

Tourism's impact on human development in Sub-Saharan Africa: a quantile regression approach and threshold analysis

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Competitiveness
Review: An
International
Business Journal

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Received 11 May 2025
Revised 28 June 2025
9 August 2025
18 August 2025
Accepted 26 August 2025

Abstract

Purpose – This study aims to investigate the impact of tourism development and its drivers on human development (HD) in Sub-Saharan Africa (SSA).

Design/methodology/approach – This study leverages data from 38 SSA countries for 2019 and 2021 and applies quantile regressions and threshold analyses to account for distributional and regime-based heterogeneity. It further applies the Huber–White Sandwich Robust Estimator for robustness checks and correction of potential heteroskedasticity.

Findings – The findings reveal that tourism development significantly contributes to human development in SSA, with more substantial positive effects in lower HD countries. Furthermore, the threshold analyses reveal that tourism's benefits to HD depend on the tourism sector's policy coherence, investment efficiency and sustainability, highlighting areas for policy considerations.

Originality/value – The study's originality lies in applying quantile regression and threshold analysis to provide deeper insights into how tourism development drivers shape HD in SSA.

Keywords Human development, Threshold regression, Tourism development, Quantile regression, Sub-Saharan Africa

Paper type Research paper

1. Introduction

Tourism is a critical driver of socioeconomic development. As a result, multilateral institutions are committed to its development through strategic financial investments in sector-specific initiatives, fostering enhanced quality of life (Buhalis *et al.*, 2023). Globally, tourism has emerged as a transformative sector, accounting for over 10% of gross domestic product (GDP) in many countries and playing a central role in employment generation and infrastructure investment (UNWTO, 2020). Despite these benefits, tourism development and



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JEL classification – C21, O15, O55, Z32

Competitiveness Review: An
International Business Journal
Vol. 35 No. 7, 2025
pp. 1-24
Emerald Publishing Limited
1059-5422
DOI 10.1108/CR-05-2025-0163

impacts remain uneven across countries and regions. Generally, tourism development can be analyzed from both the demand side and the supply side, each offering distinct perspectives and insights into how tourism evolves and impacts human development. However, this study focuses on the supply side due to its close link with destination competitiveness.

From a supply-side perspective, tourism operates as a monopolistically competitive market, where destinations must cultivate distinctiveness to remain competitive and enjoy the developmental benefits (Button, 2022). This market structure underlines the importance of destination competitiveness to tourism development, which is defined as a destination's ability to attract and satisfy potential tourists sustainably and profitably relative to alternative destinations (Buhalis *et al.*, 2023). Destination competitiveness is a multifaceted concept that defies straightforward quantification, leading to varied perspectives and methodological approaches. Alcalá-Olíd *et al.* (2025) challenge conventional assumptions that superior infrastructure, stringent environmental regulations, advanced public services or enhanced safety protocols automatically translate into market dominance. Igoumenakis *et al.* (2023) emphasize that destination competitiveness depends on a locale's ability to leverage its singular natural, cultural and historical assets to distinguish itself. Regardless of the varied perspectives, scholars agree that when effectively harnessed, competitiveness generates tangible benefits such as increased real income and societal well-being (Hussain *et al.*, 2024).

While competitiveness often explains variations in tourism outcomes, a critical and underexplored dimension, particularly in developing regions, such as Sub-Saharan Africa (SSA), is the extent to which tourism development, viewed from the supply side and measured through the pillars of destination competitiveness, translates into measurable improvements in human development. According to the United Nations Development Programme, human development extends beyond economic growth to encompass the expansion of individuals' capabilities, freedoms and access to resources that promote dignity, agency and improved quality of life (UNCTAD, 2025). This broader perspective is essential for assessing the long-term developmental impacts of tourism. At the national level, human development is captured by a composite index comprising three dimensions: health (life expectancy), education (mean and expected years of schooling) and standard of living (GNI per capita). This index, known as the Human Development Index (HDI), is used in this study together with the World Economic Forum's Travel and Tourism Development Index (TTDI), which captures the competitiveness dimensions.

