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Revisiting the finance-growth nexus in sub-Saharan Africa: Does the level of income inequality matter?

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ABSTRACT

In this paper, the modulating effect of income inequality in the finance-growth nexus using data from 29 sub-Saharan African (SSA) countries is examined. The study examines i) whether financial development still spurs economic growth in the studied countries, and ii) whether income inequality modulates the effect of financial development on economic growth. Three proxies of financial development and four income inequality indicators are used. The financial development indicators used include the financial development index, financial institutions index, and financial markets index, while income inequality is measured by the Palma ratio, the Gini coefficient, the Atkinson index, as well as the composite inequality (Comp) derived from the principal component analysis (PCA). The Generalised Method of Moments (GMM) has been used to examine this linkage. The study found that, on the whole, the beneficial effect of financial sector development on economic growth in the studied countries is weak, at best. This finding has been corroborated by the results of the interaction models, which show that income inequality interacts with financial development to yield a net negative effect on economic growth in four specifications, but a net positive effect in only two specifications. This finding is not surprising given the high level of income inequality that is currently ravaging some of the SSA countries. Policy implications are discussed.

Introduction

The relationship between financial development and economic growth has been found to be predominantly positive. However, there are instances when the link between these two macroeconomic variables has been found to be either negative or insignificant. It is also possible for the relationship between these two variables to be influenced by the introduction of a third modulating variable. Indeed, the introduction of a third modulating variable could either mitigate the negative effect or dampen the positive effect of financial development on economic growth. It is for this reason that this study includes inequality in the finance-growth nexus as a modulating variable to examine whether the introduction of the inequality variable has any significant effect on the relationship between financial development and economic growth in SSA countries.

On the theoretical front, there are currently three dominant views regarding the relationship between income inequality and economic growth. The first view posits that high income inequality has a negative impact on economic growth. High income inequality could impact economic growth negatively through the so-called 'endogenous fiscal

policy' theory. Previous studies, such as those conducted by Alesina and Rodrik (1994) and Alesina and Perotti (1996), among others, have shown that high income inequality has the potential to fuel social unrest and political instability, which are both detrimental to economic growth. Studies have also shown that high inequality could result in under-investment in human capital by segments of society that are deemed to be poor as they are likely to drop out of school (see Cingano, 2014). This ultimately deprives the poorer segments of the society the ability to accumulate physical and human capital, thereby negatively affecting human capital accumulation and economic growth (see Aghion et al., 1999; Galor and Moav, 2004; Cingano, 2014).

Despite the arguments against high income inequality, studies have also shown that high income inequality could also have a positive effect on economic growth. As an example, it has been argued that high income inequality has the propensity to spur economic growth if it provides individuals with the requisite incentives to work harder and to invest in high-risk projects associated with higher rates of return (see Mirrlees, 1971; Lazear and Rosen, 1981). In addition, high income inequality has been found to promote growth in capital accumulation through aggregate savings, thereby reducing the propensity by the rich

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to exponentially increase their consumption (see [Kaldor, 1957](#); [Bourguignon, 1981](#)).¹

Considering the important role played by income inequality on economic growth on the policy front, the current study used four income inequality proxies, namely the Atkinson ratio, the Gini coefficient, the Palma ratio, and a composite income inequality proxy to examine this linkage. To examine the modulating effect of income inequality on the finance-growth nexus, the study computed the interaction terms between each of the proxies of income inequality and financial development, thereby leading to an array of interaction terms between income inequality and financial development proxies in the growth equation. The study also used the principal component analysis (PCA) in a stepwise fashion to compute the composite income inequality proxy (Comp).

The inclusion of the interaction term between the various proxies of income inequality and financial development in the economic growth equation will enable policymakers in SSA to determine whether inequality plays a significant role in the finance-growth nexus in their countries in their quest for a sustained upward growth path². It will also enable policymakers to determine the level of income inequality that should not be exceeded for the beneficial effects of financial development (if any) on economic growth to be maintained. To our knowledge, this may be the first study to examine in detail this linkage in SSA countries in a stepwise fashion using four income inequality proxies and three proxies for financial development.

The remainder of this paper is structured as follows: In Section 2, a summary is given of previous studies on the relationship between financial development, inequality, and growth. In Section 3, the methodology used in the study is provided, while in Section 4, the empirical analysis and the discussion of the results are presented. The study is concluded in Section 5.

Literature review

The debate on the relationship between financial development and economic growth has been ongoing since the 19th century and has attracted a burgeoning of both theoretical and empirical literature. The financial sector plays a critical role in the economy by channelling savings to productive uses. Hence, the more developed the financial sector is, the better the process of resource mobilisation and allocation towards productive borrowers will be.

The positive relationship between financial sector development and economic growth has been supported by a number of studies ([Levine, 1997](#)). The original debate on the role of financial sector development can be traced back to [Schumpeter \(1911\)](#), and [Gurley and Shaw \(1955\)](#). [Schumpeter \(1911\)](#), for example, found the banking sector to be a key player in the facilitation and intermediation of savings, thereby leading to capital accumulation, which leads to economic growth. By extension, this makes financial development an important ingredient for economic growth and development. According to [Gurley and Shaw \(1955\)](#), economic development is likely to be affected negatively if self-finance and direct finance are accessible, but financial intermediaries are not available to allocate them to productive use. In a well-developed financial sector, financial intermediaries are able to facilitate the flow of loanable funds by transmitting the financial assets from savers to investors. The most notable contribution in the finance-growth nexus debate can be attributed to the studies conducted by [McKinnon \(1973\)](#), and [Shaw \(1973\)](#), who highlight the important role that financial reforms play in the development of the real sector of the economy in developing countries. [McKinnon \(1973\)](#), for example, explained the role

of financial sector liberation and development through his complementarity hypothesis, which gauges the demand for money and physical capital in the finance motive for economic development (see also [Odhiambo, 2004](#)). [Shaw \(1973\)](#), in his seminal work, also emphasised the role of financial development through his debt intermediation hypothesis.

