa, the percentage of adults who own an account has more than doubled since 2011. The percentage of account holders in SSA indicates a steady upward momentum. This rises from 23 percent in 2011, to 40 percent in 2021 which may be as a result of deliberate policy efforts to improve access to and use of financial services in the region. Figure 1 shows the regional percentages of financial institution account holders from 2011 to 2021.

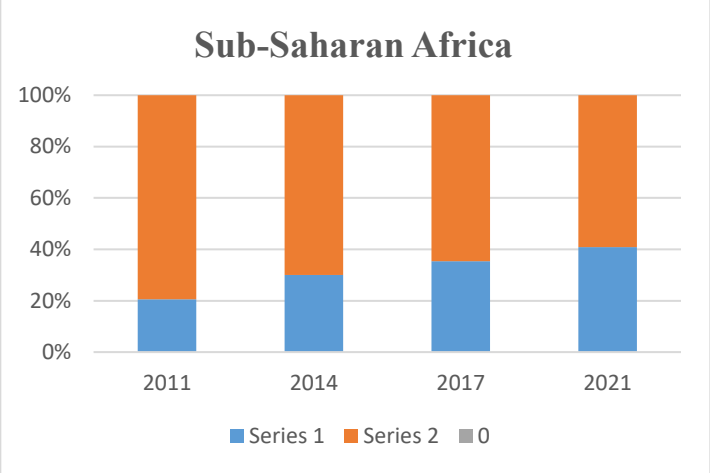
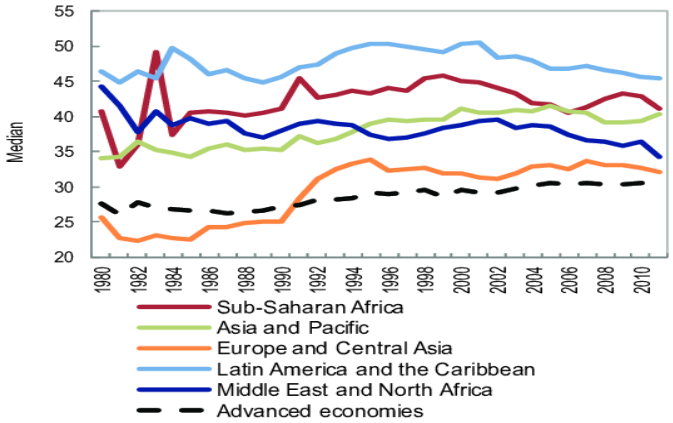


Figure 1 Percentage of Financial Institution Account Holders (2011 – 2021)
Source: Authors' Compilation based on Global Findex Database 2021

As reflected in Figure 1, only 40 percent of adults in the SSA zone have a financial institution account. This is substantially below what the UN's SDGs call for (Demirgüç-Kunt et al., 2018). It also reveals that the financial systems in SSA countries continue to be underdeveloped and availability of formal financial services and products by various household categories and businesses remains limited (Beck et al., 2015).

Sub-Saharan Africa's poverty level and income inequality remain among the most pronounced worldwide. While new statistics issued by the World Bank, reflects a reduction in SSA poverty level from 57 percent in 1990 to less than 43 percent in 2012. The poverty level remains top ranked worldwide and the sharp increase in the population has led to an increase in the number of people in extreme poverty (Beegle et al 2016). Furthermore, SSA records the second highest levels of income inequality, after Latin America and the Caribbean (Figure 2).



Source: Solt, Frederick. 2014. "The Standardized World Income Inequality Database." Working paper. SWIID Version 5.0, October 2014.

Figure 2: The Standardized World Income Inequality

Regardless of solid growth in recent years, inequality appears to have remained relatively stable, notwithstanding the fact that there are minor differences across countries (Bhorat et al 2015 and Beegle et al 2016). Countries such as Lesotho, Niger, and Sierra Leone experienced substantial decrease in income inequality. Nevertheless, in one third of countries for which data can be accessed, cumulative growth for individual countries over the period 1995–2011 were aligned with a rise in income inequality.

Proponents of financial inclusion argue that it serves a transformative role in enhancing human capital by reducing poverty and inequality. For instance, Dupas and Robinson (2019); Mlambo and Dlamini (2023; Banda and Lungu (2024) assert that financial inclusion increases household resilience by enabling individuals to manage risks, smooth consumption, and invest in health and education. Availability of credit and insurance services has the capacity to empower households to overcome financial shocks, such as health emergencies, and invest in education, leading to better outcomes in terms of skill acquisition and productivity.

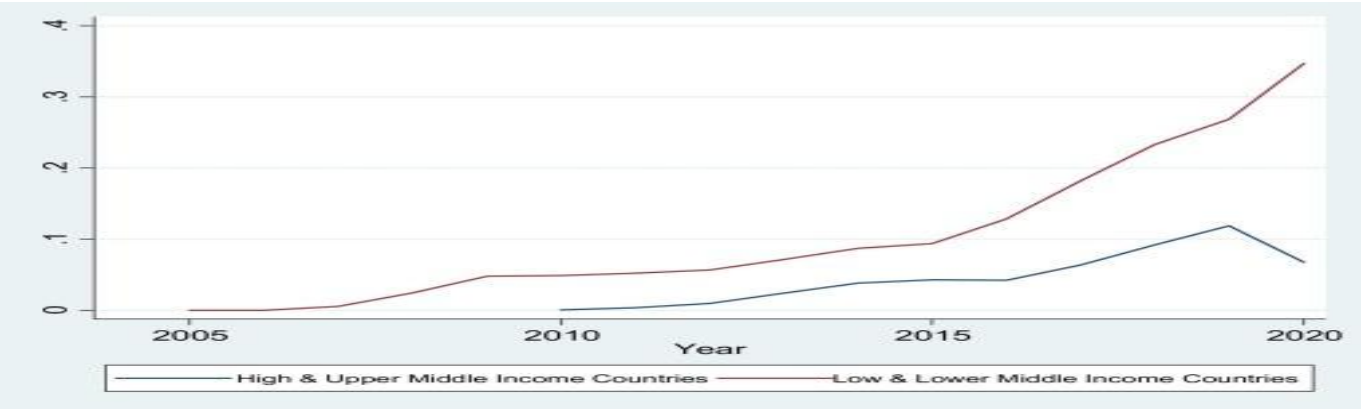


Figure 3: Digital financial inclusion trend

Source: Authors' Compilation based on Global Findex Database 2021.

