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FINANCIAL INCLUSION AND POVERTY REDUCTION IN SOME SELECTED SUB-SAHARAN AFRICA

Abstract

Poverty reduction is a significant issue in Africa. The recent Covid-19 outbreak has resulted in making 150 million more people live in despicable conditions worldwide. Given the current spike in poverty, developing policy tools to combat it is critical. Financial inclusion is one such policy implementation mechanism. Financial inclusion is essential in decreasing extreme poverty and generating shared prosperity. Therefore, this study examines the relationship between financial inclusion and poverty in Africa, addressing the void in previous studies by evaluating cross-sectional dependence in the selected African countries. The paper employed random effects, fixed effects and the Driscoll and Kraay standard errors. The findings from the study show that financial inclusion reduces poverty in Africa. The study recommended that governments work with the central banks in Africa to develop the legislation required for commercial banks and other financial institutions to enter the market and offer consumers access to affordable financial products.

Keywords: Poverty, financial inclusion, Sub-Saharan Africa

1 BACKGROUND OF THE STUDY

Poverty reduction is a significant issue for many countries. According to the (World Bank 2021), the recent Covid-19 outbreak has resulted in an additional 150 million people living in extreme poverty. Given the current spike in poverty, developing policy tools to combat it is critical.

Financial inclusion is one such policy implementation mechanism. Financial inclusion has been featured on the agenda of the global reform program and has attracted substantial interest due to its ability to break the cycle of poverty and eliminate economic inequality (Omar & Inaba, 2020). With its tagline "financial inclusion for everyone by 2020," the World Bank has also urged states to improve the availability, accessibility, and utilization of formal financial services by the population, particularly the poorest. Since then, academics and policymakers in both developed and developing countries have focused more on financial inclusion. Given that financial systems worldwide are far from inclusive, there is increased focus on financial inclusion as a potential tool to accelerate inclusive development. As a result, the current financial development is aimed at achieving financial inclusion. Financial inclusion is well-defined as "access to working and inexpensive financial goods and services that meet people's transaction needs, expenses, investments, credit, and insurance delivered in a responsible and workable manner'' Yin et al. (2019).

Financial exclusion is one of the primary causes of persistent poverty and financial adversity in emerging nations, according to Choudhury and Bagchi (2016). Bringing global poverty to an end lies in financial inclusion (Bateman et al., 2019). Financial inclusion, which allows individuals to profit from financial services and so helps the beneficiaries' financial and communal growth, is a critical component of eradicating social exclusion (Mubiru, 2012). Furthermore, financial inclusion is crucial for increasing people's quality of life and, as a result, lessening poverty (Baidoo and Akoto (2019); Baidoo et al. (2020); Koomson et al. (2020)). An all-encompassing economy is critical for the most vulnerable individuals globally working in the non-formal segment since it enables everyday payments United Nations (UN), (2013). Furthermore, it makes it easier for the poor populace to obtain loans to engage in any business that might generate

revenue for them. The poor are also able to borrow and save money when they have access to financial services, thereby allowing them to start businesses, finance schooling, and purchase assets to better their standard of living (Baidoo et al., 2019; Sakyi et al., 2021). This shows that it is critical to investigate how financial inclusion influences poverty reduction in evolving economies, particularly in Sub-Saharan Africa, where the most vulnerable populace is eminent. As a result, financial inclusion has become more prominent in Sub-Saharan Africa and evolved into an instrument for governments to combat poverty. 7 of the 17 Sustainable Development Goals (SDGs) have been linked to financial inclusion, including eradicating extreme poverty (1), reducing hunger and advancing food security (2), attaining good health and well-being (3), fostering quality education (4), advancing gender equality (5), raising shared economic growth (8), and advancing invention and maintainable industrial development (9) World Bank (2018).

Poverty, defined as having insufficient money to maintain a basic standard of living, remains a major issue in Africa (Ofori-Abebrese et al., 2020). Poverty, according to the World Bank (2015), is defined as earning a lesser amount than US$1.9 per day. Furthermore, persons living in poverty usually have poor incomes and consumption levels, as well as a lack of access to clean water, proper medical care, and improved education, among other things (Koomson et al., 2020). The rate of poverty in SSA is 41%, meaning that the sub-region now has 413 million more impoverished people than in 1990. (Nirav, 2018). Poverty decreased from 56% in 1990 to 34% in 2018 in Sub-Saharan Africa (World Bank, 2020) before the COVID-19 epidemic, which has compromised the efforts for poverty reduction (UNCTAD, 2021).

