

Does export reduce income inequality? An empirical enquiry from the sub-region of sub-Saharan Africa

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Abstract

Purpose – This study investigates the effect of exports on income inequality in sub-Saharan Africa (SSA). While trade is often regarded as a catalyst for growth, SSA's heavy reliance on primary commodity exports has raised concerns about its role in perpetuating income disparities. The research aims to provide empirical evidence on whether exports reduce or exacerbate inequality in the region.

Design/methodology/approach – The study employs panel data covering 39 SSA countries between 2010 and 2018, drawing on data from the World Bank, The United Nations Development Programme (UNDP) and United Nations Conference on Trade and Development (UNCTAD). Both static (fixed and random effects) and dynamic (system-GMM) panel estimation techniques are applied to address issues of endogeneity, serial correlation and heteroscedasticity. Inequality is measured using the Gini coefficient and the adjusted Atkinson index, while explanatory variables include export and import openness, Foreign Direct Investment (FDI), government spending, human development and employment levels.

Findings – Results reveal strong level of persistence of inequality across SSA, with exports found to significantly increase income disparities. Export dependence dominated by capital-intensive and resource-driven sectors such as oil and minerals aggravates inequality by concentrating revenues among elites. Conversely, imports generally reduce inequality by promoting efficiency and broadening access to goods. Other findings show that foreign direct investment and government spending often worsen inequality, while human development and employment contribute modestly to reducing disparities.

Originality/value – This study contributes to the literature by (1) applying a dynamic system-GMM framework to address endogeneity and persistence in inequality, (2) employing Purchasing Power Parity (PPP)-adjusted trade openness measures alongside dual inequality indices and (3) providing SSA-specific evidence linking export structure (commodity dependence) to inequality outcomes.

Keywords Export, Panel data analysis, Trade openness, Generalised method of moments (GMM),

Income inequalities, Primary commodities

Paper type Research article

1. Introduction

Trade remains a central driver of economic growth, accounting for more than half of global nominal Gross Domestic Product (GDP) (Wahab, 2018; Silajdzic and Mehic, 2018; Azdak, 2019; Owan *et al.*, 2023; Saaida, 2023). Despite the substantial contribution of sub-Saharan Africa (SSA) makes to global trade (Saaida, 2023; Azdak, 2019), it is confronted with difficulties in resolving socioeconomic issues and a lack of exports competitiveness (Rodrik, 1998; Mukhopadhyay *et al.*, 2015). Based on data collected from the World Bank's World Development Indicators (WDI), SSA exports were \$523.97 billion in 2023, or 25.78% of regional GDP, a modest decrease from \$554.24 billion in 2022, or 26.89% of GDP (Mukhopadhyay *et al.*, 2015; World Bank, 2023).

In SSA, export growth has largely been driven by primary commodities, including oil, minerals and agricultural raw materials, which are often capital-intensive and enclave-based



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(UNCTAD, 2023). Such export structures may disproportionately benefit capital owners and political elites, while offering limited employment opportunities for low-skilled workers, thereby potentially widening income inequality (Bhorat *et al.*, 2023). At the same time, weak institutional frameworks, limited human capital development and governance challenges may further shape the distributional effects of trade (IMF, 2024). Primary goods such as crude oil, gold, diamonds and cocoa account for a substantial portion of SSA's export profile (Fosu, 2015; Meniago and Eita, 2017). These goods require little value addition and rely heavily on unskilled labour (Hazama, 2017; Thelle *et al.*, 2015). This dependence restricts economic diversification and resilience while reflecting comparative advantages linked to resource availability (Blancheton and Chhorn, 2019; Meniago and Eita, 2017). Extractive exports are the main source of income in Southern and West Africa, while agricultural products like tea, coffee and flowers are contributed by nations like Kenya and Ethiopia (UNCTAD, 2018). Despite regional progress in trade liberalisation, export compositions remain skewed towards primary goods, and export volumes are declining considerably for SSA region. Countries like South Africa stand out for integrating manufacturing exports into their economy, leveraging high-tech production for sustained national development (Fosu, 2015). By contrast, extractive and agricultural export economies face mounting income disparities driven by disproportionate wage and rent distribution between export and import-competing sectors (Eggertsson and Krugman, 2012).

Income inequality poses a critical challenge across SSA, where the region consistently ranks among the highest globally in inequality metrics. Recent data show countries like South Africa, Namibia and Botswana reporting Gini coefficients of 63%, 59.1% and 53.3%, respectively (World Bank, 2023). These disparities are often linked to several factors including sector dualism and wage and rent gaps between export-oriented and import-competing sectors (Eggertsson and Krugman, 2012; Thelle *et al.*, 2015; Hazama, 2017). While trade liberalisation has expanded export volumes, SSA remains dependent on primary goods, exposing the region to global price fluctuations and competitive pressures. Countries such as Nigeria and Ghana, which focus on extractive exports like oil and gold, tend to experience higher inequality due to concentrated export revenues. Conversely, agricultural export economies like Kenya and Benin display relatively lower inequality but are still constrained by limited access to global markets and technology. Despite a growing literature on trade and inequality, three major gaps remain. First, most empirical studies rely on static panel methods that fail to account for the persistence and endogeneity of income inequality. Second, there is limited evidence focussing specifically on SSA using real (PPP-based) trade measures and multiple inequality indicators. Third, recent studies emphasise the importance of institutional and structural conditions; yet these factors are rarely integrated into dynamic trade–inequality models for SSA (Adu and Asamoah, 2024; Mensah *et al.*, 2025).