On the empirical front, various studies have been conducted to examine the link between finance and growth, but the findings are still mixed and inconclusive. Those studies can be clustered into two groups, namely i) studies that found a positive relationship between finance and growth, and ii) studies that found either a negative or no relationship between finance and economic growth. Some studies in which a positive relationship was found between finance and real sector development include those conducted by [De Gregorio and Guidotti \(1995\)](#), [Odedokun \(1996\)](#), [Ahmed and Ansari \(1998\)](#), [Ang \(2008\)](#), [Hassan et al. \(2011\)](#), [Nyasha and Odhiambo \(2015\)](#), [Akinboade and Kinfack \(2015\)](#), [Kutan et al. \(2017\)](#), [Nguyen et al. \(2019\)](#), [Yang \(2019\)](#), [Ncanywa and Mabusela \(2019\)](#), [Matei \(2020\)](#), [An et al. \(2020\)](#), [Aluko and Ibrahim \(2020\)](#), [Yusheng et al. \(2020\)](#) and [Ustarz and Fanta \(2021\)](#), among others. [De Gregorio and Guidotti \(1995\)](#), for example, while using panel data techniques, found that bank-based financial development has a positive impact on economic growth. [Odedokun \(1996\)](#) also found that bank-based financial development promotes economic growth in about 85 per cent of 71 less-developed countries. [Ahmed and Ansari \(1998\)](#), while examining the relationship between finance and growth in the three major South-Asian economies, namely India, Pakistan, and Sri Lanka, found the impact of financial development on economic growth to be largely positive. [Ang \(2008\)](#), while investigating the link between finance and growth in Malaysia during the period between 1960 and 2003, found financial development to have a positive long-run impact on economic growth. While examining the impact of financial development on growth in low- and middle-income countries, [Hassan et al. \(2011\)](#) found that there is a positive relationship between finance and growth in the studied countries. While examining the impact of financial development on growth in South Africa, [Nyasha and Odhiambo \(2015\)](#) also found a positive relationship between financial sector development and real sector development in South Africa. Similar findings were reported by [Akinboade and Kinfack \(2015\)](#) on the relationship between financial development, growth and millennium development goals in South Africa. [Kutan et al. \(2017\)](#), while examining the relationship between finance and economic growth in MENA countries, found that there is a positive relationship between financial development and growth in the studied countries. [Nguyen et al. \(2019\)](#) also found that stock markets and bond markets support economic growth in middle-income countries. They also found that the bond market has a positive impact on economic growth in high-income countries. [Ncanywa and Mabusela \(2019\)](#), while examining the impact of finance on growth in selected SSA countries, found financial development to have a positive impact on growth. Similar results were found by [Yang \(2019\)](#) for middle-income and high-income countries. While investigating the relationship between finance and growth in 11 emerging European countries using linear and non-linear models, [Matei \(2020\)](#) found the relationship between financial development and economic growth to be positive, although the intensity of the relationship was dependent on the proxy of bank development used. While examining the impact of finance on growth in 30 SSA countries, [An et al. \(2020\)](#) found financial development to have a positive impact on growth in the upper middle-income sample and in the overall sample during the period between 1985 and 2015. [Aluko and Ibrahim \(2020\)](#), while examining the impact of finance on growth in SSA, found that bank-based financial development has a positive impact on growth, although the impact is dependent on the development of the financial institutions. [Yusheng et al. \(2020\)](#) examined the impact of finance on growth in 32 SSA countries during the period 1990–2016. Using dynamic panel estimation techniques, the authors also found finance to have a positive impact on growth, but the level of the impact was dependent on the proxy used to measure

¹ For a detailed discussion on the positive and negative effects of high-income inequality on economic growth, see [Cingano \(2014\)](#).

² Some of the recent studies that have used interaction models include, among others, [Dossou et al. \(2023\)](#), [Asongu and Odhiambo \(2020a\)](#), and [Odhiambo \(2022\)](#).

financial development. More recently, Ustarz and Fanta (2021), while examining whether the effect of financial development varies across different sectors in SSA during the period from 1990 to 2018, found that financial development tends to spur growth in the service and agricultural sectors but only up to a threshold of 47.2% and 31.7%, respectively.

Apart from the above-mentioned studies, there are studies that found the relationship between financial development and economic growth to be negative, insignificant, or inconclusive. They include studies, such as Bolbol et al. (2005), Adu et al. (2013), Nyasha and Odhiambo (2015), Puatwoe and Piabuo (2017), An et al. (2020), and more recently Machado et al. (2021). Bolbol et al. (2005), while examining the relationship between financial development, structure, and economic growth using data from Egypt during the period 1974–2002, found the domestic credit to the private sector to have a negative effect on efficiency-related growth – although its interaction with PCI produces a positive and significant result. Adu et al. (2013), while examining the relationship between finance and growth in Ghana using different proxies for financial development, found that the growth effect of financial development is sensitive to the proxy used. In particular, the study found that financial development exhibited a negative growth effect on economic growth when financial development is measured by the ratio of the broad money stock to GDP. Nyasha and Odhiambo (2015), in examining the dynamic impact of market-based and bank-based financial development on growth using data from the United Kingdom (UK), found bank-based financial development to have a distinct negative impact on growth. Machado et al. (2021) examined the non-linearities on the finance-growth link using data from 36 SSA countries during the period from 1980 to 2015. Their study found a hump-shaped relationship between finance and growth in the studied countries. The authors concluded that the hypothesis of ‘too much finance harms economic growth’ holds true for low-income and less-developed countries – although the required threshold level of financial development is much lower when compared with those of higher-income and more-developed countries.