Prior to the epidemic, several economies in sub-Saharan Africa saw record growth. In the past 20 years, Ethiopia and Rwanda have recorded the fastest global growth rates, averaging more than 7.5 percent annually. Despite increases in the economic growth rate of Africa, poverty remains a

major feature of the continent's social systems. Between 2010 and 2019, Africa's real GDP per person rose by 0.25%, with differences between regional economic groups. In 2015, Sub-Saharan Africa was home-based to over half of the poorest people globally. South Asia and SSA have the maximum concentrations of people living in extreme poverty (World Bank, 2018). Poverty and financial inclusion remain major issues in Africa. According to a 2013 African Development Bank report, the continent has done poorly in adopting financial reforms to decrease poverty. According to World Bank (2016) and African Development Bank figures, Africa is the poorest region globally and the region with the second-highest economic disparity, behind Latin America. These considerations may suggest that poverty is inherent in Africa. However, the African financial sector is undeveloped, dominated by state-owned banks, and hampered by a loose legal and regulatory framework, high levels of corruption, inadequate accounting standards, and inefficient resource allocation (Appiah-Otoo et al., 2022).

Financial inclusion is an important tool for decreasing extreme poverty and generating pooled wealth, World Bank Group (2020). Having a transaction account to keep money, send and receive payments, is a primary stage to ensure wider financial inclusion. The World Bank Group remains concerned about ensuring everyone has access to a transaction account since it serves as an entry to other financial services (WBG 2020). In Sub-Saharan Africa, for example, mobile money account ownership increased from 12 percent to 21 percent. The next phase for Sub-Saharan Africa is to transition from account access (ownership) to account usage which resonates with this line of reasoning encapsulated in a recent World Economic Forum article that states: "Prosperity is not immediately derived from the standalone ownership of bank accounts but from their suitable and consistent use." As a result, it is critical to investigate how Financial Inclusion affects poverty in a few SSA.

Financial inclusion has expanded dramatically, with 1.2 billion (69%) adults worldwide now has an account as of 2017. Over 80 nations have now adopted digital financial services, some of which have a sizable market, including those utilizing mobile devices, which have brought millions of formerly excluded poor clients shifting from the usage of cash to formal financial transactions with mobile phones or other digital technologies World Bank (2020). However, these efforts have been thwarted as Sub-Saharan Africa grapples with different COVID-19 versions, worldwide inflation, supply interruptions, and climate shockwaves. According to the newest Africa's Pulse, a twice-a-year review of the region's near-term macroeconomic viewpoint, growth will be 3.6 percent in 2022, down from 4 percent in 2021. Growing global goods prices, which had speeded up from the time when the conflict between Russia and Ukraine started, have added to the region's growth difficulties.

Given the financial sector's role in the financial crisis, studying the consequences of financial inclusion on poverty in Sub Sahara Africa is intriguing. It begs the question of whether a bigger and deeper African finance industry can influence poverty (positively or negatively). Several studies, such as Mossie (2022), Inoue, (2019a) and Ouechtati (2020), have observed the effects of financial inclusion on poverty in distinct groups of economies. While some studies like Alimi and Okunade (2020) concentrated on the quantity and quality benefits of financial inclusion, others concentrated on the direction of causality. The current research looks at how financial inclusion impacts poverty.

Consequently, the main objective of this study is to examine the effect of financial inclusion on poverty in Sub-Saharan Africa. The remaining parts of the paper are divided into the literature review, methodology, results and discussion and conclusions.

2. LITERATURE REVIEW

Empirical studies examining the impact of financial inclusion on poverty rates have produced inconsistent findings. Globally, there is substantial evidence in the financial literature that Financial inclusion impacts poverty alleviation. This evidence is consistent across time periods, estimating methods, empirical settings, and data types (see Tran et al. (2022), Abdullah and Kazuo (2020), Gunarsih, Sayekti, and Dawanti (2018).

In 28 European nations, Tran et al. (2022) investigate how financial inclusion affects poverty as measured by income. The findings indicate that financial inclusion has a detrimental effect on the 1.9, 3.2, and 5 USD per day poverty thresholds. Abdullah and Kazuo (2020) examined how financial inclusion affected poverty and income inequality in 116 Countries Developing nations. Unbalanced annual panel data from 2004 to 2016 were used in the study. According to the findings, income inequality and poverty rates in developing nations are negatively impacted by financial inclusion. Gunarsih, Sayekti, and Dawanti (2018) investigated the effect of financial inclusion on reducing poverty in Indonesia. The study employed descriptive statistics, and the findings showed that more access to financial services has a detrimental effect on reducing poverty in rural areas.