Moreover, the availability of digital financial services has been linked to better financial literacy and economic empowerment which are fundamental elements of human development. The growth of mobile

money platforms in SSA contexts has increased financial access to the previously unbanked populations, especially in the rural zones as mentioned by Mazer and McKee (2020). This not only has improved the behavior of saving but also has allowed individuals to acquire micro loans to finance their education and health related costs. Additionally, as observed in figure 3 above, digital finance has become a key facilitator of financial inclusion, and it can help address the inequalities between the formal financial system and underserved groups.

Despite the positive impacts associated with financial inclusion, some scholars argue that its effect on human development is not automatic and may be limited by several factors. Among the key objections is that financial inclusion programs tend not to target the poorest groups of people or that they may actually make the poorer groups more vulnerable to financial risks. Moreover, the beneficial effects of financial inclusion could be disproportional, especially in areas with high gender gaps. Carlo M., & Arvind A. (2020) points out that microfinance, which is a major aspect of financial inclusion, in some cases, contributes to over-debtedness of low-income earners, weakening their financial health and resources to invest in human development. Kamau and Achieng (2023) also contend that the key challenges to effective human capital development are poor funding, poor infrastructure, and brain drain. Credit access with a lack of consumer protection in SSA, where the level of financial literacy is typically low, can lead to unwanted outcomes, including more debt and decreased expenditures on needed services.

The World Bank introduced the Human Development Index (HDI) in 2018 as part of its Human Capital Project, an initiative designed to raise awareness of the importance of human capital in economic development and productivity. The HDI was created to stimulate governments to invest in health and education, especially in order to close the disparities in human capital performance in various regions, and income ranges (World Bank, 2018). The index was initially published in the Annual Meetings of the World Bank in October 2018, after a long research to create a measure that can connect investments in the health sector and education to the economic growth opportunities. It has since become a world standard, enabling policymakers to assess the potential productivity of their future workforce on the basis of the current human capital conditions (Kraay, 2018).

Most of the population in SSA is still struggling with significant barriers to access financial products like savings, credit, and insurance despite significant efforts to increase financial access (Demirgüç-Kunt et al., 2018). Availability of financial services is hampered by technology barriers, geographic isolation, insufficient digital connectivity and socio-economic factors, particularly in remote and rural locations, where financial institutions tend to be few, and digital connection is limited. The entry barriers and high costs are also limiting to the underserved groups. The issue is thus in the fact that a large part of the population in SSA has been constantly financially marginalized, this crippling their capacity to accumulate human capital, hence stifling the economic growth of the region. In isolated areas, commercial banks and automated tellers are very hard to locate. The security threats, lack of internet, power supply, high costs of operation, workforce and the lack of a good road network are some of the major challenges posing a financial exclusion to the people in the rural regions. To effectively address these challenges, a deeper understanding of the nexus between financial inclusion and human development, in addition to the factors influencing this relationship, is crucial. This study seeks to address this gap by exploring specific mechanisms on how financial inclusion can be leveraged to enhance human development in SSA amidst the prevailing economic challenges.

To address this gap in scholarship, the present study poses the following critical questions.

i. To what extent does adult formal account ownership influences human development in SSA countries?
ii. To what degree does adult access to regulated institutional credit drives human development in SSA countries?
iii. By what degree does formal banking inclusion among enterprises impact human development in SSA countries?
iv. To what degree does enterprise access to outstanding regulated credit affects human development in SSA countries?
v. By what magnitude does POS terminal density affect human development in SSA countries?
vi. To what extent does ATM density influences human development in SSA countries?
vii. How significantly does income inequality drive human development in SSA countries?

The article proceeds in the following way: Section 2 is a synthesis of the empirical review and theoretical underpinnings. Section 3 gives the model specification, data and empirical estimation procedure. Section 4 presents the core findings and provides a critical discussion. The final part states specific policy interventions based on the empirical findings and points out the overall implications of the research to policy formulation.

2. Literature Review

To do the literature review, we split it into two strands; the first strand is the extant empirical review of the relationship among financial inclusion, inequality and human development while the second strand is the theoretical reviews underpinning the study.

Review of related literature

The section is a review of previous empirical research on the interrelationship between financial inclusion, inequality, and human development with a special focus on Sub-Saharan Africa and similar developing-country contexts. Despite the growing literature acknowledging the importance of financial inclusion as a strategic tool in enhancing welfare outcomes, the overall evidence base on the role of inclusive finance in changing distributional outcomes and human development indicators is still fragmented in terms of its magnitude, direction, and pathways of action. Specifically, the existing body of literature indicates that the developmental worth of financial inclusion is not only an issue of the growth of formal financial services, but also the quality of access, an institutional environment, the penetration of digital access, and the socio-economic framework of the respective nations.