Puatwoe and Piabuo (2017), while examining the relationship between financial sector development and growth in Cameroon using three indicators of financial development, namely broad money, deposit/GDP and domestic credit to the private sector, found that a negative relationship exists between bank deposits, private investment and economic growth in the short run – even though in the long run, all indicators of financial development had a positive impact on economic growth. More recently, An et al. (2020), while investigating the impact of finance on growth in 30 SSA countries during the period from 1985 to 2015, found a negative relationship between bank-based financial development and economic growth to exist in both low- and lower middle-income country samples. Kim et al. (2012), while examining the relationship between economic growth, financial development, and trade openness using data from a number of countries, found that, while banking development is detrimental to economic growth, stock market development seems to be more favourable to growth in high-income, low-inflation, and non-agricultural countries. Wen et al. (2022), in examining the impact of financial development on economic indicators in 120 countries using a dynamic panel data analysis, found a negative impact of financial development on economic growth, thereby contradicting the traditional supply-leading hypothesis, which posits that financial development spurs economic growth and development.

Methodology

GMM specification

This study uses an extension of the difference GMM technique developed by Roodman to examine the relationship between financial development, income inequality and economic growth. As outlined in studies, such as those by Asongu and Odhiambo (2020a, 2020b);

Tchamyou et al. (2019a), Tchamyou et al. (2019b) and Odhiambo (2020), the GMM technique used in this study has numerous advantages. The technique has been found to be stronger than some other panel data techniques because it limits the proliferation of instruments, thereby leading to more robust estimates (Asongu and Odhiambo, 2020b, 2020c). The technique also takes care of endogeneity in the panel data by incorporating the lagged dependent variable in the equation. The technique is more suitable in our study because it requires the number of countries (cross-sections) to be significantly higher than the periods (years) for each cross-section (country). Since our study has 29 cross-sections and 11 time periods, the GMM is the most suitable technique that can yield more robust results.

Following the work of Odhiambo (2020), Tchamyou et al. (2019a), Tchamyou et al. (2019b), Asongu and Odhiambo (2020a), and Asongu et al. (2019), the model used in this study can be presented as follows:

Variables in levels

$$y_{i,t} = \sigma_0 + \sigma_1 y_{i,t-\tau} + \sigma_2 FIN_{i,t} + \sigma_3 INEQUAL_{i,t} + \sigma_4 FIN \times INEQUAL_{i,t} + \sum_{h=1}^2 \delta_h CV_{h,i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \quad (1)$$

Variables in first difference

$$y_{i,t} - y_{i,t-\tau} = \sigma_1 (y_{i,t-\tau} - y_{i,t-2\tau}) + \sigma_2 (FIN_{i,t} - FIN_{i,t-\tau}) + \sigma_3 (INEQUAL_{i,t} - INEQUAL_{i,t-\tau}) + \sigma_4 (FIN \times INEQUAL_{i,t} - FIN \times INEQUAL_{i,t-\tau}) + \sum_{h=1}^2 \delta_h (CV_{h,i,t-\tau} - CV_{h,i,t-2\tau}) + (\xi_t - \xi_{t-\tau}) + (\varepsilon_{i,t} - \varepsilon_{i,t-\tau}) \quad (2)$$

where:

$y_{i,t}$ = Economic growth – measured by real GDP per capita (see also Odhiambo, 2009; Bekun, 2022).

FIN = three proxies of financial development, namely the overall financial development index (OFDI), financial institutions index (FII), and financial markets index (FMI).

INEQUAL = four proxies of income inequality, i.e., Gini, Atkinson, Palma, and a composite proxy (Comp), which was computed based on the first three proxies using the principal component analysis (PCA).

$FIN \times INEQUAL$ represents the interactions between various proxies of both financial development (i.e., OFDI, FII and FMI) and income inequality (i.e., Gini, Atkinson, Palma and Comp).

CV = a vector of the two control variables used in the study, i.e., inflation and government expenditure.

τ = coefficient of auto-regression.

ξ_t = time-specific constant.

η_i = country-specific effect and.

$\varepsilon_{i,t}$ = the error term.

Identification and exclusion restrictions

In this study, the time-invariant omitted variables are treated strictly as exogenous (see Asongu and Odhiambo, 2020a; Odhiambo, 2020). In order to address the endogeneity problem, the values of the regressors have been used as an instrument in the model. This is to ensure that the fixed effects are removed and cannot influence the investigated nexus.

On the exclusion restrictions, the Difference in Hansen Test (DHT) has been used to test the validity of the exclusion restriction (see Asongu and Odhiambo, 2020a). The Helmert transformation approach has also been used to remove any fixed effects that could be associated with error terms (see Asongu and De Moor, 2017).

Data

The current study focuses on a panel of 29 sub-Saharan African countries for the period 2005 to 2015. The data were obtained from various sources, including the World Development Indicators of the World Bank, the IMF Financial Development Database and the Global

Consumption and Income Project (GCIP). The selection of the study period was largely influenced by the availability of reliable data for the income inequality for all the studied countries. The dependent variable, i.e., economic growth, was obtained from the World Developing Indicators. The first three proxies of income inequality variables, namely the Gini coefficient, the Atkinson index and the Palma ratio, were obtained from the Global Consumption and Income Project (GCIP). The fourth income inequality variable, i.e., a composite index (Comp) was computed based on the first three proxies in a stepwise fashion using the principal component analysis (PCA). The financial development proxies used in this study include: 1) the overall financial development index, which incorporates both financial institutions and financial markets; 2) the financial institutions index, which indicates financial depth, financial access, and financial efficiency; and 3) financial markets index, which shows the level of financial markets depth, financial markets access and financial markets efficiency. The data for all financial development were obtained from the IMF Financial Development Database. Although the impact of financial development on economic growth is expected to be positive, previous studies have shown that, owing to the inefficient financial market systems prevailing in many developing countries, the impact of financial development on economic growth may not be positive as expected. The control variables, namely inflation and government expenditure were also obtained from the World Development Indicators. These variables have been included in the economic growth equation because of the important role that they play in economic growth and development in many developing countries.

