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Research article

X-raying tourism and income inequality dynamics in Sub-Saharan Africa: Testing the Kuznets hypothesis

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ABSTRACT

To achieve inclusive and sustainable growth, it is necessary to examine the impact of growth strategies on income distribution. The present paper aims to investigate the distributional effect of tourism on income inequality under the Kuznets hypothesis using a panel of 28 Sub-Saharan African (SSA) countries from 2005 to 2023. The study employs the Driscoll-Kraay Standard Error and Feasible Generalised Least Squares (FGLS) estimation techniques for analysis and finds a U-shaped relationship between tourism and income inequality, indicating that, in the industry's earlier stages, inequality is lower but increases in its later stages. With respect to the control variables, human capital consistently reduces inequality, whereas trade openness and economic growth worsen it. The study concludes that carefully managed tourism can effectively reduce income inequality in SSA and calls for tourism strategies that maximise tourism benefits while preventing a reversal as it progresses. Thus, possible suggestions include stage-specific tourism policy interventions that incorporate human capital development and financial support for local tourism operators to avoid distributional imbalances as tourism development proceeds. The study is novel in applying the Kuznets proposition to the dynamics of tourism-income inequality linkage in SSA.

KEYWORDS

Income inequality; Kuznets hypothesis; tourism, Sub-Saharan Africa; sustainable development

Introduction

Despite efforts to combat income inequality, it remains a persistent problem in Sub-Saharan Africa (SSA). While SSA experienced average annual GDP growth of 3.8% between 2000 and 2020, it is among the most unequal regions in the world. In 2018, the Gini coefficient in the region was 0.429 (compared to the world average of 0.390), with the top 10 per cent of the population controlling over half of total income, and the bottom 50 per cent earning less than 10 per cent (World Bank, 2018; Chancel et al., 2022). Inequality suppresses the effect of economic growth on poverty alleviation, weakens social cohesion, and halts progress towards sustainable development that leaves no one behind. Therefore, mitigating income disparity becomes crucial for the region to achieve inclusive growth. In line with the continental framework, the Africa Agenda 2063 aims to harness natural resources to secure a peaceful and prosperous future for Africa. Tourism is being utilised to promote growth and structural change in most SSA countries, as it creates employment opportunities (Tafere et al., 2021), generates tax revenue (Tang & Abosedra, 2014), enhances foreign-exchange earnings (Tugcu, 2014) and promotes inclusive development (Acha-Anyi et al., 2021). The history of inequality is associated with Kuznets' (1955) inverted-U relationship with economic growth. Kuznets assumed that during early development, investment and opportunities accumulate in specific sectors/regions, leading to higher inequality. Later in the growth process, jobs and wealth are generated on a wider scale, thereby minimising inequality. The Kuznets curve theory has been tested in various contexts and has been extended to examine the tourism-income inequality linkage. In relation to the hypothesis, it is suggested that, in its early stages, tourism promotes income inequality, as most of the benefits are captured by capital owners

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and foreign investors, before it ultimately reduces it through the creation of broad-based employment opportunities and institutional control. Studies examining the nonlinear relationship between tourism and income inequality under the Kuznets hypothesis have produced mixed results. Akarsu (2022), Kumali (2023), Subramaniam (2022), and Uzar & Eyuboglu (2019) provide support for the inverted U-shaped Kuznets curve. Alternatively, Chi (2021) and Zang (2023) observed an N-shaped pattern, whereas Gosh & Mitra (2021) observed a U-shaped pattern, a finding supported by Adeniyi et al. (2023). In SSA, where tourism has become increasingly important, this line of analysis is limited; rather, most studies examine how institutional factors, such as governance, democracy, and corruption, moderate tourism's impact on income inequality. Filling this gap is crucial to establishing a solid empirical foundation for determining whether and how tourism-led growth can foster inclusiveness. In this context, this paper investigates the relationship between tourism development and income inequality in Sub-Saharan Africa, with a particular focus on testing the Kuznets hypothesis. The study aims to provide empirical evidence for development policy and tourism planning in the region by examining whether tourism-induced growth first increases inequality and then narrows the gap. This dynamism is crucial to advancing tourism strategies that not only stimulate economic growth but also stem endemic income disparities in Sub-Saharan Africa.