Similarly, Ratnawati (2020) investigated how financial inclusion affected economic development, poverty, and income inequality in a number of Asian nations. The hypothesis test findings demonstrate that the financial inclusion dimension has not proven effective in certain Asian countries in boosting economic growth and reducing poverty alleviation.

Some studies have interestingly confirmed the ‘more financially included–less poverty rate’ argument. See Khan et al. (2022), Ayensu (2017), Ernst and Young Global Limited 2015). Ernst and Young Global Limited’s (2015) found that the financial services industry plays a significant role in achieving sustainable development. In light of the findings, Ceres (2016) proposed that

the effect of financial markets on the attainment of maintainable development will be through its impact on capital athwart global markets as a tool for poverty eradication (Anarfo & Abor, 2020). Furthermore, Adegbite and Machethe (2020) argue that financial inclusion might increase disadvantaged population households' capability to enthrall financial shockwaves by expanding human capital savings or conducting a moderate asset increase to capitalise on potential investment opportunities.

In assessing how financial inclusion affects multidimensional poverty, Churchill and Marisetty (2020) used data from forty-five thousand Indian families. The findings demonstrate that financial inclusion fuels poverty reduction. Each component of financial inclusion also contributes to the reduction of multidimensional poverty, with access to credit having the most impact after access to banking services and insurance. The findings also highlight the crucial part insurance plays in lowering multidimensional poverty.

In the same vein, Khan et al. (2022) use imbalanced data from 54 African nations from 2001 to 2019 to assess the effects of FI on poverty, income inequality, and financial stability. The findings demonstrate that Financial Inclusion decreases poverty and income inequality but increases financial stability. Bakari et al. (2019) used data from 1980 to 2017 to evaluate the effect of financial inclusion on poverty reduction in forty-nine Sub-Saharan nations. The paper used a static panel data model to examine the data. Findings showed that poverty reduction is negatively impacted by savings, ATM accessibility, information technology, private sector credit, inflation, and government spending, whereas interest rates and economic growth positively impact the poverty rate.

Moreso, Neaime and Gaysset (2018) evaluated the effect of financial inclusion on income disparity, poverty, and financial stability. They discovered that financial inclusion, as measured by the number of banks, decreases income disparity but has no influence on the poverty rate. They also discovered evidence that financial inclusion, as assessed by the number of ATMs, certainly gives rise to financial stability.

Likewise, Ayensu (2017) also looked at how financial inclusion affects poverty in a study in Sub-Saharan Africa between 2010 and 2014. The results show that Sub-Saharan Africa's poverty decreased dramatically due to local banks' lending to the private sector (financial depth). Also, Alimi and Okunade (2020) evaluate the contribution of financial inclusion and information and communication technologies (ICT) to the decrease of poverty in 27 SSA countries between 2004 and 2017. The findings suggest that spreading FI and ICT is essential for eradicating poverty in SSA countries and to eradicate poverty in the SSA area, governments ought to expand financial inclusion policies in parallel with the most recent ICT facilities developments, notably Internet usage. Additionally, Koomson et al. (2020) looked at how financial inclusion affected poverty and exposure to poverty in families in Ghana. The findings demonstrate that financial inclusion lowers poverty and exposure to poverty more in rural than city settings.

Asuming et al. (2019) undertook a relative analysis of financial inclusion in thirty-one sub-Saharan nations. Age, education, gender, wealth, the presence of financial institutions, and the rate of GDP development, according to their research, all envisage financial inclusion in Africa. They discovered that compared to men, women are 4 percent less likely to have accounts and 2 percent less likely to have accounts with financial institutions.

Financial inclusion, poverty, and income inequality in developing Asia were examined by Cyn-Young and Rogelio (2015). According to research, financial inclusion is significantly impacted by per capita income, the presence of the rule of law, and the demographic makeup of the population. Additionally, the study shows that financial inclusion lowers poverty and income inequality and that providing for the elderly and younger population through retirement pensions, a stricter legal system, the enforcement of financial contracts, and financial supervisory inaccuracy results in greater access to financial services, lowers poverty, and eliminates income inequality. In addition to indirectly lowering poverty and income inequality, financial inclusion has been shown to positively influence investment, employment, and economic growth at the expense of poverty reduction. Descriptive statistics were employed by Anwar, Uppun, and Reviani (2016) to assess the contribution of financial inclusion to Indonesian poverty decline.

