South African Journal of Economic and Management Sciences
ISSN: (Online) 2222-3436, (Print) 1015-8812

The heterogeneous effects of financial openness on income inequality in sub-Saharan Africa

Authors:
Pieter Opperman[1]
Anthanasius Fomum Tita[2]

Affiliations:
[1]Stellenbosch Business School, Faculty of Economic and Management Sciences, Stellenbosch University, Cape Town, South Africa

[2]Department of Finance, Faculty of Economics and Management Sciences, University of the Western Cape, Cape Town, South Africa

Corresponding author:
Pieter Opperman,
pietero@stellenboschbusiness.ac.za

Dates:
Received: 14 Dec. 2024
Accepted: 02 July 2025
Published: 10 Oct. 2025

How to cite this article:
Opperman, P. & Tita, A.F., 2025, 'The heterogeneous effects of financial openness on income inequality in sub-Saharan Africa', *South African Journal of Economic and Management Sciences* 28(1), a6037. https://doi.org/10.4102/sajems.v28i1.6037

Background: The external determinants of income inequality include financial globalisation or financial openness. The world is increasingly financialised and forms of cross-border investment have grown significantly. Over the past two decades, income inequality and financial globalisation have increased in various countries.

Aim: This study investigated the relationships between different de facto components of financial openness and income inequality.

Setting: Annual panel data for 43 sub-Saharan African countries from 1990 to 2021.

Method: The study employed a moments-quantile regression (MM-QR) estimation procedure that can reveal disregarded heterogeneous covariance effects in panel data models and allow for endogenous explanatory variables.

Results: The findings revealed that foreign direct investment (FDI) and portfolio equity are associated with increases in income inequality, with FDI having a more pronounced effect in more unequal countries and portfolio equity having a less pronounced effect in such contexts. Debt reduces income inequality across all quantile levels, with the strongest effects observed in more unequal countries.

Conclusion: The findings highlight the complex relationship between financial openness and inequality, shaped by its components and inequality levels.

Contribution: The study contributes to the literature as only a limited number of studies have investigated the relationship between overall de facto financial openness, its various components and income inequality in sub-Saharan Africa. The use of a quantile regression approach contributes to the small number of empirical studies employing this approach when investigating the link between financial openness and income inequality.

Keywords: financial openness; income inequality; MM-QR; panel data; sub-Saharan Africa.

Introduction

The literature has identified domestic and external determinants of inequality, but there is no agreement yet about the causes of this (De Haan, Pleninger & Sturm 2018). External or international determinants of income inequality include financial globalisation or financial openness. The world is increasingly financialised, and forms of cross-border investment have grown significantly. Financial openness is a prevalent feature of the global economy, with income inequality a progressively important issue (Ni, Liu & Zhou 2022).

According to Capelle and Pellegrino (2023), from 1971 to 2019, the dollar value of the world's total external assets and liabilities increased from approximately 50% to over 300% of world Gross Domestic Product (GDP). Along with financial globalisation, income inequality has increased within many countries over the past two decades. The 'co-movement' between financial globalisation and income inequality raises an important question about the type of relationship between them (Erauskin & Turnovsky 2022). Hence, the relationship between financial openness and income inequality is contested.

Koudalo and Wu (2022) noted that financial openness could counter market imperfections and incentivise improved allocation of financial resources, allowing the poor the needed investment

funding. Moreover, financial openness could lead to banks providing credit to the most productive borrowers, thereby steering clear of financial resources being concentrated solely on the rich or established firms. Conversely, Furceri and Loungani (2018) noted that the outcome of openness on the chances of financial crises is a channel through which financial openness can affect inequality. The poor suffer overly after such crises, increasing inequality (De Haan & Sturm 2016). Globalisation pressures could force countries to implement labour-saving technologies, decreasing labour's share in national income (Guscina 2006).

Our study investigated the relationship between financial openness and income inequality in sub-Saharan Africa. More specifically, we investigated the link between different de facto components of financial openness and income inequality. Income inequality is a pervasive concern in many African countries (Koudalo & Wu 2022), with a significant percentage of these countries ranking among the most unequal globally (Chancel et al. 2023). Gehringer (2013) noted that it has become common practice to distinguish between de jure and de facto financial openness indicators. De jure indicators are concerned with the presence or absence of legal restrictions on capital transactions, while de facto indicators measure flows or stocks of foreign assets and/or liabilities. Thus, it is not certain that a recognised financially open economy is practically so and vice versa. Although both de jure and de facto indicators contain valuable information, de facto indicators could provide a clearer picture of an economy's financial integration and are, in many empirical cases, more suitable (Kose et al. 2006).

This study contributes to the literature in several ways. Firstly, a limited number of studies have investigated the relationship between overall de facto financial openness, its various components and income inequality. Using de facto financial openness measures allows researchers to investigate the effect of overall financial openness and its various components (Avdjiev & Spasova 2022). The de facto measures of financial openness employed in this study are the stock of gross external liabilities and its components: foreign direct investment (FDI), portfolio equity and debt. Debt comprises portfolio debt and other investments (mostly cross-border bank loans). Avdjiev and Spasova (2022) reported substantial heterogeneity among different financial openness components and income inequality for a panel of 48 advanced and emerging market countries. Figini and Görg (2007) proposed to disentangle the different dimensions of financial globalisation to investigate their social impacts.

Secondly, we focused on a panel of sub-Saharan African countries. The region includes several countries with diverse levels of financial openness and income inequality, allowing for the exploitation of their rich variation to investigate the link between the two variables (Koudalo & Wu 2022). Literature that focuses on Africa is sparse and does not employ de facto financial openness measures or only focuses on one financial openness component. For instance, Kaulihowa and Adjasi (2018) tested the impact of FDI on income inequality in 16 African countries, while Koudalo and Wu (2022) used a de jure measure to test the effect of financial liberalisation on income inequality in 51 African countries. Grasping the possible drivers of inequality in Africa remains an open issue (Chancel et al. 2023). We aimed to supplement the extant literature by providing additional evidence on how overall financial openness and its various components are related to income inequality in the sub-Saharan African region.