Earlier theoretical dispositions, including the mercantilist and comparative advantage theories, emphasise the significance of trade in the form of wealth accumulation via positive trade balances. This presupposes that, as economies focus on export-driven industrialisation, wealth is created, hence increased rate of employment and eventually reduced levels of income inequality. However, these theories, in support of the position of the market economy, argue that as wealth is concentrated within the elite merchant groups in society, there is increased spate of inequality and lack of equity in the distribution of resources; this scenario could lead to a wider state of income inequality. It is therefore relevant to mention that whilst income from export-driven activities could lead to wealth creation and reduced levels of income inequality, export industrialisation-driven policies that accommodate the creation of elite merchants in the society could widen the spate of income inequality. In view of the foregoing, it is relevant to assess the impact of exports on inequality in the sub-region of SSA. Structural disposition of economies could also be relevant in assessing the direct and magnitude of impact of exports on income inequalities. Whilst economies characterised by enhanced governance and stable economic indicators could reap the benefits of exports in the form of increased wealth and improved levels of equitable resource distribution, the reverse could be said about economies with weak structural and governance

architecture. The sub-region of SSA has been known to be characterised by poor governance and institutional structures as well as incessant spate of economic instability. It is therefore relevant to empirically test these assumptions in the sub-region.

Despite a growing body of literature on trade and income inequality, three key gaps remain. First, most empirical studies on SSA rely on static panel techniques, which fail to account for the persistence and endogeneity of income inequality. Second, there is limited use of real (PPP-adjusted) trade openness measures alongside multiple inequality indicators, potentially leading to measurement bias. Third, existing studies rarely integrate structural characteristics such as export composition and institutional conditions within a dynamic modelling framework. This study addresses these gaps by making three main contributions. First, it employs a dynamic system-GMM estimator to explicitly account for endogeneity and the persistence of inequality. Second, it uses PPP-adjusted measures of export and import openness in combination with both the Gini coefficient and adjusted Atkinson index to enhance robustness. Third, the study provides SSA-specific evidence linking the region's commodity-dependent export structure to inequality outcomes. In doing so, it offers new insights into why export-led growth has not translated into inclusive development in the sub-region.

2. Literature review

Mercantilist theory, dominant from the 16th to 18th centuries, emphasises the accumulation of national wealth through positive trade balances (Wahab, 2018; Krugman *et al.*, 2012). By focussing on export-driven industries, employment levels increase, theoretically reducing income inequality. However, the concentration of wealth within elite merchant groups often undermined equitable distribution. Adam Smith's absolute advantage theory (Smith, 1776) advocates specialisation based on resource efficiency, suggesting that nations maximise productivity gains by focussing on goods they produce most efficiently. While it increases global output, this model may widen income inequality as less-competitive import-competing sectors experience wage reductions (Eggertsson and Krugman, 2012).

David Ricardo's comparative advantage theory (Ricardo, 1817) emphasises specialisation in goods produced at the least opportunity cost, predicting income equality through labour mobility. However, the theory assumes perfect factor mobility, which is unrealistic. In practice, wage and rent disparities emerge between export-oriented and import-competing sectors, driving income inequality (Sloman, 2006). Expanding on Ricardian principles, this model incorporates sector-specific capital alongside mobile labour, assuming two sectors and two goods (Eggertsson and Krugman, 2012). Export price increases disproportionately benefit capital owners, creating rent gaps and income inequality. Labour mobility is often limited, further exacerbating wage disparities between sectors.

2.1 Review of the H-O model in the context of SSA

The primary theoretical framework linking exports and inequality is the Heckscher–Ohlin model, also known as the North–South H–O theory. This model assumes a two-country, two-input, two-good world. According to the theory, the more intensively a factor is used in production, the greater the returns to that factor. For developing countries, the H–O model suggests that export increases wages for their relatively abundant factor (labour), resulting in a decline in income inequality between labour and capital. However, instead of reducing inequality, exports have increased it in many developing countries (UNDP, 2024). Mamoon (2017) explained that under free trade, firms in developing countries import advanced technologies favouring skilled labour, worsening income inequality. Imports increase demand for skilled labour, creating skill premiums that exacerbate inequality (Thelle, 2017; Mamoon, 2017; Burstein and Vogel, 2016; Lall, 1999). In SSA, where skilled labour is scarce (Barrientos and Kanji, 2002), income inequality arises from wage gaps between workers in export- and import-competing sectors (Eggertsson and Krugman, 2012). Additionally, Hazama (2017)

argued that exports concentrate significant income in capital-intensive industries rather than labour-intensive industries. These rents gap further exacerbates income inequality.

2.2 Exports and income inequality

[Asteriou et al. \(2014\)](#) explored how high-technology exports influenced income inequality across 27 European Union countries during the period from 1995 to 2009. Using static and dynamic panel analyses, including fixed effects (FE) and generalised method of moments (GMM) estimators, their study revealed that while trade globalisation reduced inequality, high-technology exports had no statistically significant effect on income inequality, particularly in high-tech and newly acceded EU member countries. [Williamson \(1997\)](#) analysed historical export patterns in various countries prior to First World War. His research showed that capital-abundant countries, such as Argentina and the United States, experienced a rise in income inequality driven by export dynamics, while labour-abundant countries like Spain and Portugal saw declines in inequality. He used scatterplot descriptive analysis to draw connections between a country's export structure and its income distribution.

The relationship between trade openness and income inequality has been extensively debated. Early theoretical models predict an equalising effect of trade in developing economies due to increased demand for low-skilled labour ([Krugman et al., 2018](#)). However, recent empirical studies suggest that this outcome is highly context dependent. Studies focussing on developing regions show that export composition matters. Export growth driven by manufacturing and labour-intensive sectors tends to reduce inequality, whereas commodity-based exports often increase inequality due to rent concentration ([Bhorat et al., 2023](#); [UNCTAD, 2024](#)). In SSA, where exports are dominated by primary commodities, trade liberalisation may therefore exacerbate income disparities. Recent panel studies employing dynamic techniques provide mixed evidence. [Adu and Asamoah \(2024\)](#) find that trade openness reduces inequality only in countries with higher institutional quality. Similarly, [Mensah et al. \(2025\)](#) show that exports worsen inequality in low-income SSA countries but have neutral effects in more diversified economies. These findings suggest that trade's distributive impact is conditional on domestic structural characteristics.