It has been stated that increasing access to financial services meaningfully decreases poverty, particularly in countries experiencing macroeconomic volatility. Coulibali and Yogo (2016) study the effects of financial services on poverty reduction in developing countries using a random and fixed effect model. According to the research, financial inclusion benefits poverty, and improve access to financial services for low-income employees which may reduce the number of employed poor people.

Finally, Schmied and Marr (2016) investigated the impact of financial inclusion on poverty in Peru. According to reports, financial inclusion has little influence on poverty pointers. Nonetheless, the research also demonstrates that access to communication technology has an essential part in poverty decrease through creating jobs and money, especially in high-unemployment areas.

According to the literature reviewed, there is an uncertain link between financial inclusion and poverty. In certain circumstances, studies (see Omar and Inaba 2020, Koomson et al. 2020) on the benefits of financial inclusion on poverty have found positive and negative effects and neutral results. The debate has been attributed to the measures' validity and the selection of data points, which resulted in differing findings. In the theoretical and empirical research, it is unclear how financial inclusion impacts poverty. The majority of this research Ouechtati (2020), Demirguc-Kunt et al. (2008) and Boukhatem (2016) support the premise of poverty alleviation. Rewilak (2013) suggests that when economic advancement happens, poverty increases. Nevertheless, Omar and Inaba (2020) present both perspectives. Inconsistent results are believed to be caused by different approaches and environments. Given these confusing and contradictory viewpoints, we intend to obtain consistent results which will give new information on Sub-Saharan Africa literature.

The present study will add to our understanding of the relationship between financial inclusion and poverty. Prior research like Koomson et al. (2020), Omar and Inaba (2020) concentrated on analytical methodologies that failed to account for cross-sectional dependency (such as ordinary least squares, instrumental variable (IV) regression, quantile regression, and generalised method of moment (GMM) panel estimates). Spatial or spillover effects induce cross-sectional dependence, which, if ignored, can lead to incorrect statistical inference. According to the open economy paradigm, the policies of one African nation are intricately tied to those of another economically related state. As a result, a cross-sectional dependency between the chosen nations must be considered. This study will address that void by evaluating cross-sectional dependence among the African nations chosen.

3. METHODOLOGY

This study infers from Schumpeter (1934) and McKinnon (1973), who showed how the provision of credit and financial services to the poor could directly help to reduce income inequality and poverty by enabling them to increase their income through investments in profitable endeavours such as well as through interest earned from savings. According to McKinnon (1973), financial intermediaries benefit the underprivileged.

3.1 Model specification

Following extant studies (Bolarinwa et al., 2022; Khan et al., 2022; Nsiah et al., 2021), the empirical model for this study is specified as:

$$POV_{it} = \alpha_0 + \alpha_1 FIN_{it} + \alpha_2 GDP_{it} + \alpha_3 INF_{it} + \alpha_4 POP_{it} + \varepsilon_{it} \quad (1)$$

Where POV denotes poverty; FIN denotes financial inclusion variables; The study utilizes four proxies for measurement of the financial inclusion; GDP is real gross domestic product per capita, whereas INF and POP denote inflation and population, respectively; ε denotes the error term; “i” represents country; “t” is the year.

3.2 Measurement of variable and data source

Data for this paper were obtained from the World Bank’s World Development Indicators WDI (2021) covering the period 2005 to 2021. Poverty is measured using household consumption expenditure, financial inclusion is measured using four proxies. These are the number of ATMs per 100,000 adults (ATM), bank branches per 100,000 adults (BRAN), deposit accounts with

commercial banks, per 1000 adults (DEPO) and borrowers from commercial banks per 1000 adults) (BOR); GDP is measured in constant 2015 US$; inflation is measured using the consumer price index and the population is measured as total. The justification for the inclusion of these variables came from empirical studies. The variables have been employed in many studies, such as (Ali et al., 2022; Inoue, 2019b; Nsiah et al., 2021; Omar & Inaba, 2020; Simatele & Maciko, 2022). The countries included are Botswana, Cabo Verde, Cameroon, Congo, Democratic Republic of Congo, Rep., Eswatini, Ghana, Guinea, Lesotho, Madagascar, Namibia, Nigeria, Rwanda, Seychelles, Uganda and Zimbabwe.