Literature review

The relationship between tourism development and income inequality has received greater empirical interest in the last twenty years. With tourism emerging as a core part of the growth policies of many developing economies, policymakers have increasingly come to see tourism as a pro-poor, labour-intensive industry with the potential to deliver inclusive growth. Nevertheless, scholars have questioned whether increased tourism growth leads to a more even distribution of income. Its redistributive impacts, based on empirical studies, depend on factors such as the country's situation, the level of economic development, institutional capabilities, and the structural peculiarities of the tourism industry. In general, the empirical literature can be divided into four broad strands (1) those studies that support the idea that tourism reduces inequality; (2) those studies that support the idea that tourism causes inequality; (3) those studies that find statistically insignificant effects; and (4) studies that explore the idea that there are nonlinear dynamics similar to the Kuznets-curve. The existing literature on single-country studies indicates that tourism development helps close income gaps. The early and influential country-level research by Blake et al. (2008), Li et al. (2016), Shahbaz et al. (2020), and Sudsawasd et al. (2022) shows that tourism growth can reduce income inequality. These researchers mostly attribute this to the equalising effect of the labour-intensive nature of the tourism industry and its ability to create both skilled and unskilled labour in the services and informal sectors. Recent facts still confirm this view. The study by Comerio & Pacicco (2024), using provincial data from Italy, reveals that tourist arrivals, as a proxy for tourism, are a conditional convergence factor that boosts the rate of income convergence across regions. Their findings suggest that tourism may serve as a spatial equaliser when integrated into a supportive regional framework. On the same note, Soyu Yildirim (2024) indicates that a one-unit rise in tourism inflows leads to a 0.03 per cent drop in income inequality in Turkiye, with Boa Hoang (2024) also reporting similar distributional gains in Singapore.

Various scholarly findings also support the narrative of inequality reduction. In his study of 113 countries between 1995 and 2012, Lv (2019) finds that tourism, measured by receipts, arrivals, and expenditures, significantly reduces regional income inequality. The findings of Nguyen et al. (2020), using data from 97 countries between 2002 and 2014, show that international tourism has a consistently negative effect on income inequality across the three subsamples. However, they also observed that the equalising effects of domestic tourism depend on institutional reforms, meaning that governance structures determine its distributive consequences. Further, a cross-country analysis by Subramaniam et al. (2022), based on the nine countries with the most equitable income distributions worldwide, finds a decline in inequality as tourism develops. Parallel results are reported by Castilho & Fuinhas (2025) for 24 EU member states, Dossou & Berhe (2024) for 30 African countries, and Paramati & Nguyen (2023) for 21 economies in the Asia-Pacific. Taken together, these studies indicate that tourism can contribute more to a more equal allocation of income when it is underpinned by effective institutional structures and strong domestic connections. Conversely, there is also a parallel body of evidence that tourism can intensify income inequality. Blake (2008), in his analysis of Kenya, Uganda, and Tanzania, reveals that tourism-related industries yield lower incomes for poorer families than other export sectors. Lee (2009) also notes that states in the United States that rely on tourism have higher income inequality than non-tourism-intensive states, and that this inequality has increased more rapidly in the former. On the same note, Incera and Fernandez (2015) find that the increase in inbound tourism to Galicia is connected with increasing income disparity.

This inequality-enforcing view is also supported by some cross-country panel studies. In their analysis of 49 developing countries, Alam & Paramati (2016) report that tourism development increases

income inequality. Raza & Shah (2017), based on 43 major tourist destinations, and Tan & Morimoto (2019), based on 138 developing economies, report similar findings. In more recent times, Adeniyi et al. (2023) in the Southern African Development Community (SADC), Ramos-Herrera (2024) in developed economies, and Sergo et al. (2024) in 115 developed nations invariably prove that tourism increases income inequality. These observations have been attributed to structural characteristics of tourism-based economies, such as enclave development, the concentration of foreign ownership, skill-based labour, and the spatial concentration of tourist activities. In this regard, tourism can generate aggregate growth without distributional benefits. Nonetheless, not all studies experience a statistically significant correlation between tourism development and income inequality. Across advanced economies, Fang et al. (2020), Chi (2021), and Gosh & Mitra (2021) find no significant impact of tourism development on income distribution. These zero results indicate that tourism's magnitude relative to overall economic activity may be too small to significantly alter distributional arrangements, or that its impact may be moderated by other macroeconomic influences.