Thirdly, from a methodological perspective, we used a quantile regression approach to investigate the link between financial openness and income inequality, thus contributing to the scarcity of empirical studies employing this approach. The approach allows for identifying the impact of financial openness (and its various components) on countries at different quantiles of income inequality. The literature has indicated that the effect of financial openness on income inequality depends on initial inequality levels (Kebede & Tawiah 2023). This study used a recent method of moments-quantile regression (MM-QR) estimation procedure of Machado and Santos Silva (2019). This approach can reveal disregarded heterogeneous covariance effects in panel data models and allow for models with endogenous explanatory variables.

Literature review

Abiad, Oomes and Ueda (2008) showed that financial liberalisation positively relates to better capital allocation efficiency. In turn, a more productive allocation of capital avoids the concentration of financial resources on rich or well-established firms only (Koudalo & Wu 2022). A theoretical contribution regarding the financial liberalisation and income inequality link was provided by Bumann and Lensink (2016), which includes agents with varying investment abilities (investors and savers) and the banking sector. Financial liberalisation lowers the wedge between interest rates on deposits and loans, thereby improving banking sector efficiency. Improved banking sector efficiency that reduces borrowing costs leads to an increase in aggregate loan demand, which requires an increase in the deposit rate to restore financial market equilibrium. The income of savers improves with an increase in the deposit rate and subsequently income distribution. Conversely, for countries with low financial depth, the interest elasticity of the demand for loans is low, indicating that a banking sector efficiency increase with the related borrowing cost decrease will have a minimal impact on loan demand. In this instance, equilibrium in the financial market requires a decrease in the deposit rate, which reduces savers' income, negatively affects income inequality.

Similarly, the relationship between FDI and income inequality presents open and unresolved questions. Foreign direct investment inflows can spur country productivity increases as imported technologies spread through the

TABLE 1: Channel summary of how the different financial openness components could influence inequality.

Channel	De facto financial openness component		
	FDI	PE	DEBT
Access to credit	-	↓	↓
Capital gains	-	↑	-
Funding conditions	-	-	↓
Foreign exchange	↓	↓	↓
Special interest groups	↑	↑	↑
Skilled premium	↑	-	-
Technology diffusion	↓	-	-

Source: Avdjiev, S. & Spasova, T., 2022, *Financial openness and inequality*, BIS Working Papers, Bank of International Settlements (BIS), Basel

FDI, foreign direct investment; PE, portfolio equity; DEBT, debt (portfolio debt + other investment liabilities).

economy decreasing inequality (Avdjiev & Spasova 2022). On the contrary, several reasons exist why FDI could increase income inequality. Jaumotte, Lall and Papageorgiou (2013) noted that financial globalisation, specifically FDI, aggravated a rising inequality trend. A possible explanation is that FDI is often concentrated in higher technology sectors tending to benefit those who already have relatively higher education and skills. Another reason is that multinational enterprises often repatriate profits back to the origin country (Kaulihowa & Adjasi 2018).

Avdjiev and Spasova (2022) summarised the channels through which each component of financial openness may influence inequality (Table 1).

Theoretically, the access to credit channel could operate for all the different financial openness components. The easing of funding conditions with more external finance should enhance access to credit for smaller firms and low-income households (Avdjiev & Spasova 2022). The case is likely stronger for debt flows (mostly cross-border bank loans), considering the bank-based financial systems in developing countries. Relatedly, more financial openness could decrease inequality through the funding conditions channel. Portfolio equity flows may increase inequality through the capital gains channel, as equity holdings tend to be concentrated among the wealthy (Avdjiev & Spasova 2022). If portfolio equity flows are used for tax avoidance and illicit flows, the wealthy disproportionately benefit (Eichengreen et al. 2021).

Foreign direct investment could be associated with increasing inequality through the skilled premium channel. With FDI often concentrated in higher technology sectors, individuals with relatively higher qualifications and skills are more likely to benefit (Jaumotte et al. 2013). The same process driving the skilled premium channel accounts for the creation of the technology diffusion channel, albeit this channel takes longer to emerge and influences inequality in a different direction (Avdjiev & Spasova 2022). Foreign direct investment inflows can allow better technologies to spread through recipient economies, employing more people in high-skilled industries, thereby reducing inequality.

A negative link between the different components of financial openness and inequality is plausible through the foreign exchange rate channel. In the presence of a currency mismatch, local currency appreciation translates into increased creditworthiness for borrowers, increased investment and boosted economic activity (Hofmann, Shim & Shin 2016). Conversely, through the special interest group channel, different components of financial openness may increase inequality. Small elites usually benefit if established interests capture financial liberalisation reforms (Claessens & Perotti 2007).

Empirical work on the relationship between financial openness and income inequality is relatively rare, revealing mixed findings (Koudalo & Wu 2022). Using both de facto and de jure financial openness indicators for a panel of 51 countries, Jaumotte et al. (2013) found that financial globalisation is related to an increase in inequality. Zhang and Ben Naceur (2019) established that financial liberalisation worsened income inequality. Erauskin and Turnovsky (2022) showed that financial globalisation increased overall income inequality. Their findings also suggest that reduced foreign investment costs have a more significant impact on inequality than reduced borrowing costs. Using data from 73 countries from 2000 to 2016 and employing a panel quantile regression approach, Kebede and Tawiah (2023) showed that the impact of financial globalisation on income inequality varied across different de facto and de jure dimensions of financial globalisation. Overall, their results revealed that financial globalisation unfavourably affects income inequality.

Conversely, Li and Yu (2014) found that financial liberalisation in general leads to lower income inequality in Asian countries. The effect was more profound in countries exhibiting greater human capital development. Delis, Hasan and Kazakis (2014) provided cross-country evidence that banking system liberalisation decreases income inequality. Additionally, external capital flow liberalisations and privatisations had a similar effect on inequality. The empirical findings of Bumann and Lensink (2016) showed that financial liberalisation lowers income inequality, conditional on the level of financial depth in the country.

For an African context, Koudalo and Wu (2022) examined the link between financial liberalisation and income inequality using a panel of 51 countries from 1995 to 2018. It was found that income inequality increased with the level of financial liberalisation. A possible explanation is that increasing financial liberalisation encourages banks to distribute financial resources more discriminately to rich clientele while dismissing the poor from access to financial services, thereby widening the income gap. Kaulihowa and Adjasi (2018) examined the impact of FDI on income inequality in 16 African countries. The authors concluded that while FDI improved the distributional aspect of income, a diminishing effect is present with a further increase in FDI, which worsened inequality.