[Franco and Gerussi \(2013\)](#) examined the role of exports in shaping income inequality across 17 transition economies over a 16-year period. By employing advanced econometric models, such as Least Square Dummy Variable Corrected estimators and bootstrapped standard errors, they found that exports to developed countries worsened inequality due to the displacement of unskilled workers by skilled labour. Conversely, exports to developing economies initially reduced inequality, though this effect reversed in the long term. [Silva \(2007\)](#) investigated the effects of export activities in Mozambique, using GINI and Atkinson indices to measure inequality across two distinct regions – northern and southern Mozambique. His analysis revealed that cash crop exports in the northern districts reduced inequality, whereas vegetable exports in the southern districts increased it, owing to the differing skill compositions and trade orientations of the labour force. [Hazama \(2017\)](#) focused on the income distribution effects of export revenue concentration. The study highlighted that in developing economies, exports concentrated in capital-intensive industries, such as oil and minerals, exacerbate income inequality. Using a FE model and treating inequality as a dynamic variable, Hazama showed robust consistency across post-estimation checks, particularly in countries with resource-driven export sectors.

[Hartmann et al. \(2017\)](#) linked economic complexity in exports to income inequality. By analysing 150 countries over 45 years (1963–2008), they demonstrated that exporting complex products lowers inequality, as these products typically require advanced skills and diversified industries. However, countries exporting simple goods, such as those in SSA, suffer from increased inequality due to the concentration of income in fuel and mining sectors.

[Blancheton and Ding \(2019\)](#) investigated the impact of sectoral export specialisation on income inequality across 52 Western and Asian economies from 1988 to 2014. Employing

system-GMM methods, their findings revealed that sectoral export diversification contributed to rising inequality, while manufacturing-focused exports tended to reduce inequality, particularly in high-income and EU countries. [DiPrete \(2007\)](#) explored the historical evolution of exports and their association with inequality. He argued that the relationship is far more intricate than a direct correlation, suggesting that empirical results vary depending on structural, historical and methodological factors. His comparative perspective emphasised the need to consider regional export compositions and political economies in the analysis.

The empirical literature presents conflicting findings on the relationship between exports and income inequality. While studies such as [Prechel \(1985\)](#) and [Barusman and Barusman \(2017\)](#) suggest that exports contribute to rising inequality by concentrating wealth in capital-intensive sectors, research by [Hartmann et al. \(2017\)](#) and [Hazama \(2017\)](#) argues that exports can reduce inequality, especially when involving complex or labour-intensive goods. [Franco and Gerussi \(2013\)](#) demonstrate that exports to developed economies tend to worsen inequality, whereas exports to developing economies may initially lower it but exacerbate inequality in the long run. [Alcalá and Ciccone \(2004\)](#) emphasise the importance of using real trade openness exports and imports over GDP at constant prices rather than nominal measures, arguing that the latter can distort conclusions about productivity and trade effects. [DiPrete \(2007\)](#) highlights that the relationship between exports and inequality is not straightforward, suggesting that empirical results vary due to differences in structural conditions, historical contexts and methodological approaches. The study underscores the need for region-specific analyses that account for broader economic frameworks influencing inequality. Given these inconsistencies, further research is necessary to assess how exports shape inequality in SSA, applying real export measures and dynamic estimation techniques to provide clearer insights.

2.3 Research hypotheses

The theoretical and empirical literature suggests that the distributional effects of trade depend on export composition, factor endowments and institutional quality. In SSA, where exports are largely commodity-based and capital-intensive, export expansion is more likely to concentrate income among capital owners rather than labour. Empirical studies ([Hazama, 2017](#); [Bhorat et al., 2023](#)) support this inequality-increasing effect.

Conversely, imports may reduce inequality by improving access to goods, enhancing productivity and lowering production costs, particularly for domestic firms ([Helble and Le 2019](#)). Similarly, foreign direct investment (FDI) may exacerbate inequality where it is skill-biased or concentrated in capital-intensive sectors. Improvements in human development are expected to reduce inequality through enhanced capabilities and labour market participation, while government spending may either reduce or worsen inequality depending on its allocation efficiency and governance quality. Based on these arguments, the study formulates the following hypotheses:

- H1. Export openness increases income inequality in sub-Saharan Africa.
- H2. Import openness reduces income inequality in sub-Saharan Africa.
- H3. FDI increases income inequality in sub-Saharan Africa.
- H4. Human development reduces income inequality in sub-Saharan Africa.
- H5. Government expenditure has a significant effect on income inequality in sub-Saharan Africa.

3. Data and methodology

This study adopts a systems GMM approach to explore the relationship between exports and income inequality in SSA. By addressing key econometric issues such as endogeneity,

multicollinearity and serial correlation, the methodology ensures robust and unbiased results. Data sources include UNCTAD, UNDP and World Bank databases, covering 39 SSA countries from 2010 to 2018. Countries with missing inequality or trade data for extended periods were excluded to ensure estimation reliability. Comprehensive diagnostic tests and robustness check further strengthen the validity of the findings, enabling meaningful insights into the dynamics of income inequality in the region. Using panel data for 39 sub-Saharan African countries from 2010 to 2018, the study applies FE, random effects (RE) and system-GMM estimators to account for endogeneity and inequality persistence. Income inequality is measured using the Gini coefficient and the adjusted Atkinson index. The data were collected from World Development Indicators (World Bank), Standardized World Income Inequality Database (SWIID) and UNCTAD and IMF databases.

The theoretical basis of this study is rooted in the principle of comparative advantage, which suggests that countries export goods they can produce efficiently and at lower costs relative to others. SSA countries principally export primary goods where they hold comparative advantages, generating significant export revenues in global markets. However, such export-driven growth often results in increased import inflows, which intensify competition for domestic firms and create wage and rent disparities between export-oriented and import-competing sectors (Eggertsson and Krugman, 2012). These disparities influence the distribution of income within countries. Higher exports can exacerbate income inequality if revenues and gains are concentrated among selected few sectors or individuals. However, if wages and rents are evenly distributed across sectors, the adverse impact on inequality may be mitigated. This dual outcome underscores the importance of analysing the relationship between exports and income inequality through robust empirical methods.