Following inconclusive results on linearity, researchers have further examined nonlinear relationships within the Kuznets curve model to determine whether tourism development has an inverted-U-shaped impact on inequality, before alleviating, or more intricate trends. An inverted-U-shaped relationship is supported by Akarsu (2022) in the case of selected thirty-four countries in Europe, the Balkans and Anatolia, Kumali et al. (2023) in the case of South Asia, Subramaniam et al. (2022) in the case of the nine leading equal-income nations, and Uzar & Eyuboglu (2019) in the case of Turkey. These findings indicate that capital owners and skilled labour may receive a larger share of tourism benefits at the outset of growth, but as the industry becomes established and interconnected, redistributive effects become more prominent. Conversely, Chi (2021) observes an N-shaped Kuznets curve in developed and developing economies, indicating a cyclical pattern in inequality as tourism evolves. Zhang (2023) supports the presence of an N-shaped relationship between domestic and inbound tourism with urban-rural income disparity in China. Simultaneously, Gosh & Mitra (2021) report a U-shaped correlation across developing countries, implying that tourism can decrease inequality in its initial phases but increase it as it develops, a result supported by Adeniyi et al. (2023). The complexity of tourism's distributive effects is evident from the variety of nonlinear outcomes. Rather than following a predictable trajectory, the tourism-inequality nexus seems to be shaped by phases of structural change, the quality of institutions, and sectoral integration.

Data and methods

Data

The study utilises the panel data of a representative sample of 28 Sub-Saharan African (SSA) countries from 2005 to 2023. These countries were selected based on their ratings in the Travel and Tourism Development Index (TTDI). The TTDI is a universally accepted tool that evaluates infrastructure quality, business environment, natural and cultural resources, and safety, thereby facilitating the sustainable development of the travel and tourism sector. It is also a useful tool for country selection, as it assesses a country's readiness to build its tourism industry in ways that enable sustainability, long-term economic growth, and inclusiveness. The explained variable is income inequality, measured through the Gini Coefficient. It is a preferred measure because it is easy to compare income distributions between two or more populations with varying numbers of people and ranges on a scale between 0 (perfect equality, everyone receives an equal amount of income or wealth) and 1 (perfect inequality, one person or group receives all the income or wealth). The data are obtained from the UN-WIDER World Income Inequality Database, which provides annual time-series data on the variable. The independent variables are tourism receipts (TR), obtained from the United Nations World Tourism Organisation (UNWTO) database. The squared tourism receipts (TR^2) are incorporated to allow for a nonlinear relationship. Also, variables for economic growth, trade openness, and human capital are added. The importance of education to mediate inequality is emphasised in the literature (Adeleye, 2023; Epo et al., 2025; Oyinlola & Adedeji, 2019). These studies show that human capital positively affects inclusive growth, with more highly educated nations experiencing greater socioeconomic gains. As the economy advances, growth has been shown to raise income inequality before lowering it (Kuznets, 1955). This hypothesis is validated by the empirical studies by Nguyen et al. (2020) and Subramaniam (2022). Openness to trade reflects a country's level of integration into the global economy and affects inequality in various ways, such as through technology transfer, sectoral shifts, and access to international markets. Nevertheless, empirical studies such as Gosh & Mitra (2021) and Maku et al. (2021) show inconsistent results about the role of an open trade in income inequality. The human capital, economic growth, and trade openness data are sourced from the World Bank's World Development Indicators (WDI).

Table 1: Definition of variables, measurement, and expected effects

Variable	Proxy / Measurement	Expected Sign	Source
Income Inequality (Dependent)	Gini Coefficient (0–1)	–	UN-WIDER World Income Inequality Database
Tourism Receipts (TR)	International tourism receipts (% of GDP)	± (nonlinear)	UNWTO
Tourism Receipts Squared (TR^2)	Square of TR to capture the nonlinear effect	± (inverted-U)	UNWTO
Economic Growth (EG)	GDP per capita (constant USD)	± (Kuznets hypothesis)	World Bank WDI
Human Capital (HC)	Education index / Average years of schooling	–	World Bank WDI
Trade Openness (Trade)	(Exports + Imports) / GDP (%)	±	World Bank WDI