A summary of the sources and definitions of the variables included in this study are provided in Appendix 1, while the summary of descriptive statistics is presented in Appendix 2.

Empirical analysis

The results reported in Table 1 show that, when the overall financial development index is used as a proxy for financial development, an increase in financial development has a negative impact on economic growth in the composite income inequality specification, but a positive impact on economic growth in the Gini coefficient specification. However, in the Atkinson and Palma specifications, its impact on economic growth is insignificant. The results also show that the interaction term between the overall financial development and income inequality is consistently negative when composite inequality, Gini and Palma are used as proxies for income inequality, but it is statistically insignificant when Atkinson is used as a proxy. This shows that composite income inequality interacts with the overall financial development to display a negative synergy on economic growth, while Gini inequality dampens the positive effect of the overall financial development on economic growth.

When the financial institutions index (FII) is used as a proxy for financial development, the results show that financial development has a positive impact on economic growth in all the income inequality specifications, i.e., composite income inequality, Atkinson income inequality, Gini income inequality and Palma income inequality. However, when income inequality is interacted with the financial institutions index, the results show that the interaction term has an impact on the economic growth in only the composite inequality and Gini index specifications. Specifically, the results show that the interaction terms between the financial institutions index and composite index and between the financial institutions index and the Gini coefficient are both negative and statistically significant. This shows that, while financial institutions have a positive impact on economic growth, an increase in income inequality measured by the composite index and Gini coefficient has a negative influence on the impact of financial institutions on economic growth. In other words, an increase in composite and Gini income inequality dampens the positive effect of financial institutions on economic growth.

Finally, when the financial markets index is used as a proxy for financial development, the results show that financial development has a consistent negative impact on economic growth in all the income inequality specifications, with the exception of the Gini inequality specification, where the coefficient of financial markets index is statistically insignificant. However, when the financial markets index is interacted with the various proxies of income inequality, the results show that the interaction term has a positive impact on economic growth in three of the four income inequality specifications, namely the composite inequality index, the Atkinson index and the Palma index. Overall, the results show that, on the whole, the financial markets variable has a negative impact on economic growth in the studied countries and that its impact on economic growth only becomes positive when it is interacted with three-income inequality proxies, i.e., composite, Atkinson, and Palma ratios. In other words, this implies that financial markets proxy only has a positive impact on economic growth when it is accompanied by an increase in three income inequality proxies, i.e., composite, Atkinson, and Palma.

To examine the overall impact of inequality in modulating the effect of financial development on economic growth, the corresponding net effects and thresholds are computed as supported by the extant literature focusing on interactive models (see Asongu et al., 2021). Indeed, the net effects will enable us to assess the incidence of income inequality in modulating the effect of financial development on economic growth. Based on our calculations, the net effect of the overall financial development index on economic growth contingent on the Gini coefficient is -16.359 , i.e. $(0.5900604 \times -909.448) + 520.270$,³ while the corresponding Gini inequality threshold is 0.572 , i.e., $520.270/909.448$.⁴ This implies that the level of Gini income inequality that must not be exceeded in order for the financial development to promote economic growth is 0.572 . Unlike in the case of Gini inequality, the results of composite income inequality, although statistically significant, show that composite income inequality interacts with financial development to display only a negative synergy on economic growth.

The corresponding net effects and threshold impact of the financial institutions index, as well as that of financial markets, can also be computed the same way. For the financial institutions, the net impact of financial development on economic growth contingent on composite inequality is 83.477 $[(-0.410624 \times -27.7907) + 72.0656]$, while the composite threshold is 2.593 $(72.0656/27.7907)$. For the Gini inequality, the threshold is 0.6597 , while the net effect is 102.484 . Finally, for financial markets proxy, the net effects are i) -253.813 for composite inequality; ii) -291.149 for Atkinson inequality; and iii) -283.675 for Palma inequality. Likewise, the corresponding thresholds are: i) 3.895 for composite inequality; ii) 0.8464 for Atkinson inequality; and iii) 12.3057 for Palma inequality.

The overall results, therefore, show that 1) Gini income inequality interacts with the overall financial development to induce a negative net effect on economic growth, but interacts with the financial institutions to yield a positive net effect; 2) composite income inequality interacts with the financial institutions index to yield a positive net effect on economic growth, but interacts with financial markets to induce a net negative effect; 3) Atkinson income inequality interacts with financial markets to yield a net negative effect on economic growth; and 4) Palma inequality interacts with financial markets to induce a net negative

³ Where 0.5900604 is the mean value of the Gini income inequality index, -909.448 is the conditional effect from the interaction between Gini income inequality and the overall financial development, and 520.270 is the unconditional effect of the overall financial development (OFDI) on economic growth.

⁴ Where 520.270 is the value of the unconditional effect of the overall financial development on economic growth, while 909.448 is the conditional effect of the interaction between the overall financial development and Gini income inequality on economic growth.

Table 1
Financial Development, Income Inequality and Economic Growth.