3.3 A-priori expectations

Theoretically, a financially inclusive system ought to enhance household consumption spending and, as a result, decrease poverty. Financial inclusion is projected to positively impact household consumption expenditure since participation in the financial sector allows households to save and spend a portion of their income on improving their welfare and eliminating poverty. We anticipate a negative GDP-per capita coefficient since increased income should lower poverty. Because higher inflation damages poverty alleviation, inflation is projected to have a positive coefficient. Because the effect of the population on poverty rest on the demographic structure of an economy, we expect the population to have either a positive or negative coefficient. For instance, if a population has a high percentage of dependents compared to the number of working-age, then such a person is overwhelmed with numerous dependents, a smaller amount would be left to save and poverty would grow, and vice versa.

Econometrically, the a-priori expectations are given as:

FIN>0; GDP>0; INF<0: POP<0>0

3.4 Techniques and methods of analysis

We begin with a descriptive analysis, followed by correlation analysis, cross-sectional dependence (CSD), panel unit root test and cointegration test. We employ the variance inflation factor (VIF) to identify potential multicollinearity in our models. We also conducted the Breusch-Pagan/Cook-Weisberg and Wooldridge tests. We employ the Random effect (RE) and Fixed Effect (FE) for our long-run relationship. However, we further employ the Driscoll and Kraay (1998) (DK) standard errors for our panel regressions. The DK standard errors (Hoechle, 1995) are autocorrelation consistent and robust to heteroskedasticity and general forms of cross-sectional and temporal dependence (He et al., 2017; Munir et al., 2020; Osuntuyi & Lean, 2022, 2023; Özokcu & Özdemir, 2017). The DK estimator works well with balanced and unbalanced panels and can deal with missing values.

3.5 Pre-estimation tests

3.5.1 Cross-sectional dependence (CSD) test

CSD is common in panel data due to the interconnections across countries. For consistency and unbiased estimations, the estimates must be devoid of CSD (Phillips & Sul, 2003). As a result, it is critical to test for CSD in panel data. We investigate CSD using Pesaran (2004) and Breusch and Pagan (1980) tests. The tests are specified as follows:

$$LM = T\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}^{2}\chi_{N(N-1)/2}^{2} \tag{2}$$

$$CD_{LM} = \left(\frac{1}{N(N-1)}\right)^{1/2}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\left(T\hat{\rho}_{ij}^{2}-1\right), N(0,1) \tag{3}$$

$$CD = \sqrt{\left(\frac{2T}{N(N-1)}\right)}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}\right)N(0,1) \quad (4)$$

$$LM_{ADJ} = \sqrt{\left(\frac{2}{N(N-1)}\right)}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}\frac{(T-k)\hat{\rho}_{ij}^{2}-\mu_{Tij}}{\sqrt{v_{Tij}^{2}}}N(0,1) \quad (5)$$

3.5.2 Panel unit root tests

Pesaran (2004) allows for CSD and slope homogeneity. It suggests a straightforward error CSD test. The test averages pairwise correlation coefficients of OLS residuals from the individual panel regressions. The test is specified as:

$$\text{CSD} = \sqrt{\frac{2T}{N(N-1)}}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}\right) \quad (6)$$

First-generation panel unit root tests are commonly used to check the variables' stationarity. However, these tests are not reliable when CSD happens (Pesaran 2007). On the other hand, the second generation of panel unit root tests developed by Pesaran (2007), such as the CIPS panel unit root test, is robust. Therefore, the author utilizes CADF and CIPS tests. Pesaran (2007) further considers the lagged cross-sectional average and the first difference in capturing CSD from a single model. Pesaran averages the t-statistics on the lagged value of the Cross-sectionally Augmented Dickey-Fuller test (CADFi) to obtain the Cross-sectionally Augmented IPS (CIPS) statistic as follows:

$$\text{CIPS} = \frac{1}{N}\sum_{i=1}^{N}\text{CADF}_{i} \quad (7)$$

3.5.3 Westerlund panel cointegration test

The Westerlund (2007) test is based on structural instead of residual dynamics; hence, it does not impose any common-factor restriction. The test accounts for cross-section dependencies and non-strictly exogenous regressors. Westerlund's test caters for nuisance occurring from the endogeneity of the regressors and has great statistical power likened to the cointegration based on dynamic tests (Altıntaş & Kassouri, 2020). Westerlund (2007) developed four tests of the null hypothesis of no cointegration. The tests are specified as follows:

$$y_{it} = \varphi_{1i} + \varphi_{2i}t + z_{it} \quad (8)$$

$$x_{it} = x_{it-1} + \mu_{it} \quad (9)$$

3.6 Panel long-run estimates

3.6.1 Random effects model

The RE assumes that the variation across the entity's error term is random and not correlated with the independent variables in the model, which permits time-invariant to act as explanatory variables. If the unobserved individual heterogeneity, however, formulated, is assumed not to correlate with the variables in the model, thus:

$$y_{it} = \mathbf{x}'_{it}\beta + E[\mathbf{z}'_i\alpha] + \{\mathbf{z}'_i\alpha - E[\mathbf{z}'_i\alpha]\} + \varepsilon_{it} \quad (10)$$

Rearranging (4.41) gives

$$y_{it} = \mathbf{x}'_{it}\beta + \alpha + u_i + \varepsilon_{it} \quad (11)$$

RE method assumes u_i is a group-specific random component comparable to ε_{it}. But for each group, there is a single draw included in the regression identically each time.

3.6.2 Fixed effects model

Given that

$$y_{it} = \alpha + X'_{it}\beta + \varepsilon_{it} \quad (12)$$

The error term is:

$$\varepsilon_{it} = \mu_i + \lambda_t + \nu_{it} \quad (13)$$

The FE assumes that μ_i are fixed parameters to estimate and the rest error term with ν_{it} independent and identically distributed IID $(0, \sigma_v^2)$. It also assumes that the X_{it} are independent of the v_{it} for all i and t.

3.6.2 The Driscoll and Kraay standard errors

The DK (1998) shows, using large T asymptotics, that the basic non-parametric time-series covariance matrix estimator may be improved to be resilient to extremely general types of cross-sectional as well as temporal dependence. This adjusting the SE estimates ensures that the covariance matrix estimator is consistent, regardless of the cross-sectional dimension N. As a result, DK's technique avoids the shortcomings of other approaches, often inapplicable when the cross-sectional dimension N of a micro-econometric panel is high (Hoechle, 1995).

In two phases, the relevant FE estimator is built. The first step is to within-transform all model variables zit ∈{yit, xit}as follows:

$$\tilde{z}_{it} = z_{it} - \bar{z}_i + \bar{\bar{z}} \quad \text{where} \quad \bar{z}_i = T_i^{-1} \sum_{t=t_{i1}}^{T_i} z_{it} \quad \text{and} \quad \bar{\bar{z}} = \left(\sum T_i\right)^{-1} \sum_i \sum_t z_{it}. \quad (14)$$

Knowing that the within-estimator corresponds to the OLS estimator of

$$\tilde{y}_{it} = \tilde{\mathbf{x}}'_{it}\theta + \tilde{\varepsilon}_{it} \quad (15)$$

4. RESULTS AND DISCUSSION

4.1. Pre-estimation analysis

The empirical analysis results are presented here, evaluated, and discussed to achieve the study's objective. The first portion of the results and discussion displays descriptive statistics and correlation matrix in Tables 1 and 2, respectively. Except for POV, BOR, ATM, and BRAN variables, the standard deviations of most variables show large variations from their means. The correlation coefficients show that most variables are negatively correlated with POV, except INF and POP, which are positively correlated with POV.

Table 1 Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
POV	266	69.216	15.742	23.706	119.412
BOR	247	77.176	84.76	.054	358.722
ATM	259	17.564	21.237	.098	92.525

BRAN	269	8.921	12.475	.04	55.071
DEPO	255	467.279	518.605	.784	2424.755
RGDP	272	2721.967	3356.129	352.321	16992.032
INF	260	155.016	368.682	42.234	5411.002
POP	272	25516691	43526710	82858	2.134e+08

Table 2 Correlation matrix

Variables	POV	BOR	ATM	BRAN	DEPO	RGDP	INF	POP
POV	1.000							
BOR	-0.362	1.000						
ATM	-0.338	0.896	1.000					
BRAN	-0.275	0.587	0.773	1.000				
DEPO	-0.198	0.698	0.811	0.785	1.000			
RGDP	-0.479	0.678	0.789	0.840	0.604	1.000		
INF	0.063	-0.026	-0.060	-0.049	0.019	-0.058	1.000	
POP	0.156	-0.321	-0.233	-0.228	0.007	-0.182	0.028	1.000

Table 3 Results of CSD tests

Model	**Breusch-Pagan LM**	**Pesaran scaled LM**	**Pesaran CD**

Model with BOR	263.9376***	9.2911***	1.5381
Model with ATM	409.1451***	18.6642***	4.4520***
Model with BRAN	424.4469***	19.6520***	1.5624
Model with DEPO	235.4649***	7.4532***	2.1796**

*** and ** 1% and 5%, level of significance, respectively.

The CSD test results are shown in Table 3. The results show the existence of CSD in our panel data. The findings refute the null hypothesis that there is no cross-sectional independence. This issue is addressed in our estimation by employing the DK standard errors, which account for CSD.