Model specification

To test the link between tourism and income inequality within the Kuznets theory framework, we followed the studies by Akarsu (2022), Gosh & Mitra (2021), and Uzar and Eyuboglu (2019). Thus, the econometric model to be estimated is specified as:

$$\text{INEQ}_{it} = \beta_0 + \beta_1 TR_{it} + \beta_2 TR_{it}^2 + \beta_3 EG_{it} + \beta_4 Trade_{it} + \beta_5 HC_{it} + \mu_i + \varepsilon_{it} \qquad (1)$$

where INEQ_{it} is defined as income inequality for the country (i) at time t. $TR_{it}$is tourism, proxied by international tourism receipts as a percentage of GDP. TR_{it}^2 represents the squared term of tourism to capture the non-linear relationship. The vector of control variables includes an economic growth proxy with GDP per capita (EG_{it}), trade openness ($Trade_{it}$), and human capital (HC_{it}), μ_i is the specific country-level fixed effects and $\epsilon_{it}$is defined as the error term.

Econometric methods

The study analysed the variables' features using summary statistics, then computed pairwise correlations and variance inflation factors to assess whether multicollinearity would be a problem. Further tests, following Pesaran & Yamagata (2008) and Pesaran (2004), examined the consistency of slope coefficients across countries and tested whether cross-sectional dependence exists in the panel data. Given the panel data structure, the variables' time-series properties were assessed using second-generation panel unit root tests, specifically the Cross-sectionally Augmented IPS (CIPS) and Cross-sectionally Augmented Dickey-Fuller (CADF), which are designed to handle cross-sectional dependence (Pesaran, 2007). Subsequently, the long-run equilibrium relationship among the variables was tested with two prominent panel cointegration tests: the Pedroni test (Pedroni, 1999, 2004) and the Westerlund test (Westerlund, 2007). The tests collectively ensure that the analysis captures both residual-based and error-correction forms of cointegration. However, Westerlund's results were prioritised over Pedroni's, primarily because they address cross-sectional dependence, accommodate heterogeneous cointegration relationships, and provide robust inference in panel-data contexts. The Westerlund cointegration test, introduced by Westerlund (2007), is a second-generation panel cointegration test that accounts for cross-sectional dependence and heterogeneity among individual units. Further, the study employed the Driscoll-Kraay (DK) standard errors estimator that is resistant to heteroskedasticity, serial correlation, and cross-sectional dependence. It is suitable for macro-panel data and yields consistent covariance matrix estimates despite cross-sectional correlation (Driscoll & Kraay, 1998). The baseline model is specified as:

$$Y_{it} = \alpha_i + \beta' X_{it} + \varepsilon_{it} \qquad (2)$$

$$i = 1,2,\dots,N; t = 1,2,\dots,T$$

where Y_{it} denotes income inequality, X_{it} is the vector of explanatory variables (tourism, transport infrastructure, and control variables), α_i represents unobserved individual effects, and $\varepsilon_{it}$is defined as the error term. The study also used the Feasible Generalised Least Squares (FGLS) model to further support the findings. This estimator is a good way to handle heteroskedasticity and contemporaneous correlation across cross-sectional units, thereby providing a validation check on the principal estimation results (Parks, 1967). The general panel regression model is:

$$Y = X\beta + \varepsilon, \quad \varepsilon \sim N(0, \Omega) \qquad (3)$$

where Ω is a non-spherical variance-covariance matrix of the error term. As such, the FGLS estimator is structured in equation (4) as:

$$\hat{\beta} FGLS = \left(X' \hat{\Omega}^{-1} X\right)^{-1} \left(X' \hat{\Omega}^{-1} Y\right) \qquad (4)$$

where $\hat{\Omega}$ is a consistent estimate of Ω. Unlike Ordinary least squares (OLS), FGLS corrects for cross-sectional correlation and heteroskedasticity, thereby improving the efficiency of the estimates (Parks, 1967).

