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Financial Inclusion, Income Inequality and Sustainable Economic Growth in Sub-Saharan African Countries

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Abstract: This study evaluates the relevance of inclusive financial access in moderating the effect of income inequality on economic growth in 48 countries in Sub-Saharan Africa (SSA) for the period 1995 to 2017. The findings using the Generalised Method of Moments (sys-GMM) technique show that inclusive financial access contributes to reducing inequality in the short run, contrary to the Kuznets curve. The result reveals a negative effect of financial access on the relationship between income inequality and economic growth. There is a positive net effect of inclusive financial access in moderating the impact of income inequality on economic growth. Given the need to achieve the Sustainable Development Targets in the sub-region, policymakers and other stakeholders of the economy must design policies and programmes that would enhance access to financial services as an essential mechanism to reduce income disparity and enhance sustainable economic growth.

1. Introduction

Over the last two decades, inclusive finance and sustainable economic growth have been of concern to policymakers, scholars, and other stakeholders of the economy. Finance leads to sustainable prosperity by providing for efficient and equitable redistribution of capital within the economy. For a country to achieve sustainable economic growth, there is an urgent need to establish different financial inclusion channels and inclusive growth. According to Babajide, Adegboye and Omankhanlen [1], financial inclusion is essential in improving the accessibility of financial products regarding payments, insurance and other services. Financial inclusion is a mechanism to minimise income disparity and achieve sustainable economic growth, due to the earnings creating opportunities that drive significant external progress regarding the financial venture, job creation and economic stability [2]. An inclusive financial system permits monetary administration to spread to individuals and businesses conceptualised as the 'unbanked' and essential financial development [3]. Innovative financial services drive growth with regards to mitigating equality and poverty by boosting capital inputs in schooling, small and medium-scale enterprises and health [4].

On the other hand, inequality has been a significant challenge in Sub-Saharan Africa (SSA), essentially because several nations in the sub-region have not benefited from the increasing economic growth over the last 20 years. Furthermore, inequality is a significant cause of exclusive economic growth in Sub-Saharan Africa (SSA). As a result of this factor, several nations in the region have failed to meet the Millennium Development Goal (MDG) targeted at poverty reduction [5]. The extremely dualistic economic system and ineffective government policy on wealth distribution despite steady economic growth at

the national level also explain the huge gap in income inequality [6,7]. Drivers of income inequality in developing economies include social and political instability, weak institutions, credit market asymmetry, rising population, the decline in human capital investment, and a high premium on technological skill and financial globalisation [8]. Extant studies have established the implication of inequalities on socio-economic sustainability and growth through underfunding in literacy, health and physical resources resulting in lower growth [9]. The causal relations between earnings disparity and development in the economy of mid-income and developing nations such as those in Sub-Saharan Africa (SSA) have been reported to be bidirectional [10]. However, this finding does not necessarily determine the flow of causality from earning disparity to growth in economic terms and vice versa. Economic growth is fundamentally related to earnings imbalance, which is typically caused by the boom in the "FIRE" economy (finance, insurance and real estate sectors of the economy) [7]. Accordingly, a gap in earnings will, in turn, cause the national output and income to decline, thus, prompting a decrease in the growth of the economy [10]. Interestingly, the influence of income inequality on economic growth in SSA can be modulated through enhanced access to financial services, which is the goal of financial inclusion. In the normal course of things, financial inclusion provides the excluded section of the society due to income inequality with the opportunity to have access to finance and other financial services, which to a great extent, would help them to engage in meaningful economic activities [1,2,6]. The ability as well as the opportunity for the financially excluded section of society to engage in investment, entrepreneurship and other economic activities provides a channel to participate and contribute meaningfully to economic development [2,9,10].

Against this backdrop, the current study aimed to assess the significance of financial access in regulating the influence of income disparity on economic growth, using a panel dataset from 48 Sub-Saharan African countries for 1995–2017. The study set out to establish to what extent financial inclusion can stem the tide of income inequality? The study also attempts to determine the extent to which financial inclusion can minimise the influence of wealth disparity on sustainable economic growth in SSA. Responding to these enquiries exposes at least two main Sustainable Development Growth (SDG) initiatives. The SDG 8 promotes sustainable and prosperous economic growth, optimal and practical opportunities and fair jobs for all, while SDG 10 focuses on reducing income inequality. This study posits that inclusive financial access has no significant impact on moderating income inequality on economic performance in 48 Sub-Saharan African countries. This study employs the system Generalised Method of Moments (GMM) against the fixed-effect estimator, which fails to consider the endogeneity of the variables. The study also uses variables such as the GNI per capita for economic growth and financial access, representing the critical predictor variables of interest.

The issue about inequality has featured in the literature from SSA but without attention to the discussion on the role of financial accessibility in fostering inclusive economic performance. Bongomin, Ntayi, Munene, and Malinga [11] explained the connection between financial access and mobile money, emphasising moderation from gender and social networks. While De Magalhães and Santaeulàlia-Llopis [12] established the relations between wages, the lowest income in society and consumption, Asongu and Kodila-Tedika [13] raised awareness of the phenomenon of African impoverishment from the context of genetic composition and conventional principal models of economic growth such as the Beijing model and the Washington Agreement. The works of Meniago and Asongu [14] and Tchamyou [15] emphasised the connection between corruption schooling, knowledge sharing, wealth allocation and financial access, while Asongu, Nnanna, and Acha-anyi [2] and Asongu and Odhiambo [16] focused on gender economic inclusion. A substantial disparity in the literature motivates this study to evaluate financial access as a moderating income inequality factor for sustainable economic growth. Bicaba, Brixiova and Ncube [17] argued that the SDG threshold for reducing poverty level to below 3% is elusive for countries in SSA, unless income disparity is addressed. According to Tchamyou

and Asongu [18], inclusive financial growth in Africa is lower than in other regions. This opinion does not undermine the fact that current theoretical and methodological research widely agrees on financial access value, among other factors [15,19]. Only by solving the evident issue of earning inequality in Africa can the continent accomplish profound poverty alleviation and substantial success towards achieving the Sustainable Development Goals (SDGs) of the 2030 Growth Agenda [7]. The present study differs from Asongu, Nnanna, and Acha-anyi [2] as it focuses on both disparity mechanisms and financial accessibility as channels to growth.