The relationship between exports and income inequality is potentially endogenous. While exports influence income distribution through employment and wage structures, inequality may also affect export performance through political economy channels, institutional quality and social stability. Additionally, omitted variables such as governance and structural transformation may bias estimates in static models. To address these concerns, this study employs the system-GMM estimator developed by Blundell and Bond (1998), which combines equations in levels and first differences. This approach uses internal instruments derived from lagged values of endogenous variables, thereby controlling for simultaneity bias, unobserved heterogeneity and measurement errors. The datasets used in this study are publicly available from the World Bank, UNDP, UNCTAD and SWIID databases. Estimation codes can be provided by the authors upon reasonable request to facilitate replication.

3.1 Model specification

The study utilises a dynamic panel estimation technique to account for the bi-directional relationship between exports and income inequality. Exports influence income inequality by altering employment and wage structures, while income inequality can affect political stability and, consequently, export performance (Hazama, 2017; Blancheton and Chhorn, 2019). A static panel model would fail to address the endogeneity inherent in this relationship, leading to biased estimates.

The model used in this study is adapted from Blancheton and Chhorn (2019) and incorporates the Atkinson index as a measure of income inequality. Given the persistence of income inequality and potential endogeneity, the study employs a system-GMM estimator (Blundell and Bond, 1998). Fixed-effects and random-effects models are also estimated for comparison.

$$ATKindex_{it} = \alpha + \vartheta ATKindex_{it-1} + \delta_1 E.O_{it} + \delta_2 I.O_{it} + \varnothing W_{it} + \sum_{T=1}^T \varphi Ty_{t-T} + u_i + \varepsilon_{it} \quad (1)$$

where

(1) $ATKindex_{it}$ measures income inequality using the adjusted Atkinson index approach

(2) $E.O_{it}$ measures export openness measured by $\left(\frac{\text{export}}{GDP \text{ at } PPP(2010)}\right)$

(3) $I.O_{it}$ represents import openness measured by $\left(\frac{\text{import}}{GDP \text{ at } PPP(2010)}\right)$

(4) $\emptyset W_{it}$, W represents a set of control variables

(5) $\sum_{t=1}^T \varphi Ty_{t-T}$, φT represents “effects of time” as a binary dummy represented with 0 and 1.

(6) δ_1 and δ_2 capture the impact of export and import openness on income inequality, respectively.

(7) u_{it} represents time-invariant country-specific effects.

(8) e_{it} accounts for random disturbances.

The study treats key variables such as export openness, import openness and FDI as endogenous, while using their lagged values as instruments in the system-GMM framework. The validity of the instruments is assessed using the Hansen test of over-identifying restrictions, while the Arellano–Bond test for second-order serial correlation [AR(2)] is used to verify the absence of autocorrelation in the residuals. The results show that the Hansen test fails to reject the null hypothesis of instrument validity, indicating that the instruments used are appropriate. Furthermore, the AR(2) test confirms the absence of second-order serial correlation, supporting the consistency of the estimates. The number of instruments is also kept within acceptable limits relative to the number of groups, thereby avoiding instrument proliferation.

3.2 Description of variables and data source

Income inequality is the dependent variable, measured through two indices:

Adjusted Atkinson index (Adj.ATKId): Available through the UNDP data catalogue (2010–2018), this measure adjusts human development index (HDI) income indices to account for inequality.

Gini coefficient: Sourced from the World Bank Povcal4Net database, this widely used metric complements the Atkinson index by capturing variations in income distribution.

Exports: The primary independent variable is export openness, measured as the ratio of exports to GDP at PPP (2010). Using real export openness mitigates potential distortions caused by nominal price fluctuations, as noted by Alcalá and Ciccone (2004).

Imports: Captures the impact of foreign competition on domestic firm performance.

Human development index: Used as a proxy for overall development, with HDI squared included to test Kuznets’ U-shape hypothesis.

Education index: Reflects human capital levels, derived from UNDP data.

Government spending: Represents public expenditure as a share of GDP, highlighting government efforts to reduce inequality.

Employment rate: Measures workforce participation across sectors, especially export- and import-competing sectors.

Foreign direct investment (FDI): Evaluates the effects of FDI inflows on inequality.

4. Results and discussion

4.1 Descriptive statistics of variables

Table 1 presents the descriptive statistics of the variables used in the study from 2010 to 2018. The statistics provide information on the mean, standard deviation, minimum and maximum values of the variables, helping to explain the distribution and variability of the data across the sample.

The dataset gives information on the interconnection between exports and income inequality of SSA between 2010 and 2018. Inequality is still high with an average Gini of 43.98 and raging between 30.82 and 63.38 demonstrating that there is a lot of variation among countries. The adjusted Atkinson index is also representative of persistent inequality. Exports as a proportion of GDP average 29.3%, but the range is wide, between 7.4% and more than 83%. The issue of exports on inequality seems to be mixed. In a resource-intensive economy with export income focused on extractive industries, revenues will tend to accrue to a small elite, denying the wider trickle-down effect to the rest of the population. This assertion serves to elaborate the reason why nations with significantly large export-to-GDP ratio are still characterised by extreme inequality. More diversified economies that have other manufactured goods or services exports have the advantage of spreading riches amongst more people. This relationship is dependent on other background factors. About 16% of GDP on average would not be enough to address inequalities caused by exports. Poor levels of human development, low sources of education and non-uniform job participation also impose limits to inclusive export benefits. In general, exports are a very important factor, though without supporting measures, it can contribute even to increasing inequality instead of decreasing it.

4.2 Dynamic panel estimation (system-GMM) results for the effect of exports on income inequality

The study estimates Equation (1) in the previous section using two dependent variables (the Gini coefficient and the Atkinson index) by applying the generalised moment method to the panel of 39 sub-Saharan African countries over a period of 9 years (2010–2018). The first section presents the system-GMM on the adjusted Atkinson index while second section presents on the Gini coefficient. The main variable of interest is exports highlighted (Exp/Gdp_ppp).