Ofosu-Mensah Ababio, Boachie Yiadom, Ofori-Sasu and Sarpong-Kumankoma (2024) provide a broader comparative view on the topic of digital financial inclusion and inclusive development in lower-middle-income countries, including the mediating factor of institutional quality. The paper applied a dynamic generalized method of moments model to a panel of 2004-2022 and discovered that the institutional quality enhances the role of digital financial inclusion towards inclusive development. Despite the fact that the study is not confined to Sub-Saharan Africa, its implications have a direct application to the region due to the fact that most of the SSA economies are in the lower-middle-income category and have the same institutional bottlenecks. The research supports the idea that financial inclusion cannot be considered outside the context of governance, regulatory credibility and enabling

policy environment.

Faton, Nonvide and Chabosson (2025) examined digital financial inclusion and reduction of inequality in African countries and established digital financial inclusion has negative and significant impact on income inequality. Their results indicate that digital payment systems like mobile money, digital wallets, and technology-based payment systems can decrease exclusion by reducing transaction costs and increasing financial accessibility to the hitherto underserved populations. The discovery particularly applies to Sub-Saharan Africa where the traditional brick-and-mortar banking networks are still shallow in most rural and low-income regions.

Said and Acheampong (2025) used the broader welfare argument to analyze the financial inclusion and energy poverty alleviation in 23 Sub-Saharan African countries between 2004 and 2019. The study, employing the dynamic ordinary least squares, fully modified ordinary least squares and the canonical correlation regression methods, revealed that financial inclusion has a significant negative impact on energy poverty in the sampled countries. Though, the dependent variable is not human development in the traditional HDI meaning, the results will still be extremely relevant as a better electricity access and access to cleaner sources of energy is intricately linked to human wellbeing, health status, academic achievements, and quality of life.

Recent empirical debates also demonstrate that financial inclusion can help to develop human beings indirectly because of the correlation to education, health and income equality. An example by Saka, Gan and Hu (2025) indicates that the indirect benefits of financial inclusion include human development in the form of education, health, and income equality, although the direct effect is not always predominant. The given view comes in handy since it implies that inequality can be a mediating or moderating channel and not merely an outcome variable. In societies of great inequality, the social developmental returns to finance can be watered down when the poor cannot use financial opportunities to translate financial access into sustainable welfare benefits due to a lack of human capital, digital skills, or social insurance.

Theoretical underpinnings

The present study is rooted in the Capability Approach, as well as the Finance-Led Inclusive Growth perspective. The Capability Approach, which was mostly identified with Amartya Sen in 1990 and it offers a solid theoretical basis since it does not emphasize income as the sole measure of evaluation, rather the actual freedoms people have to live lives of their own choice. In this context, financial inclusion is important as the availability of savings, payments, insurance, and credit increases the feasibility of households. It facilitates consumption smoothing in the event of a shock, education spending, spending on health, women agency, and productive self-employment. The point of inequality, in this view, is not the unequal distribution of income, but also an unequal distribution of capability. Thus, it is clear that financial exclusion strengthens deprivation by restricting the capacity of people to transform resources into highly valued functioning and that successful inclusion can enhance human development by broadening the range of opportunity to the underprivileged groups.

This study is complemented by the Finance-Led Inclusive Growth view that was developed by the World Bank and the United Nation Development Programme to understand how the macroeconomic transmission channels can influence welfare outcomes in accordance to the broader financial access. The thesis statement is that financial systems help improve development by drawing together savings, distributing capital efficiently, lowering transaction costs and expanding access to productive resources to non-elite groups. Finance in very unequal contexts, though, might in the short term serve the interests of already privileged households unless policy and institutional design actively extends its reach. This view can thus be used to understand how financial inclusion can either reduce or recreate inequality in cases where the populations that are excluded are actually integrated into usable financial systems. The

theory suggests that inclusive growth in SSA, where informal jobs are the norm and physical banking services are typically superficial, must both deepen the economy and extend its reach.

3. Data and Methodology

Model Specification

The study utilized an ex-post facto research design. This research design is suitable because the study is analyzing events that have since taken place and will be based on easily accessible secondary data. It is a design where inferences are made without the variables being studied being influenced by deductions made based on facts known about them and the researcher. This paper investigates the financial inclusion, inequality and human development effects in SSA nations. In particular, the World Development Indicators (WDI), United Nations Development Program (UNDP) and IMF Database were the main sources of the secondary data used in this paper, which included the years 1990-2024. The research has utilized and adapted the research of Thaddeus, Ngong, and Manasseh (2020) based on this theoretical backdrop and an extension of the empirical approach, which the literature on financial inclusion and human development employs. The functional relationship in such a manner can be characterized as follows:

$$\mathrm{HDI}_{it} = f(FBA_{it}, AWC_{it}, FBE_{it}, EWC_{it}\ \ POS_{it}, ATM_{it}, INEQ_{it},) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where i = 1, 2, ……. 15 denotes selected Sub-Saharan African countries and t = 1990, …… 2023.

Panel Autoregressive Distributed Lag (PARDL) model forms the main estimation technique for this study. The choice of this technique is justified in view of the fact that it can handle mixed stationarity, short- and long-run association, accommodate heterogeneity, and maintain robustness against endogeneity (Menegaki, 2019; Kripfganz & Schneider, 2023).