So far, studies addressing tourism development's contribution to human development in Africa (e.g. Folarin *et al.*, 2017; Adeniyi and Folarin, 2020; Xuanming *et al.*, 2024) present two significant gaps that must be addressed. First, the studies used tourist arrivals and tourism receipts as tourism development indicators instead of the comprehensive measure of the World Economic Forum's Travel and Tourism Development Index (TTDI). The downside of using tourist arrivals and tourism receipts is that they do not reveal which aspects of tourism development pillars contribute more or less to human development. This lacuna limits the understanding of how to promote human development through the various tourism development pillars. Second, the previous studies' methodologies do not allow nonlinear and conditional relationships to be investigated. These methodological weaknesses imply that the contribution of tourism development to high and low HD countries is not known. Thus, the core problem addressed in this study is the lack of robust empirical evidence linking travel and tourism development indicators to human development in SSA, particularly through comprehensive methodologies capturing nonlinearity and heterogeneity. Addressing these gaps, this study pursues dual analytical objectives:

- (1) It examines the contributions of travel and tourism development pillars/dimensions to human development in SSA.

- (2) It determines the threshold levels of the travel and tourism development dimensions that trigger a significant impact on human development in SSA.

The study findings contribute to the understanding of travel and tourism development's contribution to human development, providing intra-regional and cross-border policy insights to promote collaboration. Analyzing the dimensions of travel and tourism development provides a deeper understanding, going beyond the broader concept of tourism development to the specificity of the pillars and how they impact HD. Furthermore, the heterogeneous effects across varying HD and threshold levels identify critical points where tourism development exerts the most significant impacts. Thus, the methodologies offer a more granular and robust analysis than traditional approaches, uncovering insights to guide targeted policy interventions.

2. Literature review

2.1 Theoretical literature review

This study is grounded in human capital theory and complemented with Amartya Sen's capability framework, which views development as the expansion of individuals' substantive freedoms to lead the lives they value (Sen, 1990, 2005). Both contribute to the analysis of human development as an outcome of government efforts and the availability of capability functioning. The human capital theory attributes human development to investment in education and health, which contributes to socioeconomic progress and the well-being of people (Newman and Newman, 2022). The Sen's capability framework provides the lens to view tourism development as a transformative tool for human development, enabling expanded access to critical functioning such as health care through medical tourism, education through educational tourism and participation through inclusive tourism.

By invoking these two theories in a complementary way, this study argues that in addition to government efforts, such as expenditure on education, health and capital formation, that directly impact human development, travel and tourism development empowers residents and tourists to lead the lives they value, contributing to their human development (Sen, 1990, 2005). This means that this study conceptualizes travel and tourism development not merely as an end but as a driver of freedom, inclusion, and equity. Hence, Figure 1 posits a unidirectional impact of tourism development on human development.

To operationalize this framework, we adopt the UNDP's HDI, which encompasses health, education and income, as the outcome variable. Also, we adopt the WEF's (2021) TTDI as a measure of travel and tourism development, which captures the multifaceted dimensions of competitiveness: tourism policy, enabling environments, infrastructure, service quality, natural assets and sustainability. These dimensions are compatible within the Sen capability framework because they enhance the capabilities (e.g. medical tourism, educational tourism, wellness tourism and inclusive tourism) for human development.

2.2 Empirical literature review

2.2.1 Tourism development and human development. The nexus between tourism development (TD) and human development (HD) has gained traction within the framework of the UN Sustainable Development Goals (SDGs), yet much of the literature remains confined to economic outcomes. While TD is widely recognized for fostering economic growth through foreign exchange generation, bolstering domestic production and trade, this narrow focus often eclipses broader human development dimensions. The debate on causality remains unsettled. The tourism-led growth hypothesis (TLGH), introduced by Balaguer and Cantavella-Jorda (2002), posits tourism as a driver of growth. Subsequent