The rest of the paper is structured as follows. Section 2 focuses on the theoretical underpinnings motivating the significance of financial access as a moderating factor in the connection between inequality and economic growth. While Section 3 discusses the data and the methodology employed, Section 4 provides the results and discussion. Finally, Section 5 concludes with recommendations.

2. Literature Review

2.1. Theoretical Underpinnings

The interaction between financial accessibility and income inequality for inclusive economic growth has been the subject of extensive debate among practitioners, scholars and policymakers. Financial accessibility is the ease with which an economic agent (individual and enterprise) can access financial services such as deposit, credit, payment, insurance, and other risk-related services [20]. The proportion of these economic agents that can access financial services with ease leads to financial inclusion, either high or low. The ratio of those that can access financial services can impact the economic prosperity of a nation. On the other hand, income inequality is the unequal distribution of income and other resources among citizens. This can vary widely due to social factors such as gender, age, and ethnicity. Income inequality may affect individuals, households, enterprises and countries differently, and it is strongly associated with economic growth [21].

The intensive and extensive theories of margins are essential to examine the interaction between financial accessibility and income inequality. According to the intense margin hypothesis, finance influences inequalities by enhancing the financial resources of agents who already have access to the structured financial system, particularly, well-established companies and affluent households [22]. In comparison, the broad margin principle notes that financial growth could work on a wide margin by improving access to financial products by agents who had not used financial services due to financial constraints [23]. In other words, financial access would minimise the prevalence of differential incomes within generations by increasing economic opportunity for the less fortunate classes [24]. This is consistent with the principle of liquidity limits, which implies that credit access limitations impede the ability of low-income individuals to be enterprising and thereby boost economic operators' income inequality level [25].

On the other hand, the extensive margin theory is similarly applicable because it can be targeted by equitable financial access aimed at mitigating inequality to include the formerly unbanked populace by policymakers and stakeholders in the financial sector. In conclusion, adults, women, and youth will exploit equitable financial access to increase their participation in the formal economic system as inequality levels are low compared to high-income inequality levels. However, it should be mentioned that women face more wage inequality relative to men [2]. Therefore, this study is hinged on the intensive and extensive margin theories.

There are two vital opposing views on the effect of inclusive financial growth on income inequality. In the first strand of the literature, Greenwood and Jovanovic [26] advocate the notion of an inverted U-shaped linkage between disparity and growth of the financial sector. They argued that disparity increases with financial progress at the beginning of the growth period. This is compatible with understanding the 'Kuznets curve', centred on the premise that income inequality rises at the initial stages of economic growth and then declines as changes occur [27]. According to Greenwood and Jovanovic,

the connection between the advancement of inclusive finance and inequality is explicitly inversely related. This suggests that financial development would establish income disparity before attempting to reduce income gaps and that there would be a reduction in inequality as part of financial development. On the other hand, as the economy evolves, the association between inequality and finance may vary considerably from the transitional to the advanced economy [28].

In the second strand, Piketty and Saez [29] found that contrary to the expectations of the Kuznet's assertion, income inequality has been substantially prevalent in advanced countries such as the United States since the 1970s. In addition, the Organization for International Co-operation and Development (OECD) reported in 2008 that income inequality deepens in most advanced nations where earnings are suspected to be well above the rate in the Kuznets curve at the point where imbalance should begin to decline or at least remain relatively stationary [28]. The study shows that, as the economy gets wealthier, market mechanisms alone do not alleviate earnings inequality. Acemoglu and Robinson [30] reported that income inequality did not increase in the early phases of growth among East Asian economies.

Asongu, Nnanna, and Acha-anyi [2] argued that monetary access could enhance growth outcomes by playing a key role in advancing economic prosperity and decreasing earnings imbalance. However, the access to finance of the deprived can be limited based on collateral, processing costs and knowledge asymmetry [16]. The last strand is more in line with the hypothetical contentions of access to finance in alleviating inequalities and advancing comprehensive growth of the economy. Productive investment, improved monetary apportionment and access to monetary products can reduce the earnings imbalance [31]. The contending perspective is that monetary access advantages are generally limited to more affluent groups since they can effectively address monetary access limitations [28]. Generally, the less fortunate groups in the socio-economic space are consigned to depend essentially on remittances and the shadow economy for monetary resources utilised for small scale commerce, farming exercises and family unit input [32].