Table 4 CIPS panel unit root test results

Variable	Level	First Difference	Order of Integration
POV	-1.0428	-9.69605***	I(1)
BOR	-6.1230***	-	I(0)

ATM	-8.0526***	-	I(0)
BRAN	1.3283	-2.6236***	I(1)
DEPO	-3.0055**	-	I(0)
RGDP	1.9252	-3.9048***	I(1)
INF	0.2146	-5.3004***	I(1)
POP	0.9066	-2.6458***	I(1)

*** and ** are 1% and 5%, level of significance, respectively. Each model includes individual intercepts and trends.

We employed the CIPS panel unit root test, which caters for CSD. The CIPS panel unit root findings are presented in Table 4. The results of the unit root show that BOR, ATM and DEPO are stationary at level, while the remaining variables at stationary at first difference. Next, we utilize the Westerlung cointegration test in Table 5. We conduct cointegration tests for different models based on the financial inclusion proxy added in each model. The test statistics confirm cointegration among the variables in each model at 1% significance levels. Therefore, we conclude that cointegration exists among the variables of the study. Then, we proceed to estimate the long-run relationships.

Table Error! No text of specified style in document. **Westerlung panel cointegration test results**

Model	**Result**

Model with BOR	-2.7706***
Model with ATM	-2.8751***
Model With BRAN	-2.7414 ***
Model With DEPO	-2.7668***

Notes: *** indicates statistically significant at a 1% level of significance.

4.2. Long-run estimation

Table 6 displays the findings of the long-run link between financial inclusion and poverty. We first employ the random and fixed effects models. However, our diagnostic tests reveal the presence of heteroskedasticity and serial correlation in all the models. Nevertheless, the VIF test results show values are less than 10, suggesting the absence of multicollinearity (Gujarati & Porter, 2009). We, therefore, employ the DK standard errors for our panel regressions because of heteroskedasticity, autocorrelation, and CSD in our models. Consequently, the discussion of our results is based on the results of the DK estimations.

Table 6 Long-run estimations results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	RE	FE	DK	RE	FE	DK	RE	FE	DK	RE	FE	DK
BOR	0.0444***	0.0310***	0.0310**									
	(0.0097)	(0.0112)	(0.0119)									
ATM				0.0616***	0.0439***	0.0439**						
				(0.0095)	(0.0131)	(0.0184)						
BRAN							0.0423***	0.0096	0.0096			
							(0.0101)	(0.0115)	(0.0155)			
DEPO										0.0584***	0.0443***	0.0443***
										(0.0094)	(0.0115)	(0.0089)
RGDP	-	-	-	-	-	-	-	-	-	-	-	-
	0.3558***	0.5204***	0.5204***	0.3571***	0.4696***	0.4696***	0.2392***	0.4444***	0.4444***	0.3508***	0.4878***	0.4878***
	(0.0477)	(0.0623)	(0.0885)	(0.0449)	(0.0588)	(0.0686)	(0.0373)	(0.0591)	(0.0798)	(0.0411)	(0.0594)	(0.0677)
INF	-0.0031**	-	-	-0.0027*	-0.0036**	-	-0.0023	-0.0041**	-	-	-	-