In one of the few studies that investigated the link between multiple de facto financial openness measures (gross external

liabilities and their various components) and inequality, Avdjiev and Spasova (2022) found substantial heterogeneity among the different financial openness components. For instance, as opposed to FDI and portfolio debt, the relationship between portfolio equity and inequality was insignificant for most periods. Moreover, an increase in other investment liabilities, which consisted mostly of cross-border bank loans, was associated with a decrease in inequality as opposed to other external liabilities' components.

Methods

Data, variables and empirical model

The dependent variable ($INEQ_{it}$) refers to income inequality. Following other researchers in the field of income inequality, we used top income shares as a measure (Alvaredo et al. 2017). A limitation of using the Gini coefficient is that impacts on various parts of the income distribution are obscured (Erauskin & Turnovsky 2022). The findings of Erauskin and Turnovsky (2022) suggested that most of the impact of financial openness is experienced at the extremes of income distribution.

Financial openness (FO_{it}) and its various components (i) FDI (FDI_{it}), portfolio equity (PE_{it}) and debt ($DEBT_{it}$) are the main explanatory variables of interest. The following control variables, as standard determinants of income inequality, are included: GDP per capita and its squared term, trade, inflation, financial development and population. The variables and data sources are described as follows:

$INEQ_{it}$ = Income inequality is measured by the top 10% and top 1% income share, using data obtained from the World Inequality Database.

FO_{it} = Stock of foreign liabilities as a percentage of GDP of a country, with data obtained from the External Wealth of Nations Mark II database (updated) of Lane and Milesi-Ferretti (2007).

FDI_{it} = Stock of foreign direct investment liabilities as a percentage of GDP of a country, with data obtained from the External Wealth of Nations Mark II database (updated) of Lane and Milesi-Ferretti (2007).

PE_{it} = Stock of portfolio equity liabilities as a percentage of GDP of a country, with data obtained from the External Wealth of Nations Mark II database (updated) of Lane and Milesi-Ferretti (2007).

$DEBT_{it}$ = Stock of the sum of the stocks of portfolio debt liabilities and other investment liabilities as a percentage of GDP of a country, with data obtained from the External Wealth of Nations Mark II database (updated) of Lane and Milesi-Ferretti (2007).

$GDPpc_{it}$ = GDP per capita (log) (constant 2015 US$) of a country obtained from the World Bank's World Development Indicators. GDP per capita and its squared term were included to control the inverted U-shaped relationship between economic growth and inequality.

$Trade_{it}$ = Trade of a country is the sum of exports and imports of goods and services measured as a share of gross domestic product, with the variable obtained from the World Bank's World Development Indicators. In both empirical and theoretical literature, the impact of trade openness on income inequality is contentious (Bergh & Nilsson 2010). Eliminating trade barriers may increase the demand for unskilled labour, increasing their income (Koudalo & Wu 2022). However, Gourdon, Maystre and De Melo (2008) showed that inequality increases are positively associated with trade openness in countries with an uneducated labour force.

$Inflation_{it}$ = Consumer price index (2010=100) of a country obtained from the World Bank's World Development Indicators. BulÌr (2001) found that lower inflation rates improved income inequality.

$Financial\ Development_{it}$= The Financial Development Index of the IMF ranks countries on the depth, access and efficiency of financial institutions and financial markets. Current theories offer differing expectations about the effect of financial development on income inequality (Altunbaş & Thornton 2020). Demirgüç-Kunt and Levine (2009) noted that finance can operate at extensive and intensive margins.

$Population_{it}$ = Total population (log) of a country obtained from the World Bank's World Development Indicators. An increase in population size might be detrimental to the poor if their share of labour income is fixed in the national income (Koudalo & Wu 2022). However, with larger populations, higher productivity can ensue, potentially increasing wages for the poor.

The relationships between overall de facto financial openness, its various components and income inequality are specified using four empirical models. Different empirical models allow for the possibility of heterogeneity among the links between various components of financial openness and income inequality (Equations 1–4).

$$INEQ_{it} = \beta 0 + \beta 1 FO_{it} + \gamma X'_{it} + \varepsilon_{it} \quad \text{[Eqn 1]}$$

$$INEQ_{it} = \beta 0 + \beta 1 FDI_{it} + \gamma X'_{it} + \varepsilon_{it} \quad \text{[Eqn 2]}$$

$$INEQ_{it} = \beta 0 + \beta 1 PE_{it} + \gamma X'_{it} + \varepsilon_{it} \quad \text{[Eqn 3]}$$

$$INEQ_{it} = \beta 0 + \beta 1 DEBT_{it} + \gamma X'_{it} + \varepsilon_{it} \quad \text{[Eqn 4]}$$

Estimation procedure

In panel data analysis, when the cross-sectional (N) and time (T) dimensions are large, it becomes necessary to investigate the time series properties of the panel data and possible cross-sectional dependence. Given the increasingly globalised world, countries may be correlated because of common

shocks, regional interconnectedness and spillover effects. For weak cross-sectional dependence cases, the correlation between countries reduces as the number of countries increases. Thus, Pesaran (2015) noted that weak cross-sectional dependence errors do not pose any estimation and inferential problems. However, strong cross-sectional dependence is an issue and should be accounted for in the estimation of panel data. Pesaran (2015) developed a framework to test for weak cross-sectional dependence (CD) in panel, and we employed the procedure to investigate whether the CD is weak or whether there is evidence of strong CD. The CD test (Equation 5) is given as follows:

$$CD_{NT} = \sqrt{\frac{2}{N(N-1)}}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\sqrt{T}\hat{\rho}_{ij}\right), \quad \text{[Eqn 5]}$$

where ρ_{it} denotes the correlation coefficient of μ_{it} and μ_{jt} given by $\hat{\rho}_{ij} = T^{-1}\sum_{i=1}^{T}\xi_{it}\,\xi_{it}$ and ξ_{it} are the rescaled residuals defined as: $\xi_{it} = \frac{e_{it}}{\left(T^{-1}e_i e_i\right)^{\frac{1}{2}}}$. Under the above setting, the hypothesis is tested as follows:

H_0: $\gamma = 0$ (*weak CD*) versus H_1: $\gamma \neq 0$ (*strong CD exist*)

Furthermore, the study employed the second-generation panel unit root test developed by Pesaran (2007) that addresses the problem of CD. The technique augments the standard Dickey-Fuller (DF) regression with cross-sectional averages and the lagged levels and differences of the individual series to correct for CD. This allows the standard panel unit root test to rely on the simple averages of the individual cross-sectional augmented Dickey-Fuller (CADF) statistic. The new asymptotic results obtained from the individual CADF and their simple averages are known as the cross-sectional augmented IPS (CIPS) test. The individual $CADF_i$ and the associated $CIPS = T^{-1}\sum_{i=1}^{N} CADF_i$ statistics are examined as $N \to \infty$ followed by $T \to \infty$ and jointly as N and T approach infinity, such that $N/T \to k$, where k is a fixed, finite, non-zero positive constant (Pesaran 2007). The CADF is simple, intuitive and valid when the N and T dimensions are of the same magnitude. Monte Carlo simulations confirm its strong size and power even for small N and T.

Assume y_{it} is the observed i^{th} cross-sectional unit at time t and suppose y_{it} evolved according to a simple dynamic linear heterogeneous panel data model (Equation 6) given as:

$$y_{it} = (1-\emptyset_i)\mu_i + \emptyset_i y_{i,t-1} + \mu_{it}, i = 1,\ldots,N; T = 1,\ldots T \quad \text{[Eqn 6]}$$

where the initial value, y_{i0}, has a given density function with a finite mean and variance, and the error term μ_{it} has a single-factor structure given as Equation 7:

$$\mu_{it} = \gamma_i f_t + \varepsilon_{it} \quad \text{[Eqn 7]}$$

where f_t is the unobserved common factor, and ε_{it} denotes the individual-specific error terms, and combining equations 3 and 4 yields Equation 8:

$$\Delta y_{it} = \alpha_i + \beta_i y_{i,t-1} + \gamma_i f_t + \varepsilon_{it} \quad \text{[Eqn 8]}$$

where $\alpha_i = (1-\emptyset_i)\mu_i$, $\beta_i = -(1-\emptyset_i)$ and $\Delta y_{it} = y_{it} - y_{i,t-1}$. The panel unit root test of interest $Q = 1$ can be expressed as Equation 9:

H_0: $\beta_i = 0$ for all i
H_1: $\beta_i < 0, i = 1, 2, \ldots N, \beta_i = 0, i = N+1, N+2+, \ldots N$ [Eqn 9]

Letting $\overline{\gamma} = N^{-1}\sum_{j=1}^{N}\gamma_j$ and that $\gamma \neq 0$ for a fixed N as $N \to \infty$. The common factor f_t can be approximated by the cross-sectional mean of y_{it}, namely $\overline{y}_t = N^{-1}\sum_{j=1}^{N} y_{it}$ and its lagged values, $\overline{y}_{t-1}, \overline{y}_{t-2}, \ldots \ldots, \overline{y}_{t-N}$. Following Pesaran (2007), a simple case where ε_{it} is serially uncorrelated, the cross-sectional mean and lagged values are sufficient to filter the effects of unobserved common factors, f_t. The test of the unit root hypothesis, equation 6, is based on the t-ratio of the Ordinary Least Squares (OLS) estimate of β_i in Equation 10 (augmented DF regression):

$$\Delta y_{it} = \alpha_i + \beta_i y_{i,t-1} + c_i\overline{y}_{t-1} + d_i\Delta\overline{y}_t + \varepsilon_{it} \quad \text{[Eqn 10]}$$

Finally, the study employed the four-panel structural-based tests of the null hypothesis of no-cointegration developed by Westerlund (2007). Unlike the residual-based cointegration approach, the structural-based technique does not impose any common factor and is designed to test the null hypothesis of no error correction. The four tests are simple and easy to implement. Two tests evaluate the alternative hypothesis that the entire panel is cointegrated, while the other two assess the alternative hypothesis that at least one individual panel is cointegrated (Westerlund 2007). Thus, we implemented the above null hypothesis to evaluate the possibility of a long-run relationship between income inequality and financial openness in Africa.

Next, we employed the advanced quantile via moment (MM-QR) condition developed by Machado and Santos Silva (2019). Studies using mean regressions do not account for the heterogeneity of the relationship between financial openness and income inequality. The MM-QR estimation procedure can reveal disregarded heterogeneous covariance effects in panel data models and allow for models with endogenous explanatory variables. This is important, especially in our case, where the impact of financial openness can vary across the distribution. The MM-QR estimation procedure addresses outliers of the dependent variable by computing changes across its distribution through conditional medians measured in quantile differences. Furthermore, by estimating the location and scale coefficients, MM-QR shows how covariates affect the position and variability of the dependent variable.

Ethical considerations

Ethical clearance to conduct this study was obtained from the University of Stellenbosch and Stellenbosch Business School Research Ethics Committee (No: 32434).

Results

Table 2 presents the summary statistics. Notably, debt comprising the stock of the sum of the stocks of portfolio debt liabilities and other investment liabilities/GDP has the highest average of the main components of financial openness. Based on the skewness statistics, all the variables are not normally distributed, validating the use of a panel quantile estimation approach.

The results of the cross-sectional dependency test are provided in Table 3. All variables are statistically significant at 1%, strongly rejecting the null hypothesis of weak CD. The results suggest shocks in one country could spill over to another. The results of the cross-sectional dependency test suggest using a unit root test able to account for cross-section dependence. The CADF test results are provided in Table 4. All variables are stationary after first-order differentiation. A cointegration test is appropriate because of the unique order of integration. The Westerlund (2007) cointegration test results are shown in Table 5. For all models, the null hypothesis is rejected at the 1% significance level, indicating the existence of long-run relationships between the variables in the model.

Having completed the prerequisite steps, the MM-QR is applied. Four empirical models specify the relationships between overall de facto financial openness, its various components and income inequality. Table 6 displays the outcomes of four models, with the top 10% income share as the dependent variable. Table 7 displays the outcomes of four models, with the top 1% income share as the dependent variable.

The quantiles represent different points in the conditional distribution of income inequality. Estimating the effects of financial openness and its components across these quantiles allows us to assess their impact at varying levels of inequality and provide insights that would be missed by mean-based estimation methods.