Therefore, the aggregated model for this study is as presented below in equation (ii):

$$\begin{aligned} HDI_{it} = {} & \delta_o + \sum_{t=1}^{k} \delta_1 HDI_{it-1} + \sum_{t=1}^{k} \delta_2 FBA_{it-1} + \sum_{t=1}^{k} \delta_3 AWC_{it-1} + \sum_{t=1}^{k} \delta_4 \mathrm{FBE} \\ & + \sum_{t=1}^{k} \delta_5 EWC_{it-1} \\ & + \sum_{t=1}^{k} \delta_6 POS_{it-1} + \sum_{t=1}^{k} \delta_7 ATM_{it-1} + \sum_{t=1}^{k} \delta_8 INEQ_{it-1} + \varphi_1 HDI_{it-1} \\ & + \varphi_2 FBA_{it-1} + \varphi_3 AWC_{it-1} + \varphi_4 FBE_{it-1} + \varphi_5 EWC_{it-1} \\ & + \varphi_6 POS_{it-1} + \varphi_7 ATM_{it-1} + \varphi_8 INEQ_{it-1} + \mu_{it} \quad (2) \end{aligned}$$

δ_o = the intercept

$\delta_1 - \delta_8$ = coefficients of short-run parameters

$\varphi_1 - \varphi_8$ = coefficients of the long-run parameters

μ_{it} = the residual or error term.

Table 1: Operational description of the variables

Variable name	Symbol	Measure	Data sources
Human Development	HDI	Human development index	UNDP database
Formally Banked Adults	FBA	Percentage of adults with an account at	WDI database

		bank or other formal financial institutions	
Adults with Credit	AWC	Percentage of adults with an outstanding loans from a regulated financial institutions	WDI database
Formally Banked Enterprises	FBE	Percentage of firms with a bank account	WDI database
Enterprises with outstanding loans	EWC	Percentage of firms with an outstanding loan	WDI database
Point of sale density	POS	Number of point-of-sale terminals per 100,000	WDI database
ATM density	ATM	Number of automated teller machines per 100,000	WDI database
Income inequality	INEQ	Gini coefficient	WDI database

Source: Authors' compilation from Available literature, 2026

3. Empirical analysis

Descriptive statistics

Table 2 indicates the pooled descriptive statistics of the variables under consideration during the 1990-2023 period. Distributional properties are determined in terms of mean, standard deviation, skewness, kurtosis and relative standard deviation (RSD). The descriptive statistics give the first empirical information on the degree of human development, the level of financial inclusion, the level of inequality and the level of structural heterogeneity among the Sub-Saharan African economies. The findings show that the average human development index (HDI) is 0.477, and the median is 0.467, implying that the outcomes of human development in SSA are not high during the course of the study. The average standard deviation of 0.115 and the RSD of 24.1 percent means that the differences in human development in the region are not too large. The positive skewness shows that the increase of the regional average is due to the few countries which have relatively better development results, and the value of the kurtosis is 3.052, which indicates a normal distribution. Also, Adult formal account ownership (FBA) mean of 5.397, RSD of 64.2 percent indicate low yet highly dispersed access to formal financial accounts. Its positive skew and kurtosis of more than three show that the formal account ownership is concentrated to a few more performing economies due to unequal financial inclusion in SSA. Likewise, adult access to regulated institutional credit (AWC) has a mean value of 25.538 and a large RSD of 71.5 percent, which means that there is massive cross-country differing access to credit. The positive skewness indicates that the distribution is drawn upwards by countries that have greater access to credit, but the low kurtosis implies that the distribution has fewer extreme values.

More importantly, Formal banking inclusion among enterprises (FBE) documents the greatest mean of 87.828 and the smallest RSD of 12.4 percent, which means that the inclusion of banking on the enterprise-level is more or less good and steady in SSA. Nevertheless, the access by the enterprise to excellent regulated credit (EWC) with mean of 28.869 and RSD of 53.0 percent is an indication that the access to formal banking does not necessarily translate into effective access to credit by the firms. This is indicative of chronic credit constraints and collateral and financial market imperfections. The indicators of financial infrastructure are the most unstable. The mean and RSD of POS density is 244.663 and 118.8 percent, whereas ATM density has RSD of 155.8 percent. Their positive skewness is high, showing that the financial infrastructure is concentrated in a small number of countries and the high kurtosis of ATM proves the extreme outlier behaviour. The wage disparity (INES) with a mean

of 44.282 and RSD of 18.5 percent indicates that there is a high level of inequality throughout the SSA but with a fairly high dispersion.

Table 2: Summary of Panel descriptive statistics

Variable Name	Mean	Median	Std. Dev	Skewness	Kurtosis	RSD (%)
HDI	0.477	0.467	0.115	0.408	3.052	0.241
FBA	5.397	5.555	3.465	1.063	3.857	0.642
AWC	25.538	20.445	18.259	0.378	1.760	0.715
FBE	87.828	93.500	10.853	-0.645	1.689	0.124
EWC	28.869	26	15.311	0.905	2.855	0.530
POS	244.663	113.648	290.690	1.339	3.117	1.188
ATM	10.831	4.409	16.878	2.167	6.146	1.558
INEQ	44.282	42.7	8.202	0.722	2.960	0.185

Source: Authors'

Correlational Matrix

The pair-wise correlation matrix between the variables of the study is documented in Table 3. The findings indicate that there are uneven linear relationships among financial inclusion, inequality and human development in SSA. HDI reveals weak positive associations with FBA (0.030), AWC (0.050), FBE (0.021), POS (0.033) and ATM (0.033), while its interrelationship with EWC is virtually zero. This indicates that descriptively, financial inclusion indicators are positively but insignificantly related with human development. FBA has a positive correlation with AWC (0.552), POS (0.489) and ATM (0.388), and so it can be inferred that there is a complementary relationship between formal account ownership, credit access and financial infrastructure. Likewise, AWC has a positive correlation with POS (0.417) and ATM (0.454). Nevertheless, the relationship between EWC and FBA (-0.256), AWC (-0.470), POS (-0.406) and ATM (-0.297) is negative, which implies that access to enterprise credit might not shift in line with more general financial inclusion metrics.