Results and discussion

Descriptive statistics

As indicated in Table 2, the mean for tourism is 19.165, and the standard deviation is 1.859, indicating reasonable variation around the mean. Values between 11.51 and 23.13 indicate a wide dispersion in tourism performance across the sample. The skewness (-0.813) is negative, indicating a left-skewed distribution, with most observations taking higher tourism values and a few taking very low values. The kurtosis of 4.283 is above 3, indicating a leptokurtic distribution with heavier tails than the normal distribution, implying the presence of extreme tourism values. The inequality of income standard deviation (0.166) is lower than the mean (3.7621), implying that there is very little variation in inequality by country. The range from 3.387 to 4.171 indicates that income inequality remains clustered within the sample. The skewness of 0.727 is positive; therefore, the distribution is right-skewed (most countries are less unequal, with fewer having extremely high inequality). A kurtosis value of 3.264 indicates that the distribution is nearly normal, but with slightly larger extremes.

Table 2: Summary of descriptive statistics

Variable (s)	Mean	Max.	Min.	Std. Dev.	Skewness	Kurtosis	Obs
Tourism (TR)	19.165	23.13	11.51	1.859	-0.813	4.283	528
Income Inequality (INEQ)	3.7621	4.171	3.387	0.166	0.727	3.264	528
Economic Growth (EG)	7.1238	9.362	4.992	0.987	0.533	2.573	528
Human Capital (HC)	3.0153	3.959	0.799	0.336	-1.039	8.438	528
Trade Openness (TRD)	4.0421	4.907	2.794	0.378	-0.0323	2.804	528

Note: The abbreviations, max: Maximum; min: Minimum; obs: Observations; Std. Dev.: Standard deviation

Economic growth exhibits moderate variation, with a mean of 7.1238 and a standard deviation of 0.987. The difference between 4.992 and 9.362 indicates large disparities in growth rates across countries. The positive skewness of 0.533 indicates that countries are concentrated at lower growth rates, with fewer exhibiting exceptionally high growth rates. A kurtosis of 2.573 indicates a slightly platykurtic distribution. Additionally, the average human capital is 3.0153, with a standard deviation of 0.336, indicating a small range of variation across the samples. The large scale, from 0.799 to 3.959 points, reveals marked differences in the development of human capital. The negative skewness of -1.039 is very strong, indicating a left-skewed distribution: most countries are relatively highly endowed with human capital, with a few relatively poorly endowed. The kurtosis (8.438) is extremely high, indicating very fat tails and suggesting that human capital measures exhibit extreme values. Finally, the mean and standard deviation of the coefficient of trade openness are 4.0421 and 0.378, respectively, indicating moderate variability in trade integration. The 2.794 to 4.907 range indicates a significant difference in the trade openness across the countries. The skewness value, slightly negative at -0.0323, indicates a rather symmetric distribution. The kurtosis of 2.804 indicates that it is nearly normal, with a slight platykurtic skew.

Correlation matrix and variance inflation factor

The positive correlations in Table 3 indicate that tourism, income inequality, economic growth, human capital, and openness to trade are positively correlated. Income inequality, however, is negatively related to human capital. The analysis shows that none of the correlation coefficients exceeds commonly used threshold values; however, absolute correlation coefficients above 0.6 indicate strong multicollinearity according to standard diagnostic criteria. The highest correlation observed is 0.4258 between tourism and growth; although notable, it remains below this threshold, implying that severe multicollinearity is unlikely to significantly affect the reliability of regression estimates.

Table 3: Correlation matrix and variance inflation factor

	LNTR	LNINEQ	LNEG	LNHC	LNTRD
LNTR	1				
LNINEQ	0.3048	1			
LNEG	0.4258	0.3784	1		
LNHC	0.2049	-0.0882	0.1143	1	
LNTRD	0.0236	0.2138	0.3888	0.1643	1

Variance inflation factor

Variables	Collinearity Statistics	
	VIF	**1/VIF**
Tourism (TR)	1.26	0.7907
Economic Growth (EG)	1.60	0.6258
Human Capital (HC)	1.15	0.8665
Trade Openness (TRD)	1.19	0.8404
Mean VIF	1.29	

Note: The dependent variable: income inequality, the decision Rule: VIF values ≤ 5.

Nevertheless, the moderate correlations between tourism and growth underscore the need for further diagnostic tests. The VIF analysis in Table 3 also showed values below five (5). This threshold optimisation

led to the conclusion that the variables meet the classical linear regression model assumptions on collinearity ($Cov\ \mu/X = 0$) (Niizeki & Hori, 2023). Based on strong evidence from the VIF analysis, the output elasticities in our income inequality model were estimated with minimal concerns about endogeneity in the regressors.