The system-GMM estimates, presented in Table 2, for SSA confirm strong persistence in inequality. The lagged adjusted Atkinson index is highly significant (0.915, $p < 0.01$), while the lagged Gini coefficient also remains positive and significant (0.436, $p < 0.05$), indicating that inequality is entrenched over time. Exports as a share of GDP increase inequality in both models, with coefficients of 0.078 ($p < 0.1$) for the Atkinson index and 0.095 ($p < 0.05$) for the

Table 1. Descriptive statistics of Variables (2010 to 2018)

Variable	Observation	Mean	Std. dev	Min	Max
Year	351	2014	2.59	2010	2018
Gini Coeff	351	43.98	8.08	30.82	63.38
Adj.ATKId	331	33.76	9.45	14	67.1
Govspendgdp	347	16.00	8.71	3.60	56.71
Fdi	313	6.09	11.25	0.1	103.3
Exp/Gdp_ppp	331	29.29	13.16	7.41	83.18
Imp/Gdp_ppp	331	44.42	19.29	10.29	145.39
Hdi	351	50.83	9.53	31.9	79.6
Emp_pop14	350	59.90	15.04071	2.2	83.9
Edu_id	351	45.33	12.07873	18	73

Source(s): Authors' own work (2025)

Table 2. Dynamic panel estimation (system-GMM): the effect of exports on income inequality

Dependent variables	Adj.ATKId Sys-GMM	GiniCoefficient Sys-GMM
Lag GINI coefficient		0.43595**
Lag ADJ.ATK index	0.91452*** (0.11135)	
Exp/Gdp_ppp (2010)	0.07769* (0.04086)	0.09451** (0.04458)
Imp/Gdp_ppp (2010)	−0.05735 (0.04436)	−0.09024** (0.03854)
InEDU_IDx	0.56140 (1.06948)	−0.13645 (0.24627)
FDI	0.07412* (0.03758)	−0.00058 (0.02656)
DHDI	0.18155* (0.10337)	0.00083 (0.14586)
DHDISqd	−0.00975 (0.00969)	0.00193 (0.00785)
EMP_Pop14	0.10468 (0.14493)	−0.01354 (0.06541)
GOV.SPNDIN.GDP	0.08698 (0.07308)	0.15024** (0.07331)
Constant	−6.51309 (16.13217)	25.02552** (10.66009)
Observations	242	265
Number of countries	39	39
F-statistics	28.89*** (0.0000)	5.89*** (0.0000)
Number of instruments	39	39
Number of groups	38	31
Hansen statistic	30.39 (0.345)	26.89 (0.185)
Arellano–Bond AR(2)	0.53 (0.596)	−0.74 (0.460)
Time dummies	No	No

Note(s): Robust standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. These indicate levels at significance at 1%, 5% and 10%, respectively. The dependent variables are Gini coefficient and adjusted Atkinson index (Adj.ATKId). Time dummies are not significant. OID and AR(2) are the Hansen over-identification test of all instruments and second order autocorrelation respectively. First lag of dependent variable used for FE, RE and Sys-GMM. The italicized value 0.07769 indicates statistical significance at the 10% level ($p < 0.10$)

Source(s): Authors' own work (2025)

Gini model. This suggests that export dependence, largely commodity-driven, aggravates disparities. Imports, however, have the opposite effect: the Gini model shows a significant reduction in inequality (-0.090 , $p < 0.05$), while the Atkinson model's effect is negative but insignificant (-0.057). Other variables yield mixed results. FDI raises inequality in the Atkinson model (0.074 , $p < 0.1$) but is insignificant in the Gini model. Differenced Human Development Index (DHDI) reduces inequality in the Atkinson model (0.182 , $p < 0.1$) but not in the Gini model. Government spending significantly worsens inequality under the Gini specification (0.150 , $p < 0.05$), pointing to inefficiencies or elite capture.

4.3 Diagnostic tests

The study presents some post estimation tests undertaken in order to make the necessary corrections. Some of the diagnostics tests have already been mentioned in the previous section. These includes test for multicollinearity, test for heteroscedasticity, the test for serial correlation, the Hansen test for validity of instruments and the Hausman test for choosing between the random and fixed effect model.

Multicollinearity: From our correlation matrix, we found very high multicollinearity between education index and HDI and HDI squared. Therefore, we took the natural logarithm of education index which lowered the level of multicollinearity between education and HDI. To deal with the multicollinearity between HDI and its square, we applied a trick by differencing HDI. This is done by subtracting the mean HDI from its successive values and then we took the square of the differenced HDI (HDI square). This resulted in a low correlation between HDI and its square. In addition, the interpretation is unaffected. The variance inflation factor is below 2.

Heteroscedasticity: We test the presence of heteroscedasticity using the modified Wald test for group-wise heteroscedasticity and we find the presence of group-wise heteroscedasticity significant at 5% for our dynamic panel estimation. We dealt with this by using the robust command (see [Tables 3](#) and [4](#)).

Autocorrelation: For our dynamic panel estimation, we find the absence of second-order autocorrelation at 5% significance. The AR(2) values are -0.74 (P -value = 0.46) and 0.53 (P -value = 0.596), respectively, for Gini coefficient and adjusted Atkinson index from [Tables 5](#) and [6](#).