Dependent Variable: Economic Growth												
	Overall Financial Development Index (OFDI)				Financial Institutions Index (FII)				Financial Markets Index (FMI)			
	Campsite Inequality Index (Comp)	Atkinson (Atkin)	Gini	Palma	Campsite Inequality Index (Comp)	Atkinson (Atkin)	Gini	Palma	Campsite Inequality Index (Comp)	Atkinson	Gini	Palma
Cons	73.7372*** (0.000)	147.0579* (0.077)	68.1938 (0.396)	69.6777** (0.038)	65.7975*** (0.000)	19.3141 0.760	−223.4462*** (0.008)	53.0442* (0.070)	52.7276*** (0.000)	277.8281*** (0.000)	−2.7064 (0.981)	111.4729*** (0.000)
OFDI/FII/FMI	−83.8067** (0.025)	−137.8712 (0.604)	520.2700*** (0.000)	90.5950 (0.127)	72.0656*** (0.000)	308.4228* 0.052	970.6030*** (0.000)	166.5525*** (0.001)	−229.6065*** (0.000)	−1775.5330*** (0.000)	104.2257 (0.626)	−610.5430*** (0.000)
Composite Inequality Index (Comp)	8.7099* (0.084)	−	−	−	6.3392 (0.185)	−	−	−	−13.4113*** (0.000)	−	−	−
OFDIxComp/ FIIxComp/ FMIXComp	−49.2749 *** (0.000)	−	−	−	−27.7907*** (0.000)	−	−	−	58.9516*** (0.000)	−	−	−
Atkinson (Atkin)	−	−107.2168 (0.373)	−	−	−	63.3996 0.506	−	−	−	−304.5685*** (0.000)	−	−
OFDIxAtkin/ FIIxAtkin/ FMIXAtkin	−	29.7056	−	−	−	−372.2573	−	−	−	2097.8450***	−	−
Gini	−	(0.935)	−	−	−	0.127	−	−	−	(0.000)	−	−
OFDIxGini/ FIIxGini/ FMIXGini	−	−	−32.8805 (0.820)	−	−	−	475.0529*** (0.002)	−	−	−	96.3301 (0.579)	−
Palma	−	−	−909.4480*** (0.000)	−	−	−	−1471.2370*** (0.000)	−	−	−	−461.3643	−
OFDIxPalma/ FIIxPalma/ FMIXPalma	−	−	−	−1.1435 (0.850)	−	−	−	0.8990 (0.851)	−	−	−	−8.6476*** (0.004)
Inf	−0.4657 (0.285)	−0.2602 (0.529)	−0.0985 (0.805)	−0.2062 (0.625)	−0.0839 (0.811)	0.0636 0.882	0.2616 (0.479)	−0.1529 (0.677)	0.3581 (0.197)	−0.0249 (0.930)	0.8495** (0.046)	0.0812 (0.813)
Gov	−5.8463*** (0.000)	−5.8066*** (0.000)	−4.3564*** (0.001)	−5.5710*** (0.000)	−6.5267*** (0.000)	−5.9590*** 0.000	−6.1116*** (0.000)	−6.3827*** (0.000)	−5.6370*** (0.000)	−5.5560*** (0.000)	−5.9160** (0.010)	−4.5551 (0.000)
Time Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Net Effects	N/A	N/A	−16.3590	N/A	83.4770	N/A	102.4840	N/A	−253.8134	−291.1486	N/A	−283.6750
Thresholds			0.5720		2.5930	N/A	0.6597	N/A	3.8948	0.8463	N/A	12.3057
AR(1)Pr > z	0.188	0.194	0.180	0.189	0.192	(0.198)	0.183	0.195	0.196	0.201	0.185	0.206
AR(2) Pr > z	0.157	0.141	0.206	0.156	0.105	(0.125)	0.133	0.106	0.156	0.114	0.170	0.113
Sargan OIR	0.211	0.226	0.209	0.111	0.119	(0.182)	0.121	0.110	0.220	0.345	0.110	0.118
Prob > chi2												
Hansen OIR	0.156	0.168	0.217	0.214	0.286	(0.327)	0.261	0.380	0.177	0.447	0.139	0.655
Hansen test of overid. Restrictions												
Prob > chi2												
(Difference-in-Hansen tests of exogeneity of instrument subsets:)												
DHT for instruments												

(continued on next page)

Table 1 (continued)

Dependent Variable: Economic Growth												
	Overall Financial Development Index (OFDI)				Financial Institutions Index (FII)				Financial Markets Index (FMI)			
	Campsite Inequality Index (Comp)	Atkinson (Atkin)	Gini	Palma	Campsite Inequality Index (Comp)	Atkinson (Atkin)	Gini	Palma	Campsite Inequality Index (Comp)	Atkinson	Gini	Palma
(a) Instruments in levels												
Hansen test												
excluding group:	0.284	0.496	0.441	0.305	0.413	(0.341)	0.620	0.714	0.423	0.820	0.316	0.388
Prob > chi2												
H excluding group												
Difference (null H = exogenous)	0.165	0.116	0.174	0.225	0.254	(0.338)	0.165	0.238	0.142	0.286	0.134	0.680
Prob > chi2												
Dif (null, H = exogenous)												
(b) IV (years, eq(diff))												
H excluding group	0.142	0.242	0.250	0.275	0.304	(0.355)	0.198	0.368	0.107	0.628	0.211	0.711
Dif(null, H = exogenous)	0.358	0.163	0.253	0.206	0.315	(0.300)	0.500	0.393	0.859	0.164	0.164	0.338
Fisher (F)	320645.46	255137.40	531374.89	340437.23	2.96e+06	318439.84	3.93e+06	1.10e+06	1.91e+06	1.03e+06	116281.28	6.36e+06
Instruments	26	26	26	26	27	26	27	27	25	26	27	26
Countries (groups)	29	29	29	29	29	29	29	29	29	29	29	29
(Number of obs)	271	271	271	271	271	271	271	271	271	271	271	271
Observations												

Note: DHT = Difference in Hansen Test for Exogeneity of Instruments Subsets. Dif = Difference. OIR = Over-identifying Restrictions Test. The lagged dependent variable was included the regression analysis.

effect on economic growth.