Focusing on the relationship between FDI and income inequality, in Table 6, the coefficients of FDI are positive and significant in the 75th and 90th quantiles. In Table 7, the coefficients of FDI are positive and significant in all the quantiles. Further, the coefficients are slightly higher in more unequal countries. The results suggest FDI influences income inequality through the skilled premium channel and the special interest group channel. In developing countries, Jaumotte et al. (2013) reported that FDI is associated with rising income inequality, with inward FDI increasing the relative demand for higher-skilled workforces.

For both portfolio equity models in Table 6 and Table 7, the results indicate that portfolio equity is associated with an increase in income inequality at all quantile levels.

TABLE 3: Cross-sectional dependence test.

Variables	CD	
	Test statistic	*p*-value
Top 10%	11.940***	0.00
Top 1%	4.360***	0.00
FDI	81.650***	0.00
PE	38.100***	0.00
Debt	53.740***	0.00
FO	32.540***	0.00
GDPpc (log)	19.180***	0.00
Trade	12.840***	0.00
CPI	96.360***	0.00
FDindex	30.660***	0.00
Pop (log)	67.760***	0.00

Note: *** is for *p*-value < 0.01 significance level.

CD, cross-sectional dependence; FDI, foreign direct investment; PE, portfolio equity; Debt, debt (portfolio debt + other investment liabilities); FO, financial openness; GDPpc, Gross Domestic Product per capita; CPI, consumer price index (inflation); FD, financial development; Pop, population.

TABLE 4: Panel unit root test results.

Variables	CADF test		
	Level	First difference	Order of integration
Top 10%	-2.067	-2.211***	I(1)
Top 1%	-2.061	-2.071**	I(1)
FDI	-1.702	-2.737***	I(1)
PE	-2.075	-3.073***	I(1)
Debt	-2.467	-3.063***	I(1)
FO	-1.700	-3.117***	I(1)
GDPpc (log)	-2.064	-2.873***	I(1)
Trade	-1.715	-2.817***	I(1)
CPI	-2.022	-2.855***	I(1)
FDindex	-2.412	-3.232***	I(1)
Pop (log)	-2.130	-1.982*	I(1)

Note: ***, ** and * indicate significance at 1%, 5% and 10% respectively.

CADF, cross-sectional augmented Dickey-Fuller; FDI, foreign direct investment; PE, portfolio equity; Debt, debt (portfolio debt + other investment liabilities); FO, financial openness; GDPpc, Gross Domestic Product per capita; CPI, consumer price index (inflation); FD, financial development; Pop, population.

TABLE 2: Summary statistics.

Variables	Mean	SD	Min	Max	Obs	Skewness	Kurtosis
Top 10%	0.52	0.07	0.38	0.72	1376	0.59	2.95
Top 1%	0.18	0.05	0.09	0.36	1376	0.83	3.31
FDI	28.61	33.98	0.00	330.01	1376	3.41	22.13
PE	1.19	4.55	-0.01	59.39	1376	7.79	71.74
Debt	63.66	57.96	0.00	659.06	1376	3.39	23.32
FO	93.52	68.43	0.00	662.55	1376	2.78	15.10
GDPpc (log)	6.11	1.25	0.00	7.21	1376	-2.62	11.77
Trade	492.06	373.54	1.00	1163	1376	0.15	1.70
CPI	515.05	377.57	1.00	1189	1376	0.13	1.71
FDindex	653.91	395.21	1.0	1326	1376	0.00	1.80
Pop (log)	15.83	1.48	11.70	19.18	1376	-0.40	2.76

SD, standard deviation; Min, minimum; Max, maximum; Obs, observations; FDI, foreign direct investment; PE, portfolio equity; Debt, debt (portfolio debt + other investment liabilities); FO, financial openness; GDPpc, Gross Domestic Product per capita; CPI, consumer price index (inflation); FD, financial development; Pop, population.

TABLE 5: Westerlund panel cointegration test results.

Variance ratio	Model 1	Model	Model 3	Model 4
Top 10%	3.13***	3.98***	3.73***	3.83***
Top 1%	3.52***	4.24***	3.78***	4.07***

Note: *** indicates significance at 1%.

All relationships between portfolio equity and income inequality were significant at a 1% level, except for the coefficient in the 90th quantile in Table 7, which was significant at a 5% level. While portfolio equity increases inequality at all quantile levels, its influence lessens as inequality increases. The results imply that portfolio equity influences income inequality through the capital gains channel and the special interest group channel. The results are consistent with Alvaredo et al. (2017), who emphasise that rising inequality is driven because of unequal access to capital gains and financial assets.

For both debt models in Table 6 and Table 7, a negative and statistically significant impact on income inequality is found at all quantile levels. All relationships between debt and income inequality were significant at a 1% level, except for the coefficient in the 10th quantile in Table 6, which was significant at a 5% level. The debt models indicate that the magnitude of the effect slightly increases from the 10th to the 90th quantile. The results suggest that while debt reduces income inequality at all quantile levels, the effect is more pronounced in more unequal countries. The results imply that the access to credit channel, the funding conditions channel and the foreign exchange rate channel appear to dominate the special interest group channel. Using linear regressions, Avdjiev and Spasova (2022) reported that an increase in other investment liabilities is associated with a decrease in income inequality in emerging economies.

Focusing on the relationship between overall financial openness and income inequality, no statistically significant relationship is found. The heterogeneity among the main components of financial openness could account for this finding. Foreign direct investment and portfolio equity were associated with an increase in income inequality, as opposed to debt, which was associated with decreasing income inequality. Avdjiev and Spasova (2022) reported that for 48 countries, the relationship between financial openness and income inequality varies noticeably across the main components of external liabilities. The result complements earlier findings by Koudalo and Wu (2022), who conclude that the advancement of financial liberalisation does not inherently lead to a more equitable income distribution in African countries.