2.2. Empirical Studies

Empirically, the study of Nanziri [33] revealed that the female gender primarily uses structured transactional and informal financial structures. In contrast, men use recognised credit, insurance and investment products in South Africa, and there are no gaps in the welfare between the economically included men and women. This study, however, ignored the endogenous variables for this type of analysis. Tita and Aziakpono [6] used SSA data to investigate this issue and find that formal accounts have a favourable connection with income inequality. Neaime and Gaysset [34] explored the effect of financial inclusion on inequality and poverty in eight MENA countries between 2002 and 2015. Using the Generalised Method of Moments (GMM) and Generalized Least Squares (GLS) econometric techniques, the outcomes reveal that financial inclusion decreases wage inequality, and has little impact on poverty levels. In contrast, higher population rates, high inflation, and trade transparency have substantially increased poverty levels in the MENA area.

Turegano and Herrero [35] demonstrated that financial inclusion supports the reduction in income inequality, while the financial sector's size does not boost finance. Agyemang-badu [36] assessed the determinants of the financial inclusion model, and the analysis used a fixed-effect panel regression to analyse data from 48 African nations for the period 2004 and 2015. The research found that financial inclusion was inversely linked to poverty and income inequality in Africa. The study was limited to the estimation of fixed results. Meniago and Asongu [14] evaluated the impact of financial growth on income inequality in a panel of 48 African countries for the period 1996–2014. Using Generalised Moments Moments in the Kuznets hypothesis framework, the findings revealed that access to finance and intermediation efficacy decreases inequalities. In addition, the study indicated that a Kuznets connection is evident between GDP per capita and inequity. In another study, using an unbalanced panel dataset and credit to GDP as a metric of financial

growth from 138 advanced and emerging nations for the years 1960–2008, the findings of Jauch and Watzka [37] dismiss statistical models, forecasting a negative effect on income inequality calculated by the Gini coefficient from financial progress. The study finds that financial growth increases income inequality by adjusting for a country-fixed effect, potential endogeneity problems, GDP per capita and other control variables.

Asongu, Nnanna, and Acha-anyi [2] explore how financial mobility regulates the impact of wealth disparity on gender economic inclusion. The study, which covered a timeframe of 2004–2014, used data from 42 countries in Sub-Saharan Africa (SSA) and Generalised Method of Moments (GMM) and Fixed Effects (FE) models. The findings revealed that the purpose of financial accessibility in altering the Palma ratio's impact on female labour force participation has a negative net effect. In contrast, the importance of financial availability in moderating the Gini coefficient's impact on female joblessness has a positive net effect. Furthermore, there are net adverse consequences on women's jobs from the dependence of the Gini coefficient and the Palma ratio on financial accessibility. Park and Shin [38] conducted an empirical examination of the connection between financial access and income disparity in developing Asian nations from 1960 to 2011. Using pooled and panel regression models, the study found that financial accessibility contributes to decreasing inequality up to a point, but as inclusive financial development progresses further, it contributes to greater inequality. Kim and Kim [3] estimated the effect of financial inclusion expressed as financial equality on the association between income inequality and economic output in 40 nations that are members of the Organisation for International Co-operation and Development (OECD) and the European Union (EU) or the Eurozone for the period 2004 to 2011. The study employed the GMM and Two-Stage Least Square (TSLS) for the latter parameter using a cross-sectional analysis consisting of a fixed-effect regression. The findings revealed that income inequality has a negative effect on GDP output and the significance level is stronger in low-income countries.

3. Data and Methodology

3.1. Data

This study relies on annual time series data from 48 Sub-Saharan African nations from 1995 to 2017. It is essential to understand why countries in the region have remained impoverished in recent times despite the quantum of resources in the region and the global campaign to improve the living standards of the people. The data were sourced from World Development Indicators (WDI), Financial Development and Structure Database (FDSD), and the Global Financial Indicator (GFI). Data on the Gini coefficient, Palma ratio and Atkinson index which represent the inequality indicator were obtained from Global Consumption and Income Project (GCIP).

In tandem with Tita and Aziakpono [6], we obtained the per capita GNI economic growth variable from the World Development Indicator (WDI). The data from previous studies by Asongu, Nnanna, and Acha-anyi [2] and Tchamyou and Asongu [18] on Private Credit issued by Deposit Banks (PCRB), Private Credit issued by Financial Institutions (PCRF) and Bank Credit to Bank Deposits ratio (BCBD) were obtained from the Global Financial Indicator (GFI) and Financial Development and Structure Database (FDSD). Compared to the deposit moderator, private domestic credit from financial institutions and deposit banks makes access to a credit moderator more aligned with financial access because it is more logically linked to financial resources access. Moreover, it can evaluate financial and banking system activities regarding the provision of accessible finance. The Bank Credit to Bank Deposits ratio indicates financial efficiency with regards to the accessibility of finance.

The control variable indicators include cell phone usage, remittance, and average primary school enrollment ratio obtained from the WDI of the World Bank. In line with the previous study by Asongu and Odhiambo [16], the smartphone is projected to increase employment, which is an indicator of economic health. As far as remittances are concerned, Meniago and Asongu [14] argued that this tends to enhance inequality in Africa as most of

those travelling from the continent are from higher-income households. Finally, the average enrolment ratio in primary schools is an indicator of social inclusion and development [39]. Table 1 presents the definition of the variables in the study.

Table 1. Sources and definitions of variables.