As in other GMM-centric papers, four main information criteria were employed to examine the validity of the models used in this study. They include: i) the Sargan and Hansen over-identification restrictions (OIR) test; ii) the Difference in Hansen Test (DHT); iii) the Fisher test for the joint validity of the estimated coefficients; and iv) the second-order Arellano and Bond autocorrelation test (see also Odhiambo, 2020; Xu et al., 2021). Based on the overall results reported in Table 1, we can safely say that, on the whole, all the models employed in this study passed these tests; hence, the results can be regarded as reliable and defensible.

Conclusion and policy recommendation

This paper examines the relationship between financial development, income inequality and economic growth in 29 countries located in sub-Saharan Africa, which is currently one of the poorest regions in the world. Although this high level of poverty has been, in part, caused by decades of colonialism, civil wars, political instability and population growth, the high level of income inequality that has been reported in some of these countries has made the situation even worse. Although moderate income inequality is inevitable in any economy, and poverty cannot be alleviated merely by redistributing the existing wealth, but rather by the creation of more wealth, a high level of income inequality, which does not respond to the needs of the poorest of the poor, can serve as a hindrance to achieving a sustained upward growth trajectory. Even though a number of studies have been conducted on the relationship between financial development and economic growth, the modulating effect of income inequality in the finance-growth nexus has not been understood fully, especially in SSA. This study, therefore, attempts to answer two critical questions, namely: i) does financial development still spur economic growth in the studied SSA countries? and ii) does income inequality modulate the impact of financial development on economic growth? To answer these questions, the study employed three proxies of financial development and four proxies of income inequality in a stepwise fashion. The four proxies of income inequality used in this study include the Gini coefficient, the Atkinson ratio, the Palma ratio, and a composite index of these three proxies. The composite index was computed sequentially using the principal components analysis (PCA). The financial development proxies used in this study, on the other hand, include i) the overall financial development index, ii) the financial institutions index, and iii) the financial markets index.

The overall results show that 1) Gini income inequality interacts with the overall financial development (OFDI) to induce a negative net effect on economic growth (with a threshold of 0.572), but interacts with the financial institutions (FII) to yield a positive net effect (with a threshold of 0.6597); 2) composite income inequality interacts with the financial

institutions index (FII) to yield a positive net effect on economic growth (with a threshold of 2.593), but interacts with financial markets (FMI) to induce a net negative effect (with a threshold of 3.8948); 3) Atkinson income inequality interacts with financial markets (FMI) to yield a net negative effect on economic growth (with a threshold of 0.8463); and 4) Palma inequality interacts with financial markets (FMI) to induce a net negative effect on economic growth (with a threshold of 12.3057). These results show that, on the whole, the beneficial impact of financial development on economic growth is weak, at best.

The study attributes these findings to, among other factors, the high level of income inequality, which is currently ravaging some of the SSA countries. This finding has also been corroborated by the unconditional impact of income inequality on economic growth, which has been found to be negative and statistically significant in some specifications. It has also been supported by the results of our interaction models, which show that income inequality interacts with financial development to yield a net negative effect on economic growth in four specifications, but yields a net positive effect in only two specifications.

This finding is not surprising given the fact that the SSA region comprises some of the most unequal countries in the world. The study recommends that policies aimed at reducing income inequality without discouraging foreign direct investment should be implemented in SSA countries in order to address the triple challenges of high unemployment, poverty and income inequality. However, the study cautions SSA countries against casually redistributing the existing wealth for the sake of reducing income inequality since such policies are likely to trigger mass poverty in the long run. Instead, SSA countries should focus on the creation of more wealth through the pursuance of policies such as sound macroeconomic policies, job creation, political stability, foreign direct investment, and skills development. Owing to space constraints, the methodology used in this study was restricted to the GMM estimation technique and the interaction modelling approach. Future studies may explore other panel data estimation techniques such as CC-DOLS, CC-FMOLS, and quantile regression models to establish whether their results will differ fundamentally from the results reported in the current study.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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None.

Appendices

Appendix 1: Definitions of Variables

Variables	Signs	Definitions of variables (Measurements)	Sources
Economic growth	y/N	GDP per capita	WDI
Gini Index	Gini	"The Gini index is a measurement of the income distribution of a country's residents".	GCIP
Atkinson Index	Atkinson	"The Atkinson index measures inequality by determining which end of the distribution contributed most to the observed inequality".	GCIP
Palma Ratio	Palma	"The Palma ratio is defined as the ratio of the richest 10% of the population's share of gross national income divided by the poorest 40%'s share".	GCIP
Income Inequality Composite Index	Comp	Composite index computed by principal component analysis (PCA)	Author's own computation
Overall Financial development index	OFDI	OFDI includes both financial institutions and financial markets	IMF Financial Development Database

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Appendix 1: Definitions of Variables (continued)

Variables	Signs	Definitions of variables (Measurements)	Sources
Financial Institutions Index	FII	FII indicates the level of financial institutions depth, access and efficiency	IMF Financial Development Database
Financial Markets Index	FMI	FMI indicates the level of financial markets depth, access and efficiency	IMF Financial Development Database
Inflation	INF	CPI Inflation	WDI
Government Expenditure	Gov	Government Expenditure	WDI

WDI: World Development Indicators of the World Bank. GCIP: Global Consumption and Income Project.