Test for over-identifying restrictions: The study used several internal instruments based on the dependent variable. For Gini coefficient, the internal instrument used includes FDI, government spending (% GDP) and employment (% population). For the adjusted Atkinson index (as the dependent variable), the number of internal instruments used includes exports (as a share of GDP at 2010 prices), imports (as a share of GDP at 2010 prices at 2010 prices), education index, government spending (as % GDP), employment (as % population), FDI, HDI and HDI square. The study employs the Hansen test to determine the validity of instruments for

Table 3. Test for Heteroskedasticity (static panel) – adjusted Atkinson index

Test statistic	Value
Test	Modified Wald test for group-wise heteroskedasticity in fixed-effects regression model
Null Hypothesis (H_0)	$\sigma(i)^2 = \sigma^2$ for all i (Homoskedasticity)
χ^2 (39)	3137.39
Prob > χ^2	0.0000
Source(s): Authors' own computation using STATA 13	

Table 4. Test for Heteroskedasticity (static panel) – Gini coefficient

Test statistic	Value
Test	Modified Wald test for group-wise heteroskedasticity in fixed-effects regression model
Null Hypothesis (H_0)	$\sigma(i)^2 = \sigma^2$ for all i (Homoskedasticity)
χ^2 (39)	12572.70
Prob > χ^2	0.0000
Source(s): Authors' own computation using STATA 13	

Table 5. Test for autocorrelation (static panel) – adjusted Atkinson index

Test statistic	Value
Test	Wooldridge test for autocorrelation in panel data
Null Hypothesis (H_0)	No first-order autocorrelation
F (1, 38)	1777.970
Prob > F	0.0000
Source(s): Authors' own computation using STATA 13	

Table 6. Test for autocorrelation (static panel) – Gini coefficient

Test statistic	Value
Test	Wooldridge test for autocorrelation in panel data
Null Hypothesis (H_0)	No first-order autocorrelation
$F(1, 38)$	62.976
Prob > F	0.0000
Source(s): Authors' own computation using STATA 13	

the dynamic panel estimation. The P -values for our dynamic estimations are 0.185 and 0.345 for both the Gini coefficient and adjusted Atkinson index. Therefore, we fail to reject the null hypothesis that overidentifying restrictions are valid, that is to say, the instruments are valid for both models at 5%.

4.4 Static panel estimation result for the effect of exports on income inequality (fixed and random effect)

The regression results examining the determinants of income inequality in SSA, measured by the adjusted Atkinson index (ADJ.ATKId), using both FE and RE models are presented in [Tables 7](#) and [8](#). In both models, the lagged inequality term is highly significant and positive

Table 7. Static panel estimation: the effect of exports on income inequality using Adj.ATKId

Adjusted ATKIndex	(1) FE model (ADJ.ATKId)	(2) RE model (ADJ.ATKId)
L.adatkid	0.53719*** (0.07775)	0.94138*** (0.02360)
Exp/Gdp_ppp	0.03180** (0.03355)	0.00992** (0.01544)
Imp/Gdp_ppp	−0.01470 (0.01619)	−0.00937 (0.01193)
Dhdi	0.84718*** (0.28536)	0.04014* (0.02342)
Dhdisq	0.00958 (0.01181)	0.00084 (0.00119)
Fdi	0.03533** (0.01645)	0.03209* (0.01733)
emp_pop14	−0.44838** (0.19664)	0.00124 (0.01348)
lnedu_idx	−13.85241 (10.58776)	−0.02108 (0.07027)
Govspendgdp	−0.01765 (0.09861)	0.03288 (0.02080)
Constant	101.57308* (52.50196)	1.46465 (1.59391)
Observations	242	242
R-squared	0.54932	
F -statistic	25.97*** (0.0000)	
Number of rid	39	39
Time dummies	No	No

Note(s): Robust standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. These indicate levels at significance at 1%, 5% and 10%, respectively. The dependent variable is the adjusted Atkinson index (Adj.ATKId). Time dummies are not significant

Source(s): Authors' own work (2025)

Table 8. Static panel estimation: the effect of exports on income inequality using Gini

	(1)	(2)
Gini coefficient	FE model (GINI)	RE model (GINI)
L.Ginicoefficient	0.69807*** (0.03128)	0.94100*** (0.01807)
Exp/Gdp_ppp (2010)	0.05986** (0.03030)	0.02405* (0.01402)
Imp/Gdp_ppp (2010)	−0.03206** (0.01411)	−0.02914*** (0.01163)
DHDI	−0.28975 (0.24001)	0.02821 (0.02102)
DHDI _{sq}	0.00501 (0.00954)	−0.00102 (0.00112)
FDI	0.00950 (0.00845)	0.02241 (0.01690)
EMP_Pop14	−0.04942 (0.16921)	0.02490*** (0.01214)
lnEDU_IDx	17.12870 (12.94196)	0.07940 (0.06108)
GOV.SPNDIN.GDP	0.14274* (0.07782)	0.07833*** (0.01893)
Constant	−60.24384 (60.12930)	0.01805 (1.33289)
Observations	265	265
R-squared	0.46615	(0.000)
F-statistic	86.66*** (0.0000)	
Number of rid	39	39
Note(s): Robust standard errors in parentheses: *** <i>p</i> < 0.01, ** <i>p</i> < 0.05, * <i>p</i> < 0.1. These indicate levels at significance at 1%, 5% and 10%, respectively. The dependent variable is the Gini coefficient. Time dummies are not significant		
Source(s): Authors' own work (2025)		

(0.537, $p < 0.01$ FE; 0.941, $p < 0.01$ RE), indicating strong persistence in inequality over time. This suggests that once inequality is high, it tends to remain entrenched. Exports as a share of GDP (Exp/Gdp_ppp) show a positive but statistically insignificant effect (0.032 FE; 0.010 RE), implying that export growth alone does not systematically reduce disparities. Imports (Imp/Gdp_ppp) have a negative coefficient (−0.015 FE; −0.009 RE) but are also insignificant, suggesting limited direct of influence on inequality. Human development change (Dhdi) reduces inequality significantly in the FE model (0.847, $p < 0.01$) but only marginally in the RE model (0.040, $p < 0.1$), highlighting the importance of improvements in human welfare. Similarly, FDI is positively associated with inequality (0.035 FE, $p < 0.05$; 0.032 RE, $p < 0.1$), pointing to the unequal distribution of foreign investment benefits. Employment-to-population ratio reduces inequality in the FE model (−0.448, $p < 0.05$), consistent with the view that job creation mitigates disparities. Education index (−13.85 FE; −0.021 RE) and government spending (−0.018 FE; 0.033 RE) are insignificant, indicating weak redistributive effects.