		0.0042***	0.0042***			0.0036***			0.0041***	0.0042***	0.0047***	0.0047***
	(0.0016)	(0.0016)	(0.0008)	(0.0016)	(0.0016)	(0.0007)	(0.0017)	(0.0016)	(0.0007)	(0.0016)	(0.0015)	(0.0010)
POP	-0.0311	0.2516***	0.2516***	-0.0346	0.1634*	0.1634*	0.0034	0.3483***	0.3483***	-0.0417*	0.1711*	0.1711**
	(0.0291)	(0.0919)	(0.0762)	(0.0262)	(0.0943)	(0.0817)	(0.0224)	(0.0777)	(0.0610)	(0.0251)	(0.0930)	(0.0660)
Constant	7.1915***	4.0373***	4.0373**	7.2894***	5.0461***	5.0461***	5.8712***	2.0025*	2.0025	7.1676***	4.9170***	4.9170***
	(0.6558)	(1.3129)	(1.4380)	(0.6212)	(1.3784)	(1.3115)	(0.5186)	(1.0189)	(1.2447)	(0.5591)	(1.2557)	(0.9690)
Observations	233	233	233	245	245	245	253	253	253	241	241	241
Mean VIF			2.06			2.25			1.81			1.97
Heteroskedasticity			10.31			24.75			13.18			29.90
Prob > chi2			[0.0013]			[0.0000]			[0.0003]			[0.0000]
Serial Correlation			20.982			21.640			17.081			22.612
Prob > chi2			[0.0004]			[0.0003]			[0.0009]			[0.0003]

Notes: ***, ** and * are statistically significant at 1%, 5% and 10%, respectively. Probability values are in brackets. SE in parenthesis.

The outcomes reveal that the financial inclusion proxies, except for the BRAN, significantly affect poverty (measured using household consumption expenditure (HCE)). The results show that when the financial inclusion proxy is measured using the BOR, financial inclusion positively impacts HCE at the 5% significance level. The level of the coefficient indicates that a 1% rise in the BOR increases HCE by 0.031, indicating a poverty reduction. The results also show that when the financial inclusion proxy is measured using the ATM, financial inclusion positively impacts HCE at the 5% significance level. The level of the coefficient shows that a 1% rise in the ATM increases HCE by 0.044, indicating a poverty reduction. Similarly, the results divulge that financial inclusion positively impacts HCE at the 1% significance level when the DEPO is used as a proxy. The coefficient size indicates that a 1% increase in the DEPO increases HCE by 0.044, implying a poverty reduction.

The findings show that households profit from financial services by increasing their consumption spending when there is financial inclusion. As financial inclusion rises, consumers will have easier access to financial services like loans, encouraging business growth, increasing profitability, and enabling consumers to take advantage of those earnings. Those not in business may also use the loans for direct consumption, increasing their consumption costs. This result backs up the arguments made by Seck et al. (2017) and Nsiah et al. (2021), who argued that since the poor spend a higher proportion of their earnings on consumption, access to finance through financial inclusion might, among other things, help them improve their businesses, support the education of their children, and take care of their medical necessities, increasing their likelihoods of evading poverty.

When the BRAN is used as a proxy, it is discovered that financial inclusion does not affect HCE and, as a result, on poverty. Due to the limited presence of bank offices or branches, people living in rural regions may have difficulties receiving financial services (Maity & Sahu, 2022). Banks are interested in establishing ATMs rather than branches due to the lower costs. This causes the number of ATMs to rise more quickly than the number of branches.

The results further show that economic growth and inflation reduce HCE, thereby worsening poverty. The results indicate that HCE will decrease when economic growth and inflation increase, implying an increase in poverty. Theoretically, there are various schools of thought on the subject. Household consumption is determined by disposable income, according to the Keynesian theory of absolute income. As a result, a rise in government spending leads to additional production, employment, and income, stimulating private consumption and having a crowding effect. In contrast, the conventional real economic cycle model predicts that increasing government spending will decrease private consumption under neoclassical theory. Additionally, household consumption suffers because of the reduction in disposable income caused by inflation. On the other hand, the population variable increases household consumption expenditure and consequently reduces poverty. This finding is contrary to that of Bogari (2021), who found that the population widens the poverty gap.

5. CONCLUSION

One of the most effective methods for eradicating poverty is financial inclusion, particularly in Africa, with little financial growth. This study studied the connection between financial inclusion and poverty in a few African nations. The study's conclusions showed that all applied financial

inclusion proxies aside from BRAN would lessen Africa's poverty. As a result of these findings, it is suggested that governments work with the central banks in Africa to develop the legislation required for commercial banks and other financial institutions to enter the market and offer consumers access to affordable financial products. This will enable everyone to reach a level of inclusion that will encourage the reduction of poverty. This implies that families and firms with access to credit would produce more goods and make more money, allowing them to save money or make investments to raise their quality of life.

The study's conclusions have significant practical ramifications. Financial authorities, such as the central banks of the chosen African nations, must act quickly to create the enabling environment or framework that would allow most of the population to participate in the financial sector, reducing poverty and ultimately enhancing welfare. Due to data availability, this paper's analysis was limited to 16 African nations; hence it is important to use care when generalising the results.

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