Appendix 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Atkin	319	0.7075758	0.061735	0.50980	0.8326834
Gini	319	0.5900604	0.0382567	0.48827	0.8516453
Palma	319	6.588153	1.595274	3.01597	14.43498
Comp	319	-0.410624	1.140184	-3.69535	4.768772
OFDI	319	0.1437044	0.106185	0.03554	0.6090677
FII	319	0.2407416	0.1403587	0.06440	0.7302794
FMI	319	0.0412162	0.0899336	0.00000	0.4764373
y	319	1554.805	1527.344	310.4826	6895.574
INF	315	6.821669	6.098345	-4.29487	44.35669
Gov	299	14.27024	6.375578	4.54454	43.48379

References

- Adu, G., Marbuah, G., & Mensah, J. T. (2013). Financial development and economic growth in Ghana: Does the measure of financial development matter? *Review of Development Finance*, 3, 192–203. <https://doi.org/10.1016/j.rdf.2013.11.001>
- Aghion, P., Caroli, E., & Garcia-Penalosa, C. (1999). Inequality and economic growth: The perspective of the new growth theories. *Journal of Economic Literature*, 37(4), 1615–1660.
- Ahmed, S. M., & Ansari, M. I. (1998). Financial sector development and economic growth: The South-Asian experience. *Journal of Asian Economics*, 9(3), 503–517. [https://doi.org/10.1016/S1049-0078\(99\)80100-6](https://doi.org/10.1016/S1049-0078(99)80100-6)
- Akinboade, O., & Kinfack, E. C. (2015). Financial development, economic growth and millennium development goals in South Africa: Is there a link? *International Journal of Social Economics*, 42, 459–479. <https://doi.org/10.1108/IJSE-01-2013-0006>
- Alesina, A., & Perotti, R. (1996). Income distribution, political instability and investment. *European Economic Review*, 40(6), 1203–1228.
- Alesina, A., and Rodrik, D. (1994). Distributive politics and economic growth. *The Quarterly Journal of Economics*, 109(2), 465–490. [10.2307/2118470](https://doi.org/10.2307/2118470)
- Aluko, O. A., & Ibrahim, M. (2020). Institutions and the financial development–economic growth nexus in sub-Saharan Africa. *Economic Notes*, 49(3), e12163.
- An, H., Zou, Q., & Kargbo, M. (2020). Impact of financial development on economic growth: Evidence from Sub-Saharan Africa. *Australian Economic Papers*, 60(2), 226–260. <https://doi.org/10.1111/1467-8454.12201>
- Ang, J. B. (2008). What are the mechanisms linking financial development and economic growth in Malaysia? *Economic Modelling*, 25(1), 38–53. <https://doi.org/10.1016/j.econmod.2007.04.006>
- Asongu, S. A., & Odhiambo, N. M. (2020a). Foreign direct investment, information technology and economic growth dynamics in Sub-Saharan Africa. *Telecommunications Policy*. <https://doi.org/10.1016/j.telpol.2019.101838>
- Asongu, S. A. and Odhiambo, N. M., (2020b). Foreign Direct Investment, Information Technology and Total Factor Productivity Dynamics in Sub-Saharan Africa, African Governance and Development Institute, Yaoundé.
- Asongu, S. A., & Odhiambo, N. M. (2020c). Enhancing governance for environmental sustainability in sub-Saharan Africa. *Energy Exploration and Exploitation*, 39(1), 444–463.
- Asongu, S. A., & De Moor, L. (2017). Financial globalisation dynamic thresholds for financial development: Evidence from Africa. *European Journal of Development Research*, 29(1), 192–212.
- Asongu, S. A., Orim, S. I., & Nting, R. (2019). Inequality, information technology and inclusive education in sub-Saharan Africa. *Technological Forecasting and Social Change*, 146(C), 380–389.
- Asongu, S. A., Nnanna, J., & Acha-Anyi, P. N. (2021). The openness hypothesis in the context of economic development in Sub-Saharan Africa: The moderating role of trade dynamics on FDI. *The International Trade Journal*, 35(4), 336–359.
- Bekun, F. V. (2022). Mitigating emissions in India: accounting for the role of real income, renewable energy consumption and investment in energy. *International Journal of Energy Economics and Policy*, 2022, 12(1), 188–192.
- Bolbol, A., Patheldin, A., & Omran, M. (2005). Financial development, structure, and economic growth: The case of Egypt, 1974–2002. *Research in International Business and Finance*, 19(1), 171–194. <https://doi.org/10.1016/j.ribaf.2004.10.008>
- Bourguignon, F. (1981). Pareto superiority of egalitarian equilibria in Stiglitz' model of wealth distribution with convex saving function. *Econometrica*, 49(6), 1469–1475.
- Cingano, F. (2014). Trends in Income Inequality and its Impact on Economic Growth, OECD Social, Employment and Migration Working Papers, No. 163, OECD Publishing. [10.1787/5jxjncwv6j-en](https://doi.org/10.1787/5jxjncwv6j-en)
- De Gregorio, J., & Guidotti, P. E. (1995). Financial development and economic growth. *World Development*, 23(3), 433–448. [https://doi.org/10.1016/0305-750X\(94\)00132-1](https://doi.org/10.1016/0305-750X(94)00132-1)
- Dossou, T. A. M., Kambaye, E. N., Bekun, F. V., & Eoulam, A. O. (2023). Exploring the linkage between tourism, governance quality, and poverty reduction in Latin America. *Tourism Economics*, 29(1), 210–234.
- Galor, O., & Moav, O. (2004). From physical to human capital accumulation: Inequality and the process of development. *Review of Economic Studies*, 71(4), 1001–1026.
- Gurley, J. G., & Shaw, E. S. (1955). Financial aspects of economic development. *The American Economic Review*, 45(4), 515–538.
- Hassan, K. M., Sanchez, B., & Yu, J. (2011). Financial development and economic growth: New evidence from panel data. *The Quarterly Review of Economics and Finance*, 51, 88–104. <https://doi.org/10.1016/j.qref.2010.09.001>
- Kaldor, N. (1957). A model of economic growth. *Economic Journal*, 67, 591–624.
- Kim, D.-H., Lin, S.-C., & Suen, Y.-B. (2012). The simultaneous evolution of economic growth, financial development, and trade openness. *The Journal of International Trade & Economic Development*, 21(4), 513–537. <https://doi.org/10.1080/09638199.2010.49793>
- Kutan, A. M., Samargandi, N., & Sohog, K. (2017). Does institutional quality matter for financial development and growth? Further evidence from MENA countries. *Australian Economic Papers*, 56(3), 228–248.
- Lazear, E. P., & Rosen, S. (1981). Rank-order tournaments as optimum labor contracts. *Journal of Political Economy*, 89(5), 841–864.
- Levine, R. (1997). Financial development and economic growth: Views and agenda. *Journal of Economic Literature*, 35, 688–726.
- Machado, C. M. D. C., Saraiva, A. F. M. G., & Vieira, P. D. D. (2021). Finance-growth nexus in sub-Saharan Africa. *South African Journal of Economic and Management Sciences*, 24(1), Article a3435. <https://doi.org/10.4102/sajems.v24i1.3435>
- Matei, I. (2020). Is financial development good for economic growth? Empirical insights from emerging European countries. *Quantitative Finance and Economics*, 4(4), 653–678. <https://doi.org/10.3934/QFE.2020030>
- McKinnon, R. I. (1973). *Money and capital in economic development*. Washington: The Brookings Institution.
- Mirrlees, J. A. (1971). An exploration in the theory of optimum income taxation. available at: *The Review of Economic Studies*, 38(2), 175–208 <https://www.jstor.org/stable/2296779>
- Ncanywa, T., & Mabusela, K. (2019). Can financial development influence economic growth: The sub-Saharan analysis? *Journal of Economic and Financial Sciences*, 12(1). <https://doi.org/10.4102/jef.v12i1.194>
- Nguyen, Y. N., Brown, K., & Skully, M. (2019). Impact of finance on growth: Does it vary with development levels or cyclical conditions? *Journal of Policy Modeling*, 41(6), 1195–1209. <https://doi.org/10.1016/j.jpolmod.2019.05.006>
- Nyasha, S., & Odhiambo, N. M. (2015). Financial development and economic growth in South Africa: An ARDL-Bounds testing approach to impact analysis. *Contemporary Economics*, 9(1), 93–108.
- Odedokun, M. O. (1996). Alternative econometric approaches for analysing the role of the financial sector in economic growth: Time-series evidence from LDCs. *Journal of Development Economics*, 50(1), 119–146. [https://doi.org/10.1016/0304-3878\(96\)00006-5](https://doi.org/10.1016/0304-3878(96)00006-5)