With respect to Gini, inequality shows strong persistence, with lagged Gini significant at 0.698 (FE) and 0.941 (RE), confirming its entrenched nature. Exports as a share of GDP increase inequality significantly (0.0598, $p < 0.1$ FE; 0.0240, $p < 0.05$ RE), reflecting the region's reliance on primary commodities, where benefits are concentrated among elites. In contrast, imports reduce inequality, with coefficients of −0.0321 ($p < 0.05$ FE) and −0.0291 ($p < 0.05$ RE), suggesting that access to goods and technology can narrow disparities. Other

effects are mixed. Human development change (DHDI) is insignificant (-0.289 FE; 0.028 RE), while FDI is also nonsignificant (0.009 FE; 0.022 RE), implying limited distributional benefits. Employment reduces inequality in the FE model (-0.049) but raises it in the RE model (0.025 , $p < 0.05$), reflecting labour market differences. Government spending worsens inequality (0.143 FE, $p < 0.1$; 0.078 RE, $p < 0.01$), pointing to weak redistribution. Overall, exports aggravate inequality, while imports play an equalising role.

4.3 Discussion of empirical results

The empirical results from the system-GMM estimation provide strong evidence of persistence in income inequality across SSA, consistent with prior studies (Hazama, 2017; Blancheton and Chhorn, 2019). The positive and significant coefficient of the lagged dependent variable indicates that inequality is structurally entrenched and difficult to reverse in the short term.

The finding that export openness increases income inequality is consistent with studies emphasising the unequal distributional effects of commodity-based exports (Bhorat *et al.*, 2023; UNCTAD, 2024). In contrast to the predictions of the Heckscher–Ohlin framework, which suggests that trade should benefit abundant labour in developing economies, the results indicate that SSA's export structure dominated by capital-intensive primary commodities concentrates income among a limited group of capital owners. This result aligns with Hazama (2017) and Franco and Gerussi (2013), who find that exports in developing economies often exacerbate inequality when driven by resource-based sectors. However, it contrasts with studies such as Hartmann *et al.* (2017), which show that exports can reduce inequality when associated with complex and diversified production structures.

Unlike studies that report an equalising effect of trade, our results suggest that export structure and weak institutions constrain inclusive outcomes. The study also tested the Kuznets (1955) hypothesis and found out that HDI and its squared term do not represent position of the Kuznets (1955) hypothesis, in contrast to several studies that use the GDP as a measure of development. Using the Gini coefficient as the measure of income inequality, HDI and its squared term had their expected signs; however, squared HDI was insignificant while HDI was significant at 10%. On the other hand, using the adjusted Atkinson index as the measure of income inequality, HDI and its squared term were both insignificant. Considering the net FDI (as a share of GDP), the systems GMM results show that FDI increases income inequality (using adjusted Atkinson index) by 0.074 units at 10% level of significance. This result is however insignificant when Gini coefficient is used as the measure of income inequality. Net FDI inflow has been proven to raise income inequality (International Monetary Fund (IMF), 2007; Lee, 2006; Asteriou *et al.*, 2014; Barusman and Barusman, 2017). Lee (2006) arrived at the same conclusion about the inequality-increasing effect of FDI using a panel data of 14 EU countries over a period of 41 years. However, Hazama (2017) found a negative effect for FDI on income inequality for both high-income and lower-income economies.

Another main determinant of income inequality is the level of government spending. The results in Table 2 showed that government spending raises income inequality (Gini Coefficient) significantly at 5% by 0.15 units. However, its effect on the adjusted Atkinson index is positive but insignificant. Some papers found out that government spending has no significant effect on income inequality (e.g. Hartmann *et al.*, 2017). Others also found a significant negative effect between government spending and income inequality (e.g. Majeed, 2020). The study also showed that employment rate and education index have insignificant effects on income inequality over the selected countries within the period. These results however are not in agreement with the study of Gerrusi and Ferrara (2013) who found education to be the channel through which unskilled labour units are made skilled. Their study found out that at the early stage of education, income inequality increases and reduces at the later stage of education. Hartmann *et al.* (2017) also showed that education and employment increase the rate of income inequality in one out of three models, while the remaining two

models found them to be insignificant, just as it is in this study. In agreement with our studies are a few papers (Hazama, 2017; Hartmann *et al.*, 2017). From Table 3, imports were found to lower income inequality at 5% level of significance (when the adjusted Atkinson index represented income inequality). However, insignificant effects were found when Gini coefficient represented income inequality. This effect is as well confirmed by a few papers (Hazama, 2017). Some studies found a significant negative effect in developing economies (Gerrusi and Ferrara, 2013). Helble and Le (2019) argued that people import based on their level of income. In addition, many import-competing firms import machines and materials that promote efficiency and labour. In contrast, the work of Barusman and Barusman (2017) found a positive impact of import openness on income inequality.

The findings are quite interesting but unexpected. One thing that it reveals is how welfare and income equality is linked to imported goods/services relative to export. Recent dynamic panel studies confirm that trade reduces inequality only when accompanied by strong human capital and institutional quality (Adu and Asamoah, 2024; Mensah *et al.*, 2025). Our findings reinforce this conditional interpretation, as human development consistently mitigates inequality effects.

As it is found that export revenue increases inequality, one can conclude that export revenues end up enhancing the wealth and welfare of the middle-to-upper class than the lower class.

Though relevant, these findings come at variance to the known narrative that suggests that export increases economic development. This means that there should be further research into the various contributors to national exports and their associated value chains to attempt tracing how various players along these value chains proportionately benefit from export revenues to better appreciate the sources of inequalities and how to address them. Human development and employment show modest positive impact on reducing equality. Hence, by increasing national spending on human development, industrialisation and job creation policies and programs, SSA countries would be able to reduce inequalities.