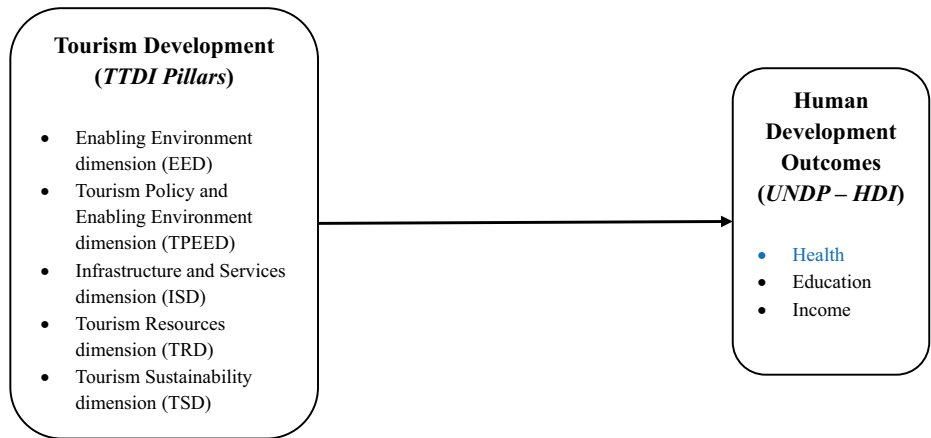


Figure 1. Conceptual framework
Source: Authors' own work (2025)

studies have yielded mixed evidence, suggesting four potential causal paths: unidirectional from tourism to growth, vice versa, bidirectional or no causality at all (Lee and Chang, 2008; Brida *et al.*, 2016; Ahmad *et al.*, 2020). Yet, conventional econometric models inadequately capture the multifaceted impact of TD. Integrating Amartya Sen's capability approach marks a critical shift, conceptualizing development as the expansion of people's freedoms and capabilities rather than mere income gains (Sen and Anand, 1994). This paradigm broadens the evaluative space, allowing for a more holistic understanding of how TD influences HD, encompassing health, education and life satisfaction. Such a reconceptualization is vital for aligning tourism policy with sustainable and inclusive development imperatives.

2.2.2 Review of methodological approaches in tourism development–human development research. Emerging evidence on the tourism development–human development (TD–HD) nexus reveals a context-dependent and methodologically diverse landscape. In Nicaragua, tourism empowered local communities to use indigenous resources, fostering a mutually reinforcing TD–HD link, while in Costa Rica, benefits were largely unidirectional, with TD enhancing well-being but not vice versa, using multivariate cointegration analyses and Granger causality testing (Croes, 2012). In Ecuador, using cointegration regression and the Granger causality test presented an inverse case where HD rather than tourism drove development, underscoring that income growth alone does not guarantee human advancement (Croes and Rivera, 2015). Subsequent findings using cointegration analyses suggested that economic growth, not TD *per se*, propels tourism (Rivera, 2017). Contrastingly, using the auto regressive distributed lag (ARDL) approach on Indian data from 1980 to 2018 revealed a strong, positive association between TD and HD, shaped also by public expenditure and trade openness, though the latter sometimes hindered HD (Sharma *et al.*, 2020).

Globally, Biagi *et al.* (2017) used the system GMM to establish that tourism is linked to educational gains, albeit variably across nations. Chattopadhyay *et al.* (2022) used panel threshold regression and uncovered a U-shaped TD–HD curve, where tourism's benefits manifest only beyond certain developmental thresholds. García *et al.* (2024) reinforced this with Spanish regional data using symbolic time series, arguing for localized strategies. A

symbolic time series analysis across 123 countries affirmed that tourism specialization elevates HDI, while low-tourism states often fall into “poverty traps,” a pattern suggesting the catalytic potential of tourism when adequately supported.

2.2.3 Regional focus: Sub-Saharan Africa versus global. In the African context, the relationship between TD and HD is also significant. Analyses from 25 countries between 1998 and 2014 showed that tourism positively influences both the education and health-care components of HD (Folarin *et al.*, 2017). Additionally, tourism contributes meaningfully to poverty reduction, supporting the viability of pro-poor tourism policy agendas (Adeniyi and Folarin, 2020). Similar findings emerged from a study of 45 African countries, where tourism receipts and arrivals were associated with improved social welfare and HDI scores (Xuanming *et al.*, 2024).

While TD is often associated with job creation and revenue growth, its role in shaping HD, commonly measured by life expectancy, education and income, remains insufficiently examined, particularly in SSA. Although Uysal *et al.* (2012) and Ridderstaat *et al.* (2016a) illustrated how tourism can enhance quality of life (QoL) through increased income and public expenditure, their findings are limited to island economies or a narrow set of nations. In developing contexts, Kubickova *et al.* (2017) introduced the human agency dimension and found bi-directional causality between TD and QoL, yet SSA countries are notably missing from much of this body of research.