The income inequality (INEQ) is positively related to the HDI (0.226), though it is negatively associated with the majority of the financial inclusion variables, such as FBA, AWC, POS and ATM. What this means is that inequalities can accompany human development benefits, whereas wider financial inclusion can only be associated with inequality reduction benefits marginally. Notably, the magnitude of all pairwise correlation coefficients is less than the traditional multicollinearity levels, which means that the explanatory variables do not have a significant linear dependence. Therefore, the correlation pattern promotes the combined inclusion of the variables in the future panel estimations.

Table 3: Correlation Matrix

	HDI	FBA	AWC	FBE	EWC	POS	ATM	INEQ
HDI	1							
FBA	0.03	1						
AWC	0.050	0.552	1					
FBE	0.021	-0.030	-0.237	1				
EWC	0.000	-0.256	-0.470	0.126	1			
POS	0.033	0.489	0.417	-0.195	-0.406	1		
ATM	0.033	0.388	0.454	0.143	-0.297	0.509	1	

INEQ	0.226	-0.046	-0.034	-0.010	0.009	-0.059	-0.066	1

Source: Authors'

Pre - Estimation Test

To consider the possibility of shared shocks and regional spillovers in Sub-Saharan Africa (SSA), cross-sectional dependence is measured by Breusch-Pagan Lagrange multiplier (LM) test and Pesaran cross-sectional dependence (CD) test. The consideration of these problems guarantees that the second-generation panel estimators are selected correctly and gives the empirical results greater strength. The outcome of the cross-sectional dependence is given in Table 4 below which gives a reasoning justifying unit root tests being conducted to establish the property of a stationary of the variables and the process of establishing the best lag structure. It also addresses the existence of a long-run relationship of equilibrium between the variables based on the ARDL bounds cointegration testing method.

Table 4 shows the panel results of cross-sectional dependence of the SSA countries. The findings indicate conflicting evidence on the variables. In the case of HDI and INEQ, the Pesaran CD values are significant at the 1 percent level, which means that human development and inequality are influenced by similar regional shocks, policy spillovers, macroeconomic interdependence and shared structural conditions among the SSA countries. In the case of the financial inclusion variables, FBA, FBE, EWC and POS, the P-CD and BP-LM statistics are insignificant implying that there is no strong evidence of cross-sectional dependence. This means that the differences in formal account ownership, inclusion of enterprise banking, enterprise credit and POS infrastructure are highly country-specific. Nonetheless, the BP-LM outcomes of AWC and ATM are remarkable, with insignificant P-CD outcomes, implying weak or test-sensitive dependence, but not strong cross-sectional dependence. Altogether, the results show that the majority of financial inclusion indicators do not have a high degree of cross-sectional dependence, whereas human development and inequality are more interrelated regionally. This justifies the use of panel estimation methods taking into consideration country heterogeneity and the possibility of common shocks, particularly in the estimation of the impact of financial inclusion and inequality on human development in the SSA.

Table 4: CD status of the panel of SSA countries

Variables	**P-CD test**		**BP LM test**		**Inference**
	Statistic	**p-value**	**Statistic**	**p-value**	Cross-Section Dependence
HDI	136.7	0.000	22369.4	0.000	No Cross-Section Dependence
FBA	0.54	0.589	1027.78	0.197	No Cross-Section Dependence
AWC	-0.045	0.964	1068.24	0.041	No Cross-Section Dependence
FBE	1.614	0.1066	1017.07	0.268	No Cross-Section Dependence
EWC	0.789	0.4300	993.67	0.461	No Cross-Section Dependence
POS	0.10	0.920	1028.97	0.189	No Cross-Section Dependence
ATM	0.852	0.394	1065.755	0.046	No Cross-Section Dependence
INEQ	13.461	0.000	9158.287	0.000	Cross-Section Dependence

Source: Authors.

Unit root Test

Table 5 presents the summary of panel unit root test results under the assumption of no cross-sectional dependence.

Table 5: Summary of Panel Unit Root Test (No Cross-Section Dependence)

	LLC	**IMP**	**ADF**	**PP**	**PVALUE**	**Inference**
FBA	-16.8373	-21.1602	589.285	1020.07	0.0000	I(0)
AWC	-15.6355	-19.9628	551.364	953.101	0.0000	I(0)

FBE	-15.6112	-18.8997	518.927	962.748	0.0000	I(0)
EWC	-16.3705	-19.3529	531.93	939.057	0.0000	I(0)
POS	-18.3403	-20.2733	560.793	1017.31	0.0000	I(0)
ATM	-18.2311	-20.6758	572.919	1023.64	0.0000	I(0)

Source: Authors.

Panel unit root tests for cross-sectional independent variables were employed, namely Levin-Lin-Chu (LLC), Breitung, IMP, ADF and PP to examine whether the dependent and independent variables have unit roots at level or they are stationary 1st difference. From the findings, it was found that the variables are stationary at levels order of integration. It is found that the human development index (HDI) and inequality (INEQ) are cross-sectional independent, hence it is inconsistent with the asymptotic distribution of the reported unit root test.

Table 6: Summary of Panel Unit Root Test (Cross-Section Dependence)

	HADRI Z-STAT	**HETEROSCEDASTIC CONSISTENT Z-STAT**	**PVALUE**	**INFERENCE**
HDI	17.7602	17.1386	0.0000	I(0)
INEQ	15.8989	12.5319	0.0000	I(0)

Source: Authors.