Homogeneity of slopes and cross-sectional dependence results

At 1% level of significance, values of delta tilde ($\tilde{\Delta}$) and adjusted delta tilde (adj$\tilde{\Delta}$) estimated across different probability levels support the rejection of the null hypothesis of slope homogeneity (see Table 4).

Table 4: Slope homogeneity tests

Pesaran-Yamagata's Homogeneity Test		
Test	**Statistics**	**P-Value**
$\tilde{\Delta}$	8.26***	0.000
adj$\tilde{\Delta}$	10.356***	0.000

Note: Level of Significance: *** $P < 0.01$, ** $P < 0.05$ respectively

As presented in Table 5, at 1% significance, the study established that the series are cross-sectionally dependent using the Pesaran (2004) CD test.

Table 5: Pesaran cross-sectional dependence test

Variables	**Pesaran CD Test**	***Prob.***	***Corr.***
Tourism (TR)	20.15***	0.000	0.247
Income Inequality (INEQ)	1.070	0.284	0.012
Economic Growth (EG)	51.46***	0.000	0.607
Human Capital (HC)	4.17***	0.000	0.049
Trade Openness (TRD)	8.64***	0.000	0.102

Note: Significant level: Same as in Table 4

Panel stationarity and cointegration tests results

Table 6 shows that all variables are below the critical values, indicating non-stationarity at the level. However, they become stable in first differences, implying that the variables are integrated of order 1 (I(1)). The Pedroni and Westerlund cointegration test results do not accept the null hypothesis of no long-run relationship, implying a stable equilibrium among tourism, economic growth, human capital, openness to trade and income inequality. This observation is consistent with empirical research showing the structural interconnections between tourism development and SSA disparity (Subramaniam, 2022; Nguyen et al., 2020).

Table 6: Panel stationarity tests results

Variables	**CIPS**		**CADF**		Order Of Integration
	Level	**1st Difference**	**Level**	**1st Difference**	
Income inequality (INEQ)	-1.623	-4.060**	0.550	-4.611**	I(1)
Tourism (TR)	-1.938	-3.940**	1.867	-2.104***	I(1)
Human capital (HC)	-1.833	-4.403**	-1.482	-3.564**	I(1)
Trade Openness (TRD)	-1.714	-3.880**	-1.683	-2.729**	I(1)
Economic growth (EG)	-2.103	-4.469 **	-1.587	-3.001**	I(1)

Note: Critical values at 10% = -2.11; 5% = -2.2; and 1% = -2.3, Level of significance: Same as in Table 4

Tables 7 and 8 reveal significant cointegrating relationships at the 5% level. The failure to accept the null of no cointegration, supported by significant coefficients and variance-ratio p-values at the 1% level from the Pedroni (1999, 2004) tests and a variance ratio of 2.3507 (p = 0.0094) observed in the Westerlund test, confirms the existence of a long-run equilibrium linking the non-stationary series. Therefore, suggesting that the variables in SSA's income inequality-tourism model tend towards their long-run equilibrium position regardless of cross-sectional dependence, which justifies estimating a long-run model.

Table 7: Results of Pedroni panel co-integration test

Tests	**Within dimension**	**Between dimension**
v-statistic	1.9024**	--
rho-statistic	2.0709	5.0116
PP-statistic	-3.2744***	-5.7416***
ADF-statistic	3.2831	2.9578
--	--	--

Note: v: variance; PP: Phillips-Perron; ADF: Augmented Dickie Fuller; DF: Dickie Fuller. Significance level: Same as in Table 4