2.2.4 Identified gaps in tourism development–human development studies. Building on existing insights, current literature often relies on average-effect models, thus masking the heterogeneity of tourism development (TD) outcomes across countries at different stages of human development (HD). Early contributions by Croes (2012) and Rivera (2017), grounded in Sen’s capability framework, highlighted this diversity in Central and South America. Similarly, Biagi *et al.* (2017) confirmed a general positive TD–HD association but underscored the need for disaggregated analysis. However, these studies fall short in addressing how TD impacts HD across varying development levels, an especially pertinent gap in SSA, where HD disparities and structural inequalities are stark.

Crucially, potential threshold effects where TD’s influence depends on variables such as GDP per capita or urbanization remain underexplored. Although De Vita and Kyaw (2017) identified diminishing returns to tourism in highly specialized economies, their analysis overlooked SSA-specific dynamics. Furthermore, even where thresholds are acknowledged, robust econometric approaches like panel threshold regression are rarely used within an HD framework.

Despite growing awareness of TD’s nonlinear and context-contingent effects (Croes *et al.*, 2021; Pyke *et al.*, 2016), most studies neglect advanced techniques such as quantile regression. This is a missed opportunity, particularly in SSA, where countries across the HDI spectrum may experience TD’s benefits or drawbacks in fundamentally different ways.

In response to these limitations, this study makes four distinct contributions. First, it addresses the lack of SSA representation in research on the TD–HD nexus. Second, it shifts focus from economic outcomes to HD-specific indicators. Third, it introduces quantile and threshold regression models to identify nonlinear and heterogeneous effects. Fourth, it centers the analysis on how TD specifically influences HD, offering a more precise understanding of tourism’s developmental role. By using panel data from SSA nations and applying advanced econometric tools, this study uncovers the complex and potentially asymmetric ways in which TD shapes HD across varying development contexts.

3. Methodology

3.1 Design, target population and sample size

The study uses a panel design to analyze the temporal dynamics between tourism and human development in SSA, capturing cumulative effects over time (Maier *et al.*, 2023). Of the 49 SSA countries, 38 were included based on data availability and consistency, ensuring statistical reliability. While excluding countries with major data gaps, the sample retains regional diversity and developmental variation (UNDP, 2023), supporting robust generalization and maintaining methodological integrity.

3.2 Estimation techniques

The quantile regression analysis was used to achieve the study's first objective. Unlike conventional ordinary least squares (OLS) regression, which estimates conditional means, quantile regression (Zhang *et al.*, 2019) evaluates conditional quantiles, offering three key advantages: (1) robustness to outliers due to median-focused estimation, (2) comprehensive insight into the dependent variable's conditional distribution and (3) enhanced statistical efficiency for non-normal error terms (Galvao and Kato, 2016).

Specifically, this study applied the unconditional quantile regression (UQR) (Firpo *et al.*, 2022), operationalized via Borgen's (2016) *xtrifreg* function in STATA. This approach ensures invariance in tourism's impact assessment across the human development spectrum. To estimate the quantile regressions for objective one, the dependent variable, human development, is transformed by centering it in the quantiles using equation (1). The re-centered influence function (RIF), defined for the τ th quantile, is:

$$RIF(y; q_\tau, F_y) = q_\tau + \frac{\tau - I(y \leq q_\tau)}{f_y(q_\tau)} \quad (1)$$

where q_τ is the kernel-estimated sample quantile, F_y indicates the cumulative function, $f_y(q_\tau)$ denotes the marginal density function of the dependent variable Y at the point q_τ and $I(\cdot)$ indicator function reflecting whether the outcome value is below q_τ .

Afterward, the newly transformed dependent variable is regressed on the explanatory variables X_i , as shown in equation (2), to estimate how the variables influence specific quantiles of human development:

$$E[RIF(Y_{it}; q_\tau | X_{it})] = X_{it}\beta_{\tau,i} \quad (2)$$

Equation (2) permits standard linear regression to be applied on the transformed RIF values, producing marginal effects of the covariates ($\beta_{\tau,i}$) across quantiles, which isolates each variable's contribution, including tourism development's impact at distinct human development levels.