The study performed panel unit root tests for cross-sectionally correlated variables using Hadri Z-Stat and Heteroscedasticity Consistent Z-Stat to check whether or not the dependent variable and independent variable has unit roots at level or is stationary 1st difference. The finding was that all the variables are stationary at levels order of integration. As presented in the tables 5 and 6 respectively, the study applied eight panel unit root tests for cross-sectional independence and dependence and discovered the variables to be stationary at levels. Thus, the Panel-ARDL can be used in the estimations.

Model Estimation

The PARDL model's short-run, long-run and error correction coefficients are shown in table 7 below:

Table 7: Panel ARDL PMG Estimates

Variable	**Coefficient**	**T-Statistic**
Short Run		
ΔFBA_t	0.023	20.21**
ΔAWC_t	-0.035	2.965**
ΔFBE_t	0.07	3.210*
ΔEWC_t	0.014	11.32*
ΔPOS_t	0.0001	3.256*
ΔATM_t	-0.021	1.432*
$\Delta INEQ_t$	-0.032	7.324*
ECT (-1)	-0.022	2.76*
Long Run		
FBA_t	0.083	16.222***

AWC_t	-0.002	-2.848***
FBE_t	0.004	12.617***
EWC_t	0.003	11.109***
POS_t	-0.000	-2.408***
ATM_t	-0.010	-12.101***
$INEQ_t$	-0.003	-5.909***

Source: Authors'

***, **, * represent statistical significance @ 1%, 5% & 10% respectively

The Panel ARDL (PMG) estimates in Table 7 shed light on both the short-run (immediate) and long-run (persistent) effects of financial inclusion, inequality and human development in Sub-Saharan Africa. The findings show statistically significant relationships across most variables, indicating both short- and long-term effects. The long-run estimates show that financial inclusion has differential but largely significant impacts on human development. Adult access to a formal bank account (FBA) has a positive and significant effect on HDI (0.083), suggesting that better access to financial services positively impacts long-run human development. Likewise, firm banking inclusion (FBE = 0.004) and firm access to credit (EWC = 0.003) have positive and significant impacts, implying that financial access by firms boosts investment, employment and welfare. By contrast, the effect of adult access to credit (AWC = -0.002) is negative and significant, suggesting that adult credit growth in the absence of sufficient institutional quality and productive credit use may be counterproductive. The results on financial infrastructure are mixed: POS density has a negative but weak effect, while ATM density (-0.010) has a significant negative impact, implying that financial infrastructure may not necessarily improve human development, especially in the absence of adequate financial literacy and efficiency. INEQ (-0.003) has a negative and significant long-run effect on HDI, suggesting that inequality restricts inclusive development and welfare improvements from financial inclusion. These results are consistent with the inclusive development and institutional perspectives which suggest that financial access needs to be complemented by distribution and efficient institutions to bring about sustainable development.

The short-run dynamics demonstrate that the changes in financial inclusion variables also affect human development, albeit to different extents. The coefficient of ΔFBA (0.023) is positive and significant, suggesting that rising account ownership positively affects development in the short run. Likewise, ΔFBE (0.070), ΔEWC (0.014) and ΔPOS (0.0001) are positive and significant, implying that improving enterprise inclusion, credit access and digital financial infrastructure in the short run promote human development. However, the coefficient of ΔAWC (-0.035) is negative and significant, supporting the long-run findings that credit access may have detrimental short-run effects if it is not properly allocated. ΔATM (-0.021) is also negative, and ΔINEQ (-0.032) is negative and significant, showing that rising inequality has a negative impact on human development in the short run. Overall, the magnitudes of the short-run coefficients are smaller than those of the long run, showing smooth adjustment to the long-run relationship.

The error correction term (ECT(-1) = -0.022) is negative and significant, implying that the variables are cointegrated in the long run. The negative and significant ECT implies that there exists a stable long-run relationship between financial inclusion, inequality and human development in SSA. The size of the coefficient suggests that, on average, 2.24 percent of the short-run disequilibrium is corrected each period. While the rate of adjustment is slow, it suggests that long-run equilibrium is restored over time. This evidence suggests that shocks to financial inclusion and inequality have long-run but eventually temporary effects on human development, as the system returns to equilibrium. The

statistical significance of the ECT also confirms the validity of the estimated model, and provides justification for the choice of panel estimation technique.

5. Summary and Conclusions

The paper focuses on the dynamic relationship of financial inclusion, income inequality and human development in Sub-Saharan Africa during the years 1990 to 2023. The paper finds short run and long-run relationships between adult formal account ownership, adult access to regulated credit, enterprise banking inclusion, enterprise access to credit, POS density, ATM density, income inequality and human development using the Panel ARDL PMG model.

The empirical evidence indicates that financial inclusion has varying impacts on human development in SSA. The positive and statistically significant effects of the adult formal account ownership, enterprise banking inclusion, and enterprise access to regulated credit on human development are positive in the long run. This implies that the avenue to formal financial services, when coupled with productive enterprise action and wider involvement in the financial system, can lead to better welfare, income prospects and socio-economic progress. Adult access to regulated credit, POS density and ATM density are however negatively affected in the long-run, suggesting that financial accessibility and the development of infrastructure does not necessarily lead to higher human development outcomes when credit is ill-allocated, transaction costs are high, digital access is uneven or financial services are not effectively linked to productive and welfare-enhancing activities.

The short-run findings also support the fact that human development is strongly affected by variations in financial inclusion indicators even though the direction of the effect varies across indicators. Formal ownership of account, enterprise inclusion in banking, enterprise credit access and POS density enhance human development in the short run and adult credit access, ATM density and income inequality lower human development. The negative and statistically significant error correction value ensures that there is a stable long-run equilibrium relationship between the variables. The rate at which adjustment takes place is however relatively low implying that changes in the equilibrium of long-run human development are countered slowly in SSA economies.