Some general comments about the impact of the other explanatory variables are provided. The results show evidence of an inverted *U*-shaped relationship between economic growth and inequality, verifying the Kuznets (1955) hypothesis. In Table 6, the GDP per capita coefficient is significantly positive while the GDP per capita squared term coefficient is significantly negative in the 50th, 75th and 90th quantiles of all four models. In Table 7, the GDP per capita coefficient is significantly positive while the GDP per capita squared term coefficient is significantly negative in the 25th, 50th, 75th and 90th quantiles of all four models. Increased trade was significantly associated with an increase in income inequality in the 10th quantiles of most models. In the 10th, 25th and 50th quantiles, increased inflation is significantly associated with an increase in income inequality. Population size is associated with a significant decrease in income inequality at all levels of income inequality.

Conclusion and policy recommendations

This study investigated the heterogeneous effects of financial openness across various distributions of income inequality in 43 sub-Saharan African countries from 1990 to 2021, employing the recent MM-QR estimation procedure of Machado and Santos Silva (2019). Before the panel quantile regression analysis, the CD test was used to identify cross-sectional dependence. A second-generation unit root test was used to test stationarity, with a cointegration test to ascertain long-run relationships between the variables.

Our analysis presented notable results. Firstly, the results indicated that the relationship between financial openness and income inequality differs among the main components of financial openness. Foreign direct investment and portfolio equity were associated with an increase in income inequality, while debt was associated with a decrease in income inequality. Secondly, the effect of FDI on increasing inequality is more pronounced in more unequal countries. Thirdly, the effect of portfolio equity on increasing inequality is less pronounced in more unequal countries. Fourthly, while debt reduces income inequality at all quantile levels, the effect is more pronounced in more unequal countries.

Following Kebede and Tawiah (2023) for a different set of countries, we concluded that the impact of financial openness on income inequality in sub-Saharan African countries varies depending on the dimensions of financial openness and initial levels of income inequality. Policies related to globalisation should consider the initial levels of income distribution (Kebede & Tawiah 2023). Also, it is important for sub-Saharan African countries to distinguish between different flow types in policy design.

The FDI-associated increase in income inequality is likely because of the skilled premium channel and the special interest group channel. To mitigate the skilled premium effect, policy strategies to invest in human capital development programmes in FDI-driven sectors should be considered. It is central to structure FDI in ways that the subsequent skill-biased employment is mitigated (Kaulihowa & Adjasi 2018). Mitigating the special interest group effect could require sub-Saharan African countries to encourage FDI in labour-intensive sectors that generate more broad-based employment opportunities.

TABLE 6: Financial openness, its components and income inequality: Dependent variable top 10% income share.

Financial openness component	Location		Scale		MM-QR									
	Coefficient	*T*-statistic	Coefficient	*T*-statistic	τ = 10		τ = 25		τ = 50		τ = 75		τ = 90	
					Coefficient	*T*-statistic	Coefficient	*T*-statistic	Coefficient	*T*-statistic	Coefficient	*T*-statistic	Coefficient	*T*-statistic
FDI model														
FDI	0.00008	1.59	0.00003	1.24	0.00003	0.48	0.00005	0.82	0.00007	1.5	0.00011**	2.24	0.00013**	2.39