To achieve objective two of the study, equations (3) and (4) are specified following Wang's (2015) fixed-effects panel threshold regression model, which identifies structural breaks or "thresholds" in tourism development's impact on human development. Equation (3) specifies a baseline-panel regression as follows:

$$y_{it} = \alpha_i + \delta q_{it} + \beta_i X_{it} + \varepsilon_{it} \quad (3)$$

where y_{it} represents the human development of country i during period t , with $1 \leq i \leq N$ and $1 \leq t \leq T$. Also, α_i signifies country-specific fixed effects, ε_{it} denotes random disturbances, q_{it} is the tourism development for country i at time t and X_{it} is a vector of k time-varying control

variables widely recognized in existing studies. To empirically implement [equation \(3\)](#), the study hypothesizes a single-threshold scenario, reformulating [equation \(3\)](#) into [equation \(4\)](#):

$$y_{it} = \alpha_i + \delta_1 q_{it} I(q_{it} \leq \gamma) + \delta_2 q_{it} I(q_{it} > \gamma) + \beta_i X_{it} + \varepsilon_{it} \quad (4)$$

where γ is the threshold value separating the two regimes (Regime 1 and Regime 2), $I(\cdot)$ denotes the indicator function distinguishing these regimes and δ_1 and δ_2 represent the slope coefficients of the threshold variable in Regime 1 and Regime 2, respectively. The variables y_{it} , α_i , q_{it} , X_{it} and ε_{it} retain their prior definitions.

These techniques offer a robust analytical framework for capturing distributional heterogeneity and structural asymmetries in the TD–HD relationship across SSA. Quantile regression reveals effects across HDI levels, while threshold regression identifies nonlinearities, showing tourism’s impact intensifies only after specific development thresholds are surpassed.

3.3 Data

The study used secondary annual panel data from 38 sampled sub-Saharan African economies for 2019 and 2021. The decision to use this set of countries was solely dictated by data availability and the need for a balanced panel for the period of our study. The data used were from multiple reliable sources to provide robust, rigorous, evidence-based insights for informed policy and strategic decision-making. [Table 1](#) provides a detailed description of the variables and their measurements.

3.3.1 Justification of controlled variables. In examining the impact of tourism development on human development among African countries, accounting for country-specific differences is essential to isolate tourism’s true effect on human development. First, population growth is controlled as it shapes human capital development by affecting the supply of labor, the scale of educational and health service needs and demographic pressure on infrastructure ([Khan et al., 2021](#); [López-Gay et al., 2021](#)). Urbanization is similarly relevant, as the agglomeration of people and services in urban areas typically enhances access to education, health care and employment opportunities – core components of human capital ([Sutheeshna, 2021](#); [López-Gay et al., 2021](#)). Gross capital formation, reflecting investment in physical infrastructure and productive capacity, contributes to human development through job creation and improved access to services and technology, which are instrumental in skills development ([Roy, 2024](#)).

Moreover, government effectiveness is included as it influences the quality of public services and institutions, thereby shaping educational outcomes, labor market efficiency and broader human capital indicators ([Tan et al., 2023](#)). Similarly, government expenditure on education is a direct input to human capital development, enhancing knowledge acquisition, workforce productivity and socioeconomic mobility ([Arvin et al., 2021](#)). Finally, digitalization is considered due to its transformative potential in expanding access to education, upskilling and promoting knowledge diffusion – all of which are integral to building human capital ([Li et al., 2023](#)).

4. Results

4.1 Preliminary findings

[Table 2](#) presents the descriptive statistics for Sub-Saharan African countries, highlighting key regional development trends. Human development averages 0.573, indicating moderate but insufficient investment in education, health and workforce skills. The tourism development index, with a mean of 3.285, reflects appreciable sectoral progress, while the enabling environment dimension, with a mean of 3.586, points to governance weaknesses.