The research also concludes that income inequality has both adverse and statistically significant impacts on human development, both in the short-run and the long-run. This means that continued inequality undermines the ability of financial inclusion to achieve inclusive development results. In cases of unequal income distribution, the financial access benefits can be concentrated among the relatively advantaged groups, thus restricting the change in health, education and living standards among the poor households.

On the whole, it has been established that financial inclusion continues to play a significant role in human development in SSA, and its success is determined by the quality, structure and inclusiveness of financial access. The results indicate that the policy should shift to developing financial services that are more useful in terms of development. Financial regulators and governments in SSA are encouraged to reinforce policies that encourage the low-cost ownership of accounts, useful credit provision, enterprise funding, consumer protection and financial literacy. Moreover, policies aimed at reducing inequality like inclusive education, employment, social protection and support of small enterprises should be adopted to make sure that financial inclusion is converted into widespread human development. Thus, sustainable human development in SSA needs a synergistic approach, which involves the financial inclusion deepening with an equity-based reform and enhanced institutional backing.

REFERENCES

Abimbola, A., Olokoyo, F.O., Babaloa, O. & Farouk, E. (2018). Financial inclusion as a catalyst for poverty reduction in Nigeria. *International Journal of Scientific Research and Management, 06(06)* 481 - 490. https://doi.org/10.18535/ijsrm/v6i6.em06

Aribaba, F.O., Adedokun, J.O., Oladele, R., Babaturde, A.D., Ahamodu, A.O. & Olassehinde, S. A. (2020). Financial Inclusion Scheme and Poverty Alleviation in Nigeria .*ACTA Universitatis Danubius, 16* (4), 220-233.

Aterido, R., Beck, T., & Iacovone, L. (2019). Access to finance in Sub-Saharan Africa: Opportunities and challenges for human capital development. *World Development*, 123, 104611. https://doi.org/10.1080/15228916.2018.1484209

Atta-Aidoo, J., Matthew, E. C., Saleh, A. O., & Bizoza, S. (2022). *Financial inclusion and household economic development in Burundi: What are the gender dynamics?* African Economic Research Consortium (AERC) Discussion Page.

Beck, T., Demirgüç-Kunt, A., & Honohan, P. (2019). Access to financial services: Measurement, impact, and policies. *Journal of Financial Stability*, 42, 56-71.

Beck, T., Demirgüç-Kunt, A., & Levine, R. (2015). Financial institutions and markets across countries and over time. *Journal of Financial Economics*, 114(1), 1–21.

Beegle, Kathleen, Christiansen L., Dabalen, A., & Gaddis I. (2016). "Poverty in a Rising Africa: Overview." World Bank, Washington.

Bhorat, H., Naidoo, K., & Pillay, K. (2015). "Growth, Poverty and Inequality Interactions in Africa. An Overview of Key Issues," Mimeo, Inc. https://doi.org/10.22004/ag.econ.267778

Carlo M., & Arvind A. (2020). Microfinance and financial inclusion: Challenges and opportunities. Strategic Change 29(3):257-266. https://doi.org:10.1002/jsc.2339

Chibba, M. (2019). Financial inclusion, poverty reduction and the millennium development goals. *The European Journal of Development Research*, 21(2), 213–230. https://doi.org/10.1057/ejdr.2008.17

Chigudu, T., & Mlambo, J. (2022). Financial Inclusion and Human Capital Development in Zimbabwe. *Journal of African Development*, 33(2), 154-180.

Demirgüç-Kunt, A., & Klapper, L. (2022). *Financial inclusion in Africa*: An overview. The World Bank.

Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2020). The Global Findex Database 2017: Measuring financial inclusion and opportunities to expand access to and use of financial services. The World Bank Economic Review, 34(Supplement_1), S2-S8. https://doi.org/10.1093/wber/lhz013

Dupas, P, & Jonathan R. (2019). "Savings Constraints and Microenterprise Development: Evidence from a Field Experiment in Kenya." American Economic Journal: Applied Economics 5(1): 163–92. https://doi.org/10.1257/app.5.1.163

Ezenwakwelu, G.C. (2018). Effects of financial inclusion on selected macroeconomic variables in Nigeria. *Global Journal of A lied, Management and Social Sciences,* 15. 259-271. https://www.goiamss.net.

Faton, C. Y., Nonvide, G. M. A., & Chabossou, A. F. (2025). Digital financial inclusion and the reduction of gender inequalities in Africa. *Discover Global Society*, *3*(1), 25. https://doi.org/10.1007/s44282-025-00146-z

Fatou, D., & Diallo, S. (2024). Financial inclusion and healthcare access in Senegal: A panel data approach. *Senegalese Economic Review*, 29(1), 65-82.

Harley, T. W., Adegoke, A. J. & Adegbola, D. (2017). Role of Financial Inclusion in Economic Growth and Poverty Reduction Role of Financial Inclusion in Economic Growth and Poverty Reduction. *Internal Journal of Research in Economics and Social Sciences (IJRESS),* 265-271. ISSN(o): 2249-7382, http://euroasiapub.org

Ibrahim, A., & Olasunkanmi, O. I. (2019). Financial inclusion and economic growth nexus in Sub-Saharan Africa. *Journal of African Economics*, 28(4), 1–22.

Kamau, J., & Achieng, L. (2023). Challenges of Human Capital Development in SSA: A Focus on Healthcare and Education. *African Journal of Human Capital Studies*, 19(1), 50-65.