Table 8: **Westerlund panel cointegration tests**

Statistic	**Statistic Value**	**P-value**
Variance ratio	2.3507***	0.0094

Note: Significance level: Same as in Table 4

The long run model results

Table 9 presents the estimated long-run effects of the model using the DK Standard Errors methodology. The results show that the effectiveness of tourism (LnTr) on the income inequality is negative and statistically significant. These findings suggest that, in the initial phases of tourism development, a 1 per cent

increase in tourism reduces income disparity by 0.012 units. On the other hand, the value of $LnTr^2$ is positive and significant (0.00087), indicating that beyond a certain point, tourism development may worsen disparity. In short, tourism and income inequality in SSA have an inverted Kuznets curve or a U-curve. This effect could be explained as follows: in the initial years of tourism growth, jobs for less-skilled labourers in the hotel and transportation industries are created, generating income in less well-served areas. Tourism expenditure has multiplier effects that are passed through the local economies, hence minimising inequality. This finding is consistent with Dossou & Berhe's (2024) observation that tourism brings income equalisation in Africa. They, however, failed to examine further the quadratic effect of tourism on income disparity. Nonetheless, advancements in tourism are also associated with an increase in skilled-labour and capital-intensive sectors, thereby benefiting affluent investors and better-educated workers, while at the same time elevating property values, which can lead to economic dualism between tourist enclaves and the rest of the economy. This shift explains why, as the tourism sector develops, its capacity to reduce inequality declines, only to eventually reverse. Nonetheless, our finding is supported by Gosh & Mitra (2021) in their study of developing countries and Adeniyi et al. (2023), who explored the Southern African Development Community.

Table 9: Results of the nonlinear effect of tourism on income inequality in SSA

Indicators	DK Standard Errors			Cross-sectional time-series FGLS		
	Coef.	Std. Err.	t-stat.	Coef.	Std. Err.	z-stat.
Constant	3.39803***	0.09359	36.31	3.5611***	0.09003	39.55
LnTr	-0.01213**	0.00435	-2.79	-0.0044	0.00306	-1.45
$LnTr^2$	0.00087***	0.00021	4.16	0.0003	0.00016	1.59
LnEG	0.04171***	0.00938	4.44	0.0226**	0.01006	2.25
Lntrd	0.06163**	0.02442	2.52	0.0193	0.01188	1.62
LnHC	-0.09094***	0.02022	-4.50	-0.0130	0.01013	-1.29

Note: Significance level: Same as in Table 4

Regarding the control variables, the coefficient of economic growth is positive and significant. This finding is consistent with Dossou et al. (2023) and Nguyen (2021), who both employed the PCSE estimation method, whereas this study used a different method. Trade openness (lnTRD) has a positive and significant coefficient, indicating that trade liberalisation may disproportionately benefit skilled workers and capital owners. Similar results were obtained by Akarsu (2022), Alam & Paramati (2016), and Uzar & Eyuboglu (2019). Raza & Shah also obtained an insignificant positive relationship between trade openness and income inequality. However, the result contrasts with that of Maku et al. (2021), which found a significant negative relationship. Further findings show that human capital (LnHC) exhibits the most consistent and significant inequality-reducing effect, indicating that education and skills development enable broader participation in economic opportunities and are the most effective tools for addressing income inequality among the variables analysed. This result supports the finding of Epo et al. (2025) but contrasts with Adeleye (2023). The results of the Cross-sectional time-series FGLS analysis are similar, though less significant.

Conclusion and recommendations for the policymakers

Tourism is one of the most important branches of the service industry, enabling countries to advance in economic, social, and cultural development. Despite the substantial evidence on the ability of tourism to spur economic growth and development, create different types of jobs, direct, indirect, and induced, increase foreign exchange earnings, and increase government tax revenues, its impact on income distribution is a debatable one. The results obtained regarding its distributional effects vary by geographical setting and methodological approach. The paper examines the distributional impacts of tourism on income inequality in a sample of 28 Sub-Saharan African countries with highly and moderately mature tourism industries between 2005 and 2023. The research used DK Standard Errors and FGLS estimating techniques, which are robust to heterogeneity and cross-section dependence. Our results indicated that the relationship between tourism and income inequality is U-shaped, meaning that tourism initially reduces income inequality. But this effect is negated as it grows larger. Human capital (LnHC) exhibits the most consistent and significant inequality-reducing effect. These results demand policy measures to enhance tourism's capacity to reduce income inequality without reversing it. Therefore, policymakers in SSA are advised to design and introduce stage-specific, distributional centred policy interventions that help to avoid distributional imbalances as tourism growth proceeds, for example, the adoption of a pro-poor tourism approach, financial inducement of local tourism entrepreneurs to compete favourably with foreign investors, introduction of local content requirement and promotion of comprehensive human capital development programmes including tourism-specific skills training, language education, hospitality management, cultural preservation and enhancing service quality.

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