GDPpc	0.00736**	2.33	0.00548**	2.34	-0.00067	-0.21	0.00223	0.84	0.00684**	2.24	0.01249***	2.65	0.01586***	2.67
GDPpc sq	-0.00126***	-3.39	-0.00057**	-2.37	-0.00042	-1.04	-0.00072**	-2.04	-0.00121***	-3.30	-0.00180***	-3.59	-0.00215***	-3.49
Trade	0.00000	0.79	-0.00000	-1.88	0.00001**	2.06	0.00001	1.74	0.00000	0.89	-0.00000	-0.11	-0.00000	-0.62
CPI	0.00001***	2.81	-0.00001***	-3.81	0.00002***	5.35	0.00001***	4.96	0.00001***	3.02	0.00000	0.41	-0.00000	-0.62
FDindex	-0.00001	-1.85	0.00000	0.21	-0.00001	-1.91	0.00001**	-2.07	-0.00001*	-1.90	-0.00001	-1.32	-0.00001	-1.04
Pop (log)	-0.04583***	-9.17	-0.00710**	-2.50	-0.03543***	-5.76	-0.03919***	-7.19	-0.04516***	-9.02	-0.05247***	-8.90	-0.05683***	-8.07
Constant	1.25076***	15.82	0.13117***	2.92	1.05858***	10.89	1.12801***	13.08	1.23843***	15.61	1.37368***	14.71	1.45424***	13.01
PE model														
PE	0.00346***	8.38	-0.00010	-0.47	0.00360***	9.03	0.00355***	9.44	0.00347***	8.61	0.00337***	6.44	0.00331***	5.36
GDPpc	0.00994***	3.22	0.00547**	2.45	0.00193	0.59	0.00492*	1.74	0.00936***	3.11	0.01506***	3.41	0.01847***	3.30
GDPpc sq	-0.00154***	-4.10	-0.00056**	-2.38	-0.00071	-1.63	-0.00102***	-2.67	-0.00148***	-3.99	-0.00206***	-4.31	-0.00242***	-4.10
Trade	0.00000	0.52	-0.00000	-1.18	0.00001	1.41	0.00000	1.17	0.00000	0.60	-0.00000	-0.06	-0.00000	-0.31
CPI	0.00001***	3.33	-0.00001***	-3.60	0.00002***	5.77	0.00001***	5.38	0.00001***	3.53	0.00000	0.98	-0.00000	-0.08
FDindex	-0.00001**	-2.02	0.00000	0.47	-0.00001**	-2.19	-0.00001**	-2.32	-0.00001**	-2.09	-0.00001	-1.35	-0.00001	-1.00
Pop (log)	-0.04811***	-10.60	-0.00499*	-2.03	-0.04080***	-7.97	-0.04353***	-9.42	-0.04758***	-10.54	-0.05278***	-9.56	-0.05589***	-8.53
Constant	1.28022***	18.05	0.09685*	2.56	1.13823***	14.16	1.19129***	16.40	1.26984***	17.96	1.37090***	16.01	1.43117***	14.12
Debt model														
Debt	-0.00008***	-4.18	-0.00001	-1.24	-0.00006**	-2.25	-0.00007***	-3.00	-0.00008***	-4.11	-0.00009***	-4.28	-0.00010***	-3.94
GDPpc	0.00629*	2.11	0.00415*	1.94	0.00014	0.05	0.00244	0.95	0.00592**	2.05	0.01012**	2.33	0.01279**	2.35
GDPpc sq	-0.00112**	-3.13	-0.00042*	- 1.84	-0.00050	-1.25	-0.00073**	-2.08	-0.00108***	-3.07	-0.00150***	-3.21	-0.00177***	-3.10
Trade	0.00000	0.71	-0.00000	-1.89	0.00001**	2.05	0.00001	1.68	0.00000	0.81	-0.00000	-0.16	-0.00000	-0.58
CPI	0.00001**	2.33	-0.00001***	-3.47	0.00001***	4.64	0.00001***	4.21	0.00001**	2.52	0.00000	0.25	-0.00000	-0.71
FDindex	-0.00001**	-2.03	0.00000	0.31	-0.00001**	-2.14	-0.00001**	-2.31	0.00001**	-2.09	-0.00001	-1.39	-0.00001	-1.07
Pop (log)	-0.04774***	-9.63	-0.00555*	-2.15	-0.03950***	-7.11	-0.04258***	-8.45	-0.04724***	-9.57	-0.05287***	-8.90	-0.05645***	-8.03
Constant	1.29042***	16.38	0.11007***	2.67	1.12705***	12.80	1.18808***	14.86	1.28041***	16.30	1.39195***	14.66	1.46298***	12.97
FO model														
FO	-0.00003	-1.17	0.00000	0.36	-0.00003	-1.46	-0.00003	-1.44	-0.00003	-1.20	-0.00002	-0.80	-0.00002	-0.61
GDPpc	0.00725**	2.43	0.00557**	2.46	-0.00091	-0.30	0.00203	0.79	0.00668**	2.30	0.01237***	2.77	0.01587***	2.81
GDPpc sq	-0.00120***	-3.37	-0.00057**	-2.39	-0.00037	-0.93	-0.00067*	-1.93	-0.00114***	-3.25	-0.00173***	-3.60	-0.00208***	-3.52
Trade	0.00000	0.77	-0.00000*	-1.76	0.00001**	2.00	0.00001	1.69	0.00000	0.89	-0.00000	-0.06	-0.00000	-0.45
CPI	0.00001**	2.52	-0.00001***	-3.50	0.00002***	4.76	0.00001***	4.40	0.00001***	2.73	0.00000	0.39	-0.00000	-0.58
FDindex	-0.00001*	-1.74	0.00000	0.53	-0.00001**	-2.06	-0.00001**	-2.14	-0.00001	-1.81	-0.00001	-1.08	-0.00001	-0.76
Pop (log)	-0.04248***	-9.08	-0.00476*	-1.95	-0.03551***	-6.67	-0.03803***	-7.88	-0.04200***	-8.99	-0.04687***	-8.42	-0.04985***	-7.63
Constant	1.20104***	16.22	0.09318**	2.44	1.06470***	12.66	1.11387***	14.56	1.19154***	16.11	1.28674***	14.66	1.34514***	13.07
No	1376	-	1376	-	1376	-	1376	-	1376	-	1376	-	1376	-