Variable	Abbreviation	Measurement	Sources
Gross national income (GNI) per capita	GNIPC	The nation total earnings per year over the population	WDI
Bank credit to bank deposits ratio	BCBD	Bank credit on bank deposits (%)	FDSD
Private domestic credit from the financial institution	PCRF	Privates domestic credits from the financial institution (% of GDP)	GFI
Private domestic credit from deposit money banks	PCRB	Private domestic credit from deposit banks (% of GDP)	FDSD
Gini coefficient	Gini	"The Gini index is a component of the earnings circulation of a nation's inhabitants".	GCIP
Atkinson index	Atkinson	"The Atkinson record estimates disparity by figuring out which end of the dispersion contributed most to the noticed imbalance".	GCIP
Palma ratio	Palma	"The Palma proportion is characterised as the proportion of the most wealthy 10% of populace's gross public earnings split by the 40% least fortunate's share".	GCIP
mobile penetration Global	Mobile	Mobile cellular subscriptions (per 100 people)	WDI
Remittance	Remit	Percentage of remittance inflows to GDP	WDI
Primary school enrollment	Enrollment	School enrollment, primary (% gross)	WDI

WDI: World Development Indicators. FDSD: Financial Development and Structure Database. GCIP: Consumption and Income Project. GFI: Global Financial Indicator.

3.2. Model Specification

To examine the relevance of inclusive financial access in moderating the impact of income inequality on economic growth in 48 Sub-Saharan African countries., this study employed the system-GMM (sys-GMM) estimation procedure developed by Blundell and Bond [40]. Unlike the difference GMM, the sys-GMM utilises both the original specification in levels and first differences. Although the sys-GMM fall short of the theoretical establishment to show that the employment of lagged and differences of outcome and explanatory variables are dependable instrumental indicators, it is sensitive to selecting the lag length necessary for the study. The optimal lag length is the one selected by the respective criteria in the system. For this study, the lag length is 2, which is good to maintain the degrees of freedom and stability of the model. This was validated using a lag length of 4 and the result was not significantly different from that obtained using the lag length of 2. The use of a two-step sys-GMM is important when cross-sectional variability is more prevalent than the time variability in a study. In addition, it helps to deal with heteroscedasticity. Importantly, apart from handling the issues that could surface due to the one-period lag of the dependent variable as a regressor, the estimation method controls endogeneity by disposing of fixed effects that conceivably correspond with the error terms [41].

The study excludes country-specific variables to avoid issues about the endogeneity of the variables. Furthermore, the main assumptions that govern the utilisation of the GMM analytical strategy are expressed accordingly. For example, the number of chosen countries (N) is considerably higher than the number of cycles in each cross-section region (T). The N > T conditions required for the use of the tool are then satisfied. The data structure of the research panel reports that cross-country variations are taken into account in the forecasts. The study's measure of indicators is consistent with the correlation between their level and first order series—greater than 0.8. This validates the reliability in the variable. Finally, the use of the sys-GMM technique helps to address the issue of endogeneity from two significant possibilities. First, the use of internal tools deals with reverse causality or simultaneity. Second, any unnoticed heterogeneity is controlled by time-invariant

absent indicators, and this is in tandem with contemporary GMM-centric literature, as documented in Tchamyou [15].

The developed econometric model for this study is specified as follows:

$$Inequality_{i,t} = \beta_0 + \beta_1 Inequality_{i,t-1} + \beta_2 Inclusion_{i,t} + \sum_{j=1}^{J} a_j X_{jit} + \beta_4 \gamma_i + \beta_5 \theta_t + \varepsilon_{i,t} \quad (1)$$

$$\begin{aligned} Growth_{i,t} = \alpha_0 &+ \alpha_1 Growth_{i,t-1} + \alpha_2 Inequality_{i,t} + \alpha_3 Inclusion_{i,t} \\ &+ \alpha_4 Inequality_{i,t} * Inclusion_{i,t} + \sum_{j=1}^{J} a_j X_{jit} + \alpha_4 y_i + \alpha_5 \theta_t + \varepsilon_{i,t} \end{aligned} \quad (2)$$

where $Growth_{i,t}$ is the economic growth, that is, GNI per capita growth for country i in time t ... $Growth_{i,t-1}$ is the one year lagged economic growth, which is the GNI per capita growth, which captures the dependent variable persistency. This indicates the estimate for the linear dynamic panel data model. Furthermore, the *Inequality* is a measure of the extent of income inequality proxy as per the Atkinson index, GINI coefficient and Palma ratio. One of the Palma ratio benefits is that it measures the distribution's tails (i.e., the lowest and richest), whereas the Gini concentrates primarily on the whole distribution [42]. While *inclusion*, signifying inclusive financial access, is established to reduce inequality, financial access will be measured by the bank credit to bank deposits ratio, private domestic credit from deposit banks (percentage of GDP), and private domestic credit from financial institutions (percentage of GDP) country i in time t. $X_{ji,t}$ measures the control variable (remittance, mobile penetration, school enrolment), $\mathbb{Y}_t$ is the country-fixed effect, $\theta_{i,t}$ is the time effect and $\varepsilon_{i,t}$ is the error term. The different measures of financial access, econometric specifications and control variables are expected to bring about robust results.

4. Results and Discussion

4.1. Preliminary Analysis

The results of the descriptive statistic are presented in Table 2. Table 2 shows the mean, maximum, standard deviation, Kurtosis and Skewness value for all the variables used in analysing financial inclusion, income inequality and economic growth in SSA between 1995 and 2017.

Table 2. Descriptive statistics.