- Odhiambo (2004), Financial Liberalisation and Economic Growth in Sub-Saharan African Countries: Dilemmas and Prospects, PhD (Economics) thesis - University of Stellenbosch (South Africa).
- Odhiambo, N. M. (2009). Finance-growth-poverty nexus in South Africa: A dynamic causality linkage. *The Journal of Socio-Economics*, 38, 320–325.
- Odhiambo, N. M. (2020). Financial development, income inequality and carbon emissions in Sub-Saharan African countries: A panel data analysis. *Energy Exploration & Exploitation*, 38(5), 1914–1931.
- Puatwoe, J. T., & Piabuo, S. M. (2017). Financial sector development and economic growth: Evidence from Cameroon. *Financial Innovation*, 3(25), 2–18. <https://doi.org/10.1186/s40854-017-0073-x>
- Schumpeter, J. A. (1911). *The theory of economic development, an inquiry into profits, capital, credit, interest, and the business cycle* (p. 1989). Cambridge MA: Harvard University Press Stern.
- Shaw, E. S. (1973). *Financial deepening in economic development*. New York: Oxford University Press.
- Tchamyou, V. S., Erreygers, G., & Cassimon, D. (2019a). Inequality, ICT and financial access in Africa. *Technological Forecasting and Social Change*, 139(February), 169–184.
- Tchamyou, V. S., Asongu, S. A., & Odhiambo, N. M. (2019b). The role of ICT in modulating the effect of education and lifelong learning on income inequality and economic growth in Africa. *African Development Review*, 31(3), 261–274.
- Ustarz, U., & Fanta, A. B. (2021). Financial development and economic growth in sub-Saharan Africa: A sectoral perspective. *Cogent Economics & Finance*, 9(1). <https://doi.org/10.1080/23322039.2021.1934976>
- Wen, J., Mahmood, H., Khalid, S., & Zakaria, M. (2022). The impact of financial development on economic indicators: a dynamic panel data analysis. *Economic Research-Ekonomska Istraživanja*, 35(1), 2930–2942. <https://doi.org/10.1080/1331677X.2021.1985570>
- Xu, C., Han, M., Dossou, T. A. M., & Bekun, F. V. (2021). Trade openness, FDI, and income inequality: Evidence from sub-Saharan Africa. *African Development Review*, 33(1), 193–203.
- Yang, F. (2019). The impact of financial development on economic growth in middle-income countries. *Journal of International Financial Markets, Institutions and Money*, 59, 74–89. 10.1016/j.intfin.2018.11.008.
- Yusheng, K., Bawuah, J., Nkwantabisa, A. O., Atuahene, S. O. O., & Djan, G. O. (2020). Financial development and economic growth: Empirical evidence from Sub-Saharan Africa. *International Journal of Finance & Economics*, 26(3), 3396–3416. <https://doi.org/10.1002/ijfe.1967>