Note: ***, ** and * indicate significance at 1%, 5% and 10% respectively.

MM-QR, moments-quantile regression; FDI, foreign direct investment; PE, portfolio equity; Debt, debt (portfolio debt + other investment liabilities); FO, financial openness; GDPpc, Gross Domestic Product per capita; CPI, consumer price index (inflation); FD, financial development; Pop, population.

TABLE 7: Financial openness, its components and income inequality: Dependent variable top 1% income share.

Financial openness component	Location		Scale		MM-QR									
	Coefficient	*T*-statistic	Coefficient	*T*-statistic	τ = 10		τ = 25		τ = 50		τ = 75		τ = 90	
					Coefficient	*T*-statistic	Coefficient	*T*-statistic	Coefficient	*T*-statistic	Coefficient	*T*-statistic	Coefficient	*T*-statistic
FDI model														
FDI	0.00008	1.84	0.00002	0.80	0.00012**	2.20	0.00013***	2.67	0.00014***	3.24	0.00016***	3.51	0.00017***	3.20
GDPpc	0.00736	1.91	0.00307	1.58	0.00364	1.39	0.00516**	2.03	0.00706**	2.37	0.01068**	2.34	0.01295**	2.23
GDPpc sq	-0.00126***	-2.86	-0.00034*	-1.78	-0.00066**	-2.02	-0.00083***	-2.75	-0.00104***	-3.29	-0.00144***	-3.29	-0.00169***	-3.09
Trade	0.00000	0.82	-0.00001***	-3.40	0.00001***	2.87	0.00001**	2.02	0.00000	0.70	-0.00001	-1.11	-0.00001*	-1.72
CPI	0.00001**	2.58	-0.00001***	-4.18	0.00002***	7.62	0.00001***	7.00	0.00001***	5.13	0.00000	1.32	-0.00000	-0.10
FDindex	-0.00001*	-1.76	-0.00000	-1.03	-0.00000	-1.05	-0.00001	-1.53	-0.00001*	-1.77	-0.00001	-1.67	-0.00001	-1.56
Pop (log)	-0.04583***	-9.77	-0.00711***	-2.69	-0.03217***	-6.90	-0.03568***	-8.44	-0.04009***	-9.53	-0.04846***	-8.59	-0.05368***	-7.46
Constant	1.25076***	16.86	0.13647***	3.31	0.64837***	8.78	0.71568***	10.67	0.80033***	12.04	0.96105***	10.92	1.06140***	9.43
PE model														
PE	0.00159***	5.38	-0.00033**	-2.29	0.00204***	8.18	0.00187***	7.47	0.00166***	5.92	0.00127***	3.28	0.00102**	2.19
GDPpc	0.00935***	3.04	0.00288	1.55	0.00540**	2.07	0.00688***	2.73	0.00873***	3.05	0.01212***	2.81	0.00102**	2.19
GDPpc sq	-0.00124***	-3.82	-0.00031	-1.64	-0.00082**	-2.48	-0.00098***	-3.20	-0.00117***	-3.75	-0.00153***	-3.64	-0.00176***	-3.38
Trade	0.00000	0.13	-0.00000**	-2.55	0.00001**	2.27	0.00000	1.54	0.00000	0.46	-0.00000	-0.89	-0.00001	-1.35
CPI	0.00001***	4.43	-0.00001***	-3.85	0.00002***	7.58	0.00001***	7.00	0.00001***	5.18	0.00000	1.56	0.00000	0.17
FDindex	-0.00001	-1.62	-0.00000	-0.60	-0.00000	-1.24	-0.00001	-1.57	-0.00001	-1.67	-0.00001	-1.38	-0.00001	-1.24
Pop (log)	-0.03734***	-9.17	-0.00528**	-2.26	-0.03010***	-7.41	-0.03280***	-8.72	-0.03619***	-9.31	-0.04241***	-7.94	-0.04636***	-6.92
Constant	0.75920***	12.06	0.10647***	3.00	0.61335***	9.61	0.66771***	11.31	0.73602***	12.20	0.86128***	10.57	0.94089***	9.22
Debt model														
Debt	-0.00009***	-5.33	-0.00002**	-2.12	-0.00006***	-3.17	-0.00007***	-4.22	-0.00008***	-5.12	-0.00011***	-5.21	-0.00013***	-4.75
GDPpc	0.00681**	2.27	0.00176	0.91	0.00441*	1.83	0.00532**	2.30	0.00637**	2.31	0.00847*	1.94	0.00989*	1.76
GDPpc sq	-0.00096***	-3.05	-0.00019	-0.98	-0.00070**	-2.25	-0.00079***	-2.81	-0.00091***	-3.05	-0.00114***	-2.68	-0.00129**	-2.40
Trade	0.00000	0.15	-0.00001***	-3.20	0.00001***	2.80	0.00001*	1.89	0.00000	0.62	-0.00001	-1.12	-0.00001*	-1.75
CPI	0.00001***	3.57	-0.00000***	-3.41	0.00001***	6.37	0.00001***	5.86	0.00001***	4.24	0.00000	1.14	-0.00000	-0.13
FDindex	-0.00001*	-1.86	-0.00000	-1.08	-0.00000	-1.00	-0.00001	-1.56	-0.00001	-1.83	-0.00001*	-1.76	-0.00001	-1.66
Pop (log)	-0.04096***	-9.13	-0.00658***	-2.83	-0.03198***	-7.80	-0.03539***	-8.96	-0.03931***	-9.12	-0.04718***	-8.14	-0.05251***	-7.19
Constant	0.82996***	11.72	0.13140***	3.61	0.65065***	10.04	0.71886***	11.52	0.79714***	11.69	0.95411***	10.48	1.06053***	9.21
FO model														
FO	-0.00002	-1.14	0.00000	0.21	-0.00003	-1.60	-0.00003	-1.55	-0.00003	-1.25	-0.00002	-0.73	-0.00002	-0.54
GDPpc	0.00795***	2.70	0.00318*	1.71	0.00360	1.45	0.00524**	2.21	0.00726***	2.65	0.01104**	2.62	0.01338**	2.49
GDPpc sq	-0.00106***	-3.46	-0.00034*	-1.81	-0.00060*	-1.92	-0.00078***	-2.71	-0.00099***	-3.35	-0.00139***	-3.41	-0.00165***	-3.19
Trade	0.00000	0.25	-0.00001***	-3.05	0.00001***	2.77	0.00001*	1.91	0.00000	0.64	-0.00000	-1.01	-0.00001	-1.57
CPI	0.00001***	3.82	-0.00000***	-3.53	0.00001***	6.63	0.00001***	6.10	0.00001***	4.46	0.00000	1.28	0.00000	0.05
FDindex	-0.00001	-1.50	-0.00000	-0.72	-0.00000	-0.98	-0.00000	-1.36	-0.00001	-1.52	-0.00001	-1.36	-0.00001	-1.25
Pop (log)	-0.03501***	-8.29	-0.00530**	-2.36	-0.02776***	-6.72	-0.03050***	-7.82	-0.03385***	-8.32	-0.04016***	-7.47	-0.04406***	-6.58
Constant	0.72825***	10.94	0.10613***	3.09	0.58312***	8.94	0.63793***	10.32	0.70515***	10.96	0.83134***	9.93	0.90949***	8.74
No	1376	-	1376	-	1376	-	1376	-	1376	-	1376	-	1376	-

Note: ***, ** and * indicate significance at 1%, 5% and 10%, respectively.

MM-QR, moments-quantile regression; FDI, foreign direct investment; PE, portfolio equity; Debt, debt (portfolio debt + other investment liabilities); FO, financial openness; GDPpc, Gross Domestic Product per capita; CPI, consumer price index (inflation); FD, financial development; Pop, population.

Portfolio equity was found to be associated with an increase in income inequality, likely because of the capital gains channel and the special interest group channel. With portfolio equity holdings tending to be concentrated among the wealthy (Avdjiev & Spasova 2022), capital gains tax reforms should be considered as a way to reduce the regressive effects of portfolio equity. For countries where inequality reduction is an important policy goal, the design and sequencing of liberalisation efforts aimed at balancing their equity impact against other effects may need consideration (Furceri & Loungani 2018). Debt was associated with a decrease in income inequality. With debt comprising mostly other investment liabilities that generally consist of cross-border activity of the banking sector, policies that channel cross-border banking flows to sectors generating broad-based employment and inclusive growth could be considered.

Our results enhance the theoretical comprehension of the distributional consequences of various components of financial globalisation by indicating that its impact is conditional on the initial level of inequality. This reinforces a more nuanced theory of globalisation where the impacts of capital flows depend on domestic structural conditions and existing patterns of inequality. Using a panel quantile estimation procedure, we show that different components of financial globalisation have heterogeneous effects across the income distribution, further highlighting the need for differentiated policy interventions. For sub-Saharan African countries, a differentiated approach and understanding are vital, given entrenched structural disparities, less developed financial systems and human capital deficits could augment channels through which financial globalisation affects domestic welfare outcomes.

Acknowledgements

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

P.O. contributed to the conceptualisation methodology, formal analysis, investigation, writing, visualisation, project administration, software validation, data curation, resources writing, review and editing. A.F.T contributed to the conceptualisation methodology, formal analysis, investigation, writing, visualisation, project administration, software validation, data curation, resources writing, review and editing.

Funding information

The research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Data availability

Data are available from the corresponding author, P.O., upon reasonable request.

Disclaimer

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