Variables	N	Sum	Mean	Min	Max	SD.	Kurtosis	Skewness
GNIPC	811	1537	1.895	−36.33	38.60	5.553	13.36	−0.544
PCRB	1024	73,327	71.61	8.138	221.9	28.53	3.873	0.434
PCRF	943	17,424	18.48	0.403	160.1	23.56	18.33	3.712
BCBD	1015	16,948	16.70	0.403	106.3	16.29	9.864	2.443
Atkinson	796	561.6	0.706	0.444	0.898	0.0594	4.724	−0.285
Gini	796	470.3	0.591	0.441	0.868	0.0422	16.20	2.398
Palma	796	5230	6.571	2.484	22.07	1.849	25.65	3.417
Remittance	861	3283	3.813	0.018	108.4	8.556	65.39	6.854
School (PSE)	870	84,125	96.70	23.36	156.4	24.36	2.899	−0.271
Mobile	1083	35,457	32.74	0	173.5	39.47	3.769	1.246

Note: N: observations; SD: Standard Deviation; Min: minimum; Max: maximum.

Table 3 presents the correlation coefficients between variables. The results reveal a low correlation within the variables, except among the inequality variables, which measure income inequality too but in different ways. The low correlation among the variables indicates that there is no issue of multicollinearity in the models. The correlation matrix does not disclose the dynamic relationship between the deployed variable; this is ultimately discussed in the analytical effects section, which shows the complexity of the indicators in a relationship.

Table 3. Correlation matrix.

Variable	GNIPC	PCRB	PCRF	BCBD	Atkinson	Gini	Palma	Remit	PSE	Mobile
GNIPC	1									
PCRB	−0.0172	1								
PCRF	0.0826	0.366 ***	1							
BCBD	0.0911	0.365 ***	0.435 ***	1						
Atkinson	−0.0425	−0.0638	−0.0156	−0.0818	1					
Gini	−0.0160	0.0341	0.0528	−0.0332	0.811 ***	1				
Palma	−0.00653	0.00568	0.0354	−0.0369	0.804 ***	0.642 ***	1			
Remit	−0.0280	−0.0005	0.0554	0.0797	0.253 ***	0.0178	0.163 ***	1		
PSE	−0.0149	−0.125 *	0.154 **	0.154 **	−0.0336	−0.0912	−0.114 *	0.0600	1	
Mobile	0.0699	−0.0310	0.338 ***	0.387 ***	−0.192 ***	−0.234 ***	−0.157 **	0.176 ***	0.177 ***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; GNIPC: Gross National Income per Capita. Gini-Inc: Gini index of inequality. Atkin-Inc: Atkinson Inequality index. Palma-Inc: Palma ratio of inequality. BCBD: Bank credit on Bank deposits. PCRB: Private domestic credit from deposit banks. PCRF: Private domestic credit from deposit banks and other financial institutions. Remittance: Personal Remittance. PSE: Primary School Enrollment rate. Mobile: Mobile Penetration.

4.2. Empirical Results

Table 4 presents the regression estimate results on the effect of financial inclusion on income inequality in SSA nations. The employment of multiple inequality variables and financial inclusion indicators are essential and measures used in a robustness check. Panel A of the table captures the effect of financial inclusion proxies (BCBD, PCRF and PCRB) on the Atkinson. Panel B of the table captures the effect of financial inclusion proxies (that is BCBD, PCRF and PCRB) on the GINI coefficient. Panel C of the table shows the impact of financial inclusion proxies (BCBD, PCRF and PCRB) on the Palma ratio. Column I of each Panel reports the regression analysis, excluding the control variables to observe the explanatory variables' influence on the dependent variables. Column II of each Panel reports of the regression analysis with the control variables for robust analysis. Importantly, two criteria were used to evaluate the viability of the models for the study. First, the null hypothesis of the second-differential (AR (2)) by Arellano and Bond for the nonexistence of autocorrelation in the residuals. Secondly, the Sargan and Hansen Over-Identification Restriction (OIR) examinations should not be significant because their null hypotheses assume that instruments are not related to the error terms. While the Sargan OIR analysis is not meant to be robust but not instrumentally weakened, the Hansen OIR is robust yet instrumentally weakened. To mitigate the proliferation of instruments, we ensured that instruments were lower than the cross-sectional quantity in the model specification [13]. The validation of estimations in Table 4 depends on Hansen's J tests and the Arellano–Bond test. The analysis results indicate that AR (2) *p*-value > 5% suggests no evidence of autocorrelation at the lagged second order for the model at a 5% level of significance. In addition, there is no evidence of a correlation with error terms and instrument variables, as indicated by the *p*-value of Hansen J test > 5% at 5% significance levels.

Table 4 shows that deposits banks' credit (PCRB) reduces the Gini coefficient and the Palma ratio at 5% and 1% level of the coefficient, respectively. Hence, a degree of variation in PCRB explains a 0.0000302 decrease in the Gini index and a 0.00266 reduction in Palma ratio ceteris paribus. As for the loans issued by the financial institution or system (PCRF), a negative coefficient is observed at a significance level of 1%. This implies that a unit variation in PCRF will lead to a 0.000102 reduction in the Gini index. The bank credit to deposit ratio (BCBD) significantly mitigates the Atkinson index and Palma ratio at 1% level of significance. This result indicates that a proportionate increase in BCDB will cause a 0.000380 and 0.0112 unit decline in the tail distribution of inequality (Atkinson index and Palma ratio, respectively).

Table 4. Financial inclusion and income inequality (Generalised Method of Moments (GMM) Estimation).