Table 1. Variable description, measurement and source

Variable	Description/measurement	Source
Human development (HD)	An index of education, life expectancy and gross national income	UNDP-HDI
Tourism development index (TDI)	A composite index that measures a country's ability to develop tourism	WEF-TTDI
Enabling environment dimension (EED)	Index score that measures regulatory, safety, and business environment for tourism	WEF-TTDI
Tourism policy and enabling environment dimension (TPEED)	Index score that assesses policies and regulatory conditions for tourism growth	WEF-TTDI
Infrastructure and services dimension (ISD)	Index score that evaluates transport, accommodation, and service infrastructure	WEF-TTDI
Tourism resources dimension (TRD)	Index score that measures natural, cultural, and recreational tourism resources	WEF-TTDI
Tourism sustainability dimension (TSD)	Index score that assesses the environmental and economic sustainability of tourism	WEF-TTDI
Population growth (POP)	The annual percentage increase in population	WDI
Urbanization (URB)	The percentage of the population living in urban areas	WDI
Gross capital formation (GCF)	Total investment in physical assets like infrastructure as a percentage of GDP	WDI
Government effectiveness (GEF)	An index score that measures the quality of governance and public services	WDI
Government expenditure on education (GEX)	Government spending on education as a percentage of GDP	WDI
Digitalization (DIG)	The extent of digital adoption in the economy and society based on ICT goods and service import	WDI

Note(s): The TTDI is a composite index based on EED, TPEED, ISD, TRD and TSD. This is computed by the WEF

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

Also, tourism policy reveals a higher mean at 4.046, though implementation gaps persist. Tourism resources, with a mean of 1.929, remain underutilized due to weak marketing and preservation efforts. Moreover, infrastructure and services averaging 2.383 reveal severe deficits in transportation and utilities, hindering diversification. Tourism sustainability, with a mean of 4.282, is a strong point, emphasizing environmental and cultural preservation. Socioeconomic factors show high population growth of 7.257%, urbanization at 46.04% with stark disparities and gross capital formation at 23.473% of GDP, indicating moderate investment. Government education spending, indicating 4.509%, is low, mirroring human development challenges, while digitalization, with a mean of 4.466, remains weak, limiting technological progress.

The correlations in Table 3 indicate significant relationships between human development and several key variables. Human development strongly correlates positively with the tourism development index (0.829), enabling environment (0.747) and infrastructure and services (0.864), meaning that better human capital is associated with better tourism development, enabling environment and infrastructure and services. Also, the moderate positive correlations with tourism policy (0.564), resources (0.303) and sustainability (0.389) imply weaker relationships. Furthermore, the negative correlation with population growth (−0.366) suggests demographic pressures hinder HD, while urbanization (0.368) has a positive impact.

Table 2. Descriptive statistics

Variable	Mean	SD	Min.	Max.
HD	0.573	0.091	0.408	0.806
TDI	3.285	0.353	2.78	4.036
EED	3.586	0.51	2.844	4.977
TPEED	4.046	0.522	3.182	5.308
ISD	2.383	0.511	1.813	3.909
TRD	1.929	0.572	1.216	3.87
TSD	4.282	0.297	3.836	5.026
POP	7.257	0.524	6.102	8.34
URB	46.04	15.057	17.174	71.56
GCF	23.473	7.457	12.796	39.726
GEX	4.509	2.222	0.358	10.391
DIG	4.466	2.148	1.53	8.01

Note(s): Number of observations are 76. HD = human development; TDI = Tourism Development Index; EED = enabling environment dimension; TPEED = Tourism Policy and Enabling Environment dimension; ISD = infrastructure and services dimension; TRD = tourism resources dimension; TSD = tourism sustainability dimension; POP = population growth; URB = Urbanization; GCF = Gross capital formation; GEF = Government effectiveness; GEX = Government expenditure on education; DIG = Digitalization

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

While descriptive statistics and simple correlations do not allow for causal inference, they serve to establish preliminary associations before a more rigorous causal analyses are done using the econometric specification in [equations \(1\)–\(4\)](#) to address objectives 1 and 2. The diagnostic tests, model fitness and robustness checks of the causal analyses are provided as supplementary material A and B.

4.2 The impact of tourism development on human development in Sub-Saharan Africa

The results in [Table 4](#) examine the impact of tourism development on human development in SSA using both random effects and quantile regressions. The random effects result in Model 4 provides an aggregate estimate of the effect of tourism development and human development. The positive and significant effect of 0.111 implies that a more developed tourism sector contributes to improvements in human development in SSA. However, this overall impact conceals subtle differences among countries with varying initial levels of human development, as highlighted by the quantile regression.