Koomson, I., Villano, R.A. & Hadley, D. (2020). Effect of Financial Inclusion on Poverty and Vulnerability to Poverty: Evidence Using a Multidimensional Measure of Financial Inclusion. *Social Indicators Research* 149, 613–639. https://doi.org/10.1007/s11205-019-02263-0

Kraay, A. (2018). *Methodology of the Human Capital Index*. World Bank.

Kuri, P.K. (2010). Inclusive and Exclusive Development in India in the Post-reforms Era.

Laha, A. (2015). Association between financial inclusion arid human development in South Asia: A cross-country analysis with special reference to India. *Journal of Economic Policy and Research,* 10(2), 69-91.

Lungu, M., & Banda, D. (2024). Digital Financial Services and Human Capital Development in Zambia. *Zambian Journal of Economic Policy*, 42(1), 78-95.

Manja, L. P., & Badjie, I. A. (2022). The economic development effects of formal and informal financial access in the Gambia: *A Comparative assessment*. SAGE Open, 12(1), 1-21. https://doi.org/10.1177/21582440221081111

Mazer, R., & McKee, K. (2020). The role of digital finance in advancing financial inclusion and human capital in Sub-Saharan Africa. *World Development*, 127, 104758.

Mensah, K., & Boateng, J. (2024). Digital financial inclusion and healthcare access in Ghana: A structural equation modeling approach. *Ghanaian Economic Journal*, 19(2), 101-125.

Mlambo, D., & Dlamini, S. (2023). Exploring the nexus between financial inclusion and skill development in Mozambique: A study from 2014 to 2023. *Mozambican Journal of Economic Development*, 10(1), 65-82.

Mlambo, D., & Ncube, M. (2024). The impact of financial inclusion on educational outcomes in Zimbabwe: Evidence from panel data analysis. *Zimbabwean Journal of Economic Policy*, 40(3), 88-105.

Mohammed, J. I., Mensah, L., & Gyeke Dako, A. (2017). Financial inclusion and poverty reduction in Sub-Saharan Africa. *African Finance Journal*, 19(1), 1–22. https://hdl.handle.net/10520/EJC-74aea6652

Mukasa, D., & Kagabo, W. (2024). The impact of financial inclusion on educational outcomes in Uganda: Evidence from a longitudinal study (2019-2023). *Ugandan Journal of Development Studies*, 17(1), 45-62.

Nwafor, M C & Yomi A. I, (2018) the nexus between financial inclusion and economic growth. Evidence from Nigeria. *International Journal of Research and Innovation in Social Science* (IJRISS) |Volume II, Issue IV, April 2018|ISSN 2454-6186. www.rsisintemational.org. 143 – 164.

Ofosu-Mensah Ababio, J., Boachie Yiadom, E., Ofori-Sasu, D., & Sarpong–Kumankoma, E. (2024). Digital financial inclusion and inclusive development in lower-middle-income countries: the enabling role of institutional quality. *Journal of Chinese Economic and Foreign Trade Studies*, *17*(2-3), 133-151. https://doi.org/10.1108/JCEFTS-02-2024-0017

Okonkwo, J. J., & Nwanna, I. (2021). Financial Inclusion and Economic Growth in Nigeria: An Empirical Study; *International Journal of Research and Innovation in Social Science* (IJRISS) | 5(1): 323-330.

Okoth, J., & Ochieng, R. (2024). Financial inclusion and youth employment in East Africa: A mixed-methods approach. *East African Journal of Development*, 31(2), 76-94.

Ozili, P. K. (2018). Impact of digital finance on financial inclusion and stability. Borsa Istanbul Review, 18(4), 329-340. https://doi.org/10.1016/j.bir.2017.12.003

Park, C. Y., & Mercado Jr, R. (2018). Financial inclusion, poverty, and income inequality. *The Singapore Economic Review,* 63(01), 185-206. https://doi.org/10.1142/S0217590818410059

Said, R., & Acheampong, A. O. (2025). Financial inclusion and energy poverty reduction in sub-Saharan Africa. *Utilities Policy*, *82*, 101567. https://doi.org/10.1016/j.jup.2023.101567

Saka, A. N. A., Gan, C., & Hu, B. (2025). Financial inclusion, poverty, and income inequality. *Cogent Economics & Finance*, *13*(1), 2587236. https://doi.org/10.1080/23322039.2025.2587236

Sarma, M., & Pais, J. (2011). Financial inclusion and development. Journal of international development, 23(5), 613-628. https://doi.org/10.1002/jid.1698

Schultz, T. W. (1961). Investment in human capital. *The American Economic Review, 51*(1), 1-17.

Thaddeus, K., Ngong, C. & Manasseh, C. (2020). "Digital financial inclusion and economic growth: evidence from Sub-Saharan Africa (2011-2017)", *International Journal of Business and Management,* 8(4) 212-217.

Thathsarani, U, Wei, J. & Samaraweera, G. (2021). Financial Inclusion's Role in Economic Growth and Human Capital in South Asia: *An Econometric A roach. Sustainability* 13(8), 4303, 1-18 https://doi.org/10.3390/su13084303

Toure, B., & Diop, M. (2024). Financial inclusion and healthcare access in Senegal. *Journal of African Health Economics*, 12(1), 34-50.

Vo, T, Van, D & Vo T.G (2019). Mobile Financial Services, Financial Inclusion, and Development: A Systematic Review of Academic Literature. *The Electronic Journal of Information Systems in Developing Countries* 84(5): el 2044. 1-28 https://doi.org/10.1002/isd2.12044

World Bank. (2018). *World Development Report 2018: Learning to Realize Education's Promise*. World Bank Group.

Yorulmaz, R. (2012). Financial Inclusion and Economic Development: A Case Study of Turkey and a Cross-Country Analysis of European Union. Clemson, SC: Clemson University, 6-53.