Variables	Atkinson		GINI Coefficient		Palma Ratio	
	Panel A		Panel B		Panel C	
	I	II	I	II	I	II
L.atkinson	0.960 *** (0.00121)	1.045 *** (0.0102)				
L.gini			0.799 *** (0.00237)	0.580 *** (0.00460)		
L.palma					0.746 *** (0.00161)	0.845 *** (0.0115)
PCRB	−0.0000492 *** (0.00000620)	0.0000373 ** (0.0000161)	−0.0000627 *** (0.0000091)	−0.0000302 ** (0.0000120)	−0.00239 *** (0.000272)	−0.00266 *** (0.000585)
PCRF	0.000551 *** (0.00000747)	0.000351 *** (0.0000349)	−0.0000175 * (0.00000934)	−0.000102 *** (0.0000211)	0.0162 *** (0.000300)	0.0142 *** (0.00101)
BCBD	−0.000520 *** (0.0000262)	−0.000380 *** (0.0000887)	0.000134 *** (0.0000238)	0.000321 *** (0.0000445)	−0.0137 *** (0.000729)	−0.0112 *** (0.00226)
Remittance		−0.000208 *** (0.0000187)		0.000336 *** (0.00000829)		−0.00284 *** (0.000812)
Primary School Ed. (PSE)		0.000610 *** (0.0000390)		−0.000191 *** (0.0000159)		0.0165 *** (0.00115)
Mobile Penetration		−0.0000979 *** (0.0000146)		−0.0000721 *** (0.00000742)		−0.00243 *** (0.000635)
Constant	0.0290 *** (0.00122)	−0.0903 *** (0.00922)	0.120 *** (0.00113)	0.263 *** (0.00371)	1.685 *** (0.0220)	−0.398 ** (0.177)
Observations	673	505	673	505	673	505
Number of Country	38	35	38	35	38	35
Hansen_test	26.64	24.32	19.08	28.15	23.21	23.99
Hansen Prob	0.183	0.931	0.580	0.822	0.333	0.937
Sargan_test	285.5	107.3	216	240.2	392.3	138.9
Sargan Prob	0	0	0	0	0	0
AR(1)_test	0	0	0	0	0	0
AR(2)_test	0.352	−1.570	−0.641	0.519	−1.490	−1.334
AR(2)_*p*-value	0.725	0.116	0.522	0.604	0.136	0.182
No. of Instruments	26	44	26	44	26	44

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In contrast, PCRB has a significant positive relationship with only the Atkinson index, at 5% significance. On average, a degree change in PCRB will adjust the Atkinson index by 0.0000373 upwards. Likewise, the PCRF is significantly positive to the alternative inequality variables (Atkinson index and the Palma ratio) at 1% significance. This explains a 0.000351 and 0.0142 increase as a result of a 1% change in PCRF. The positive effect of BCDC is relative to the Gini index at 1% significance, indicating that an increase in the credit to deposit ratio can lead to a rise in the Gini index in SSA.

For the control variables, personal remittance has a mitigating effect on the Atkinson index and the Palma ratio at 1% level of significance. However, only the Gini coefficient shared a positive change with remittance at the significance level of 1%. On the other hand, primary school enrollment has a mitigating effect on inequality regarding the Gini index and had a positive impact on the alternative inequality variable, significant at 1% level. Smartphone penetration was found to have a negative impact on the various income inequality parameters at a statistical strength of 1%.

Table 5 shows the empirical findings of financial inclusion and its impact on the relationship between income inequality and economic growth in SSA. However, this study adjusts for the pitfall in interactive regression by computing the net effect estimate and adding all the constitutive variables to the specification [16,18]. In other words, this study sums the net effect to explore the prevalence of financial inclusion in moderating the

impact of earnings disparity on inclusive economic growth. For instance, in the penultimate column of Table 5 (Column II of Panel A), the net effect of domestic credit to the private sector (percentage of GDP) (PCRF) is used to moderate the impact of Atkinson index on GNI per capita by 26.895 ([−1.194 × 18.48] + [48.96]). The computation is based on the mean value of domestic credit to the private sector (percentage of GDP) (PCRF), which is 18.48. The unconditional effect of the Atkinson index is 48.96, and the conditional effect from the interaction between the domestic credit to the private sector (percentage of GDP) (PCRF) and Atkinson index is −1.194. Therefore, the finding established from (Column II of Panel A) suggests a positive net effect from the role of financial inclusion in modulating the impact of the Atkinson index on economic performance in Sub-Saharan Africa.

Table 5. Financial inclusion, income inequality and economic growth (GMM Estimation).