Most importantly, the main aim of this study is to investigate the effect of exports on income inequality for 39 selected SSA countries over the period of 2010–2018. The results of the systems GMM estimation in Table 2 show that a unit increase in exports will increase income inequality (Adj.ATkid) by 0.078 (2.d.p), at 10% level of significance. In addition, a unit increase in exports raised income inequality (Gini coefficient) by 0.095 (2.d.p), at 5% level significance. In both cases, the results showed that exports are major drivers of income inequality in sub-Saharan Africa. The various components of exports are significant in explaining the dynamics of income inequality. Based on data obtained from the World Bank's WDI (2019), a key driver of exports in sub-Saharan Africa is primary exports. Primary exports form the largest share of the sub-regions' exports. Incomes are clustered within this sector than others; therefore, workers within this sector tend to earn more than workers in other sectors, resulting in considerable income inequality. Agreeing to these results are a number of empirical papers (Prechel, 1985; Barusman and Barusman, 2017; Franco and Gerussi, 2013; Dawood *et al.*, 2017). On the other hand, a few papers argue otherwise (Silva, 2007; Hazama, 2017; Goldberg and Pavnick, 2007; Asteriou *et al.*, 2014).

5. Conclusions

This study provides new dynamic evidence on the export–inequality nexus in SSA. By accounting for persistence, endogeneity and structural characteristics, the results demonstrate that export-led growth alone is insufficient for inclusive development. Complementary policies in education, diversification and governance are essential to ensure equitable outcomes. Exports have been identified to be a key variable in determining income inequality (UNDP, 2024). In this study, we investigated the effect of exports on income inequality in sub-Saharan Africa. The Heckscher–Ohlin model forms the theoretical underpinning for this study. The model predicts that exports will reduce income inequality in developing countries. As a

limitation, the theory could not explain why income inequality is rising in developing countries such as those in SSA. Further extensions to the model (Mamoon, 2017) attributed rising income inequality to the inflow of technology, creating skill premiums in developing countries (Lall, 1999). Our study, however, found that unskilled labour is highly dominant and uniform in SSA (Barrientos and Kanji, 2002; World Bank, 2013; Hazama, 2017); therefore, skilled labour is insignificant to the extent that skill premiums are not significant within the sub-region. We therefore attribute the anomaly of rising income inequality to the wage and capital gaps created between exporting and importing competing sectors. To test this assertion, our study used the dynamic model specification by Blancheton and Chhorn (2019). The panel data collected served as the main reason for using the system-GMM. The results from the analysis revealed that exports, foreign direct investment (FDI), and the human development index (HDI) exacerbate income inequality (Adj. ATKID). In addition, exports and government spending worsen income inequality (Gini coefficient). But imports improve income inequality. The positive effect of SSA exports on income inequality is also found in a few studies (Prechel, 1985; Mamoon, 2017; Barusman and Barusman, 2017).

In conclusion, our study argues that exports worsen income inequality. This is because exports create a wage-gap between labour units employed within exporting and import competing sectors, thereby worsening income inequality. This is also the case because of the nature of sub-Saharan exports which is dominated by primary exports. Primary exports form more than 50% of sub-Saharan exports. These types of exports are largely made up of fuels and mineral exports. Primary exports also create higher incomes for capital owners by concentrating export revenues within capital intensive sectors. This further worsens income inequality. Government spending worsens income inequality because we suspect that government spending is largely channelled towards a few elite groups, leaving a larger portion of the population unaddressed. This worsens the income inequality (Gini coefficient). FDI worsens income inequality because it is channelled into business ventures or avenues that create income gaps, creating higher income inequality (Adj.ATkid). Imports lower income inequality because many import-competing firms purchase foreign goods that aid production and efficiency.

The findings of this study have important policy implications for SSA. First, there is a critical need for export diversification towards labour-intensive and value-added sectors such as agro-processing and light manufacturing. This would broaden income distribution by increasing employment opportunities across different skill levels.

Second, governments should improve the efficiency and targeting of public expenditure to ensure that it benefits wider segments of the population rather than being concentrated among elites. Investments in education, healthcare and rural infrastructure are particularly important for enhancing inclusive growth.

Third, FDI policies should be aligned with inclusive development objectives by prioritising sectors with high employment generation potential rather than capital-intensive extractive industries. Finally, strengthening institutional quality and governance frameworks is essential to ensure that export revenues are equitably distributed and contribute to reducing inequality.

Appendix

The appendices provide supplementary information supporting the empirical analysis of exports and income inequality in sub-Saharan Africa. Appendix Table A1 presents the correlation matrix of the study variables, showing the strength and direction of relationships among the variables and helping to assess potential multicollinearity issues. Appendix Table A2 contains the list of 39 sub-Saharan African countries included in the study based on data availability and consistency for the period 2010–2018.

Table A1. Correlation matrix

	Ginico	Adj.ATKid	Gov/gdp	fdi	exp_gdp	imp_gdp	Dhdi	emp_p14	edu_id
ginico	1								
Adj.ATKid	−0.1833	1							
gov/gdp	0.1329	−0.0299	1						
Fdi	−0.1495	−0.0515	0.0756	1					
exp_gdp	0.118	0.3981	0.1027	0.1148	1				
imp_gdp	−0.1558	0.0129	0.5074	0.53	0.4177	1			
Dhdi	0.3441	0.6163	0.1976	−0.138	0.3675	−0.0026	1		
emp_p14	−0.0646	−0.1552	−0.0926	0.0669	−0.3476	−0.0176	−0.271	1	
edu_id	0.4101	0.349	0.1917	0.0448	0.3247	0.1348	0.8497	−0.2572	1
Source(s): Authors' own computation using STATA 13									

Table A2. List of 39 sub-Saharan African countries for empirical analysis

Benin	Gabon	cp
Botswana	Gambia T	Namibia
Burkina faso	Ghana	Niger
Burundi	Guinea	Nigeria
Cote D'Ivoire	Guinea Bissau	Rwanda
Cameroon	Kenya	Sao Tome
Central African republic	Lesotho	Senegal
Chad	Liberia	Sierra Leone
Comoros	Malawi	South Africa
Congo republic	Mali	Togo
Dr Congo	Mauritius	Uganda
Djibouti	Mauritania	Zambia
Eswatini	Mozambique	Zimbabwe
Ethiopia		

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