Variables	Dependent Variable: Gross Net Income (Per Capita Growth)								
	Atkinson Index			Gini Coefficient			Palma Ratio		
	Panel A			Panel B			Panel C		
	I	II	III	I	II	III	I	II	III
L.GNIPC	0.110 ** (0.0467)	0.0115 (0.0324)	0.0727 * (0.0427)	−0.0149 (0.0644)	0.138 *** (0.0274)	0.210 *** (0.0540)	0.0397 (0.0487)	0.0851 *** (0.0275)	0.122 *** (0.0436)
Atkinson	24.03 ** (10.57)	48.96 *** (5.969)	87.71 *** (11.47)						
Gini				93.56 *** (28.94)	70.48 *** (12.62)	46.56 *** (10.95)			
Palma							1.354 ** (0.544)	1.533 *** (0.356)	1.835 *** (0.316)
PCRB	0.123 (0.0887)			1.259 *** (0.219)			0.149 *** (0.0490)		
PCRF		0.833 *** (0.0818)			0.0832 (0.0936)			0.142 *** (0.0395)	
BCBD			1.966 *** (0.249)			0.292 * (0.176)			0.330 *** (0.0633)
PCRB*Atkinson	−0.166 (0.133)								
PCRF*Atkinson		−1.194 *** (0.120)							
BCBD*Atkinson			−3.025 *** (0.402)						
PCRB*Gini				−2.034 ** (0.362)					
PCRF*Gini					−0.113 (0.145)				
BCBD*Gini						−0.416 (0.278)			
PCRB*Palma							−0.021 *** (0.00780)		
PCRF*Palma								−0.0148 ** (0.00417)	
BCBD*Palma									−0.0472 ** (0.00869)
Remittance	−0.351 *** (0.0934)	−0.175 *** (0.0354)	−0.324 *** (0.0528)	0.142 ** (0.0560)	−0.194 *** (0.0742)	−0.280 *** (0.0783)	−0.252 *** (0.0724)	−0.380 *** (0.145)	−0.489 *** (0.162)
School	−0.057 *** (0.0172)	−0.065 *** (0.0187)	−0.0161 (0.0247)	−0.13 *** (0.0220)	−0.0450 ** (0.0222)	−0.0356 (0.0230)	−0.062 *** (0.0130)	−0.043 *** (0.0137)	−0.0182 (0.0158)
Mobile	0.018 *** (0.00224)	0.0174 *** (0.00497)	0.0342 *** (0.00599)	0.0104 ** (0.0046)	0.0210 *** (0.00453)	0.0161 *** (0.00366)	0.0156 *** (0.00320)	0.0113 *** (0.00358)	0.0138 *** (0.00510)
Net Effect	N/A	26.895	37.193	−52.095	N/A	N/A	−0.128	1.259	1.047
Constant	−9.488 (7.464)	−26.31 *** (3.576)	−55.57 *** (8.573)	−44.5 *** (15.70)	−35.66 *** (8.077)	−22.84 *** (7.032)	−1.528 (2.687)	−3.492 * (2.106)	−7.6 97 *** (2.190)
Observations	407	386	407	407	386	407	407	386	407
Number of Country	33	32	33	33	32	33	33	32	33
Hansen_test	22.52	23.61	15.40	23.23	22.16	20.24	22.52	23.46	20.48

<div align="center">**Table 5.** *Cont.*</div>

Variables	Atkinson Index			Gini Coefficient			Palma Ratio		
	Panel A			Panel B			Panel C		
	I	II	III	I	II	III	I	II	III
Hansen Prob	0.429	0.368	0.845	0.389	0.450	0.568	0.429	0.376	0.553
Sargan_test	49.09	41.09	40.75	43.87	38.41	39.98	47.64	40.57	39.40
Sargan Prob	0.000778	0.00805	0.00882	0.00368	0.0165	0.0109	0.00121	0.00927	0.0127
AR(1)_test	−3.971	−3.563	−4.366	−2.988	−3.524	−4.083	−3.808	−3.592	−4.289
AR(1)_*p*-value	0.0000715	0.000366	0.0000127	0.00281	0.000425	0.0000445	0.000140	0.000329	0.0000179
AR(2)_test	−0.200	−0.490	−0.252	−0.598	−0.198	0.0488	−0.386	−0.360	−0.176
AR(2)_*p*-value	0.842	0.624	0.801	0.550	0.843	0.961	0.699	0.719	0.860
No. of Instruments	30	30	30	30	30	30	30	30	30

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. N/A is Not Applicable since a minimum of one assessed coefficient required for calculating net impacts is insignificant. Constants are incorporated in the regressions. The mean value of domestic credit to the private sector (% of GDP) (PCRF) is 18.48; the mean value of bank credit to bank deposit (%) (BCBD) is 16.7; the mean value of private domestic credit from deposit banks (% of GDP) (PCRB) is 71.61.

As presented in Table 5 (column II Panel A), there is a positive net effect from the role of bank credit to bank deposit ratio in moderating the effect of the Atkinson index on GNI per capita. In the columns in Panel B, it can be established that there is a net adverse effect from the role of private credit issued by a deposit bank in moderating the Gini index for economic growth. The results in the columns in Panel C indicate that there is also a net negative effect from the role of Private Credit deposit banks in modulating the Palma ratio for economic growth in SSA. Furthermore, there is a net positive effect from private credit issued by the financial system in modulating the Palma ratio for SSA economic growth. There is a favourable net effect in the relevance of the bank credit to bank deposit ratio in moderating Palma's ratio to economic growth.

4.3. Discussion of Empirical Findings

The financial access variable that signifies the banking system (PCRB) and financial system efficiency (PCRF) positively impacts the Atkinson inequality index. The banking system activity variable (BCBD) has a positive coefficient on the Gini index, and similarly, the financial system efficiency (PCRF) has a positive coefficient on the Palma ratio. The results are all insignificant and this is in contrast with the expectation of the significance of financial inclusion to influence income inequality on economic growth. This result could be adduced to the high proportion of people that are excluded from the income network. It may be due to the low levels of access to financial products and services owing to the level of financial literacy and financial development in the region. Sub-Saharan Africa is one of the regions in the world characterized by a low level of financial market development, and this has largely contributed to the income inequality in the region. This could be due to the absence of a transaction history of late users of the banking system who might have access to financial facilities. Thus, the issues of asymmetric knowledge, such as vulnerability to default risk continue to prevail. The control of loan rates in numerous SSA territories may dampen the banks' motivation to issues loans, mainly when expenses of loaning processes are higher than profit from loans. Another key implication of this result is that there is an urgent need for policymakers to engage in policies and programmes geared towards closing the gap between the wealthy and the economically poor in the region. This will bring about a high degree of income equality in the region. In addition, the government in each of these countries would need to invest massively in education to bridge the gap in financial literacy. This supports the viewpoint of Evans and Jovanovic [43]; Holtz-Eakin et al. [44]; Black and Lynch [25]; Bae et al. [45]; Batabyal and Chowdhury [24] that persistent income inequality can be controlled or minimised through enhanced access to finance by the economically poorer segments of the society.

Furthermore, it is important not to neglect the increased earnings disparity levels in SSA, which have weakened the initiatives of inclusive financing for better access to funds for the impoverished and, in turn, restricted inclusive growth and development on various fronts. The inadequate but growing development of the sub-regional financial system and efficiency may not be enough to mitigate the earnings disparity across the board. This finding corroborates the study of Tita and Aziakpono [6]. However, the result is consistent with the apriori expectation that the banking system's financial accessibility dynamics (PCRB) and financial system efficiency (PCRF) mitigate the Gini index.

In contrast, the dynamics of banking system efficiency (PCRB) and banking system activity (PCRF) reduces the Palma ratio and only the banking system activity variable (BCBD) has a mitigating impact on the Atkinson index. The reduction effect of financial access signifies it is critical for developing nations/regions (such as SSA), where comparatively more of the population experience inadequate access to inclusive formal financial services, to expand financial services to the vulnerable. This finding is in tandem with those of Le, Ho and Mai [46] who assessed the impact of financial inclusion on income inequality in transition economies.

Table 5 shows the unconditional effect of financial accessibility on GNI per capital, which represents positive economic growth. The interactive effect between inclusive financial access and income inequality on economic growth remained negative across model specifications, indicating that the underdevelopment in the financial system causes a reduction in inclusive financial accessibility in SSA. The argument is that the region's financial sector's current state is not adequately stable to minimise income disparity. This is because the relationship between private credit issued by the financial system and the Atkinson index has an increases the GNI per capita (economic growth). If income inequality is controlled given the current level of credit access in SSA, economic growth will abate. This is in agreement with the findings of Asongu, Nnanna, and Acha-anyi [2], who analysed the interactive effect of financial access and income inequality on female employment.

Furthermore, Tchamyou and Asongu [18] recently reported that inclusion in the conventional financial area in SSA is still low because numerous grown-ups do not know about financial accounts. Thus, the excessive dependence of households on the shadow economic sector may clarify why the empirical examination inadequately validates the extensive margin hypothesis. Recall that the extensive margin hypothesis rousing this evaluation posits that components of society that were recently prohibited from the formal economic area (not excluding females) can use accessible finance to engage themselves monetarily to become associated with the formal sector of the economy.

Thus, this motivates the net effect computation at which further enhancing inclusive financial access modulates the negative relationship between earnings disparity and economic growth. Based on this premise, a positive net effect from enhancing financial accessibility for the moderation of the impact of the earnings gap on economic growth is consistently evident in Column II and III of Panels A and C. The net effect has a positive coefficient when all other predictor variables are statistically controlled, which proves the prospects of inclusive financial accessibility in reducing income inequality's adverse impact on economic growth. However, a negative effect was observed in Column I of Panel B and Column I of Panel C, which also shows the low level of inclusive financial access in SSA. Given the result for the net effect, it is concluded that such a net effect has economic importance and makes economic sense.

5. Conclusions and Recommendations

This research empirically assesses how financial inclusion can be utilised to moderate the influence of income inequality on economic growth. This study focuses on 48 nations of Sub-Saharan Africa (SSA) from 1995 to 2017. The study employed a system Generalised Method of Moments (sys-GMM) approach. This issue is of interest for the developing Sub-Saharan Africa (SSA) region since it gives insights into three strategic challenges from

the region's sustainable development agenda in the 21st century. The SDGs referred to here tackle inequality increase (SDG 10), decent work and economic growth (SDG 8) and an inclusive and efficient financial system (SDG 8.10).

The analysis of the moderating role of inclusive financial access on the effect of the earnings gap on economic growth yielded several significant findings. Above all, the results show that the positive net impact from financial accessibility suggests that financially less developed economies such as those in SSA stand to earn the most significant growth and equity gains from financial development. The negative interactive effect of financial access and income inequality on economic growth as established could result from the low level of inclusive financial development in SSA and the dominance of the shadow economy.

Overall, the findings suggest that the effect of financial access on income inequality for inclusive growth is mixed and inconclusive. There are grounds for both a beneficial and adverse impact of inclusive financial accessibility on imbalance, impacting economic growth. The empirical evidence's salient policy recommendations are that financial accessibility is an essential but inadequate encompassing solution for income disparity and improving the vulnerable income groups' involvement in the formal economic environment. Consequently, the monetary access channel must be accompanied by other policy initiatives to reduce the earnings gap's impact on inclusive economic growth. In addition, the high-income disparity may require actionable strategies aimed at the moderation of the impact of earnings disparity to achieve inclusive economic growth. In SSA, policymakers should step-up initiatives to minimise excess liquidity holdings by local banks to encourage microeconomic and industrial activity through lending. The formulation of country-specific policy for comprehensive investment in primary to tertiary education is essential to reduce growth disparity. To achieve financial inclusion, a deliberate effort is required by the policymakers to ensure higher accessibility to financial services. Moreover, the investment in human development schemes will help boost banking and financial system efficiency to create access to credit, improve mobile and agent banking needs, and reduce extreme transaction expenses. This study utilised one aspect of financial inclusion: financial accessibility in evaluating the moderating effect on income inequality and economic growth in SSA. Hence, it would be valuable to include other aspects of financial inclusion, such as financial services usage and quality as alternative independent variables in future studies.

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