Furthermore, the quantile regression results in models 1–3 reveal how the impact of tourism development varies across countries stratified by their human development levels: the 25th, 50th and 75th quantiles. The findings reveal that tourism development positively affects human development across all quantiles, but the effect diminishes as human development improves. Thus, from 0.228 in the 25th quantile to 0.189 in the 75th quantile. This gradient suggests a diminishing marginal return of tourism on HDI as countries progress, reflecting how tourism initially catalyzes human capital formation in lower-development contexts by providing entry-level jobs such as hospitality and guides, incentivizing basic education and improving health services to meet industry demands. In contrast, higher-quantile countries face diminishing returns as their human capital approaches thresholds where advanced sectors such as technology and finance become more impactful. This finding extends the work of [Khan et al. \(2021\)](#) by empirically demonstrating the heterogeneity of tourism's developmental effects across different HDI levels, revealing

Table 3. Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) HD	1.000						
(2) TDI	0.829* (0.000)	1.000					
(3) EED	0.747* (0.000)	0.850* (0.000)	1.000				
(4) TPEED	0.564* (0.000)	0.849* (0.000)	0.819* (0.000)	1.000			
(5) ISD	0.864* (0.000)	0.902* (0.000)	0.372* (0.021)	0.656* (0.000)	1.000		
(6) TRS	0.303* (0.065)	0.372* (0.021)	-0.086 (0.610)	0.244 (0.140)	0.264 (0.109)	1.000	
(7) TSD	0.389* (0.016)	0.543* (0.000)	0.465* (0.003)	0.478* (0.002)	0.351* (0.031)	-0.060 (0.719)	1.000
(8) POP	-0.366* (0.024)	-0.295* (0.072)	-0.606* (0.000)	-0.206 (0.214)	-0.411* (0.010)	0.587* (0.000)	-0.319* (0.051)
(9) URB	0.368* (0.023)	0.064 (0.703)	-0.046 (0.782)	-0.177 (0.287)	0.265 (0.108)	0.297* (0.070)	-0.154 (0.357)
(10) GCF	-0.230 (0.164)	0.043 (0.799)	0.075 (0.655)	0.118 (0.479)	-0.067 (0.687)	-0.060 (0.720)	0.098 (0.560)
(11) GEX	0.181 (0.278)	0.276* (0.094)	0.299* (0.068)	0.223 (0.179)	0.267 (0.106)	-0.060 (0.720)	0.265 (0.107)
(12) DIG	0.013 (0.937)	-0.112 (0.501)	-0.174 (0.296)	-0.142 (0.394)	0.010 (0.954)	0.125 (0.456)	-0.267 (0.106)

Note(s): *shows significance at $p < 0.1$ HD = Human development; TDI = Tourism Development Index; EED = Enabling environment dimension; TPEED = Tourism Policy and Enabling Environment dimension; ISD = Infrastructure and services dimension; TRD = Tourism resources dimension; TSD = Tourism sustainability dimension; POP = population growth; URB = Urbanization; GCF = Gross capital formation; GEF = Government effectiveness; GEX = Government expenditure on education; DIG = Digitalization

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

(continued)

Table 3. Continued

Variables	(8)	(9)	(10)	(11)	(12)
(1) HD					
(2) TDI					
(3) EED					
(4) TPEED					
(5) ISD					
(6) IRS					
(7) TSD					
(8) POP	1.000				
(9) URB	-0.009 (0.958)	1.000			
(10) GCF	0.115 (0.492)	-0.144 (0.388)	1.000		
(11) GEX	-0.591* (0.000)	-0.002 (0.991)	-0.263 (0.111)	1.000	
(12) DIG	0.092 (0.583)	0.047 (0.778)	-0.396* (0.014)	0.100 (0.550)	1.000

Table 4. The impact of tourism development on human development in Sub-Saharan Africa

Variables	(1) 25 Quant	Quantile regression (2) 50 Quant	(3) 75 Quant	Random regression (4) Overall
TDI	0.228*** (0.0272)	0.212*** (0.0285)	0.189*** (0.0354)	0.111*** (0.0394)
POP	-0.0491* (0.0288)	-0.0493** (0.0214)	-0.0574** (0.0224)	-0.0434 (0.0292)
URB	0.00147* (0.000805)	0.00181*** (0.000648)	0.00176*** (0.000495)	0.00128** (0.000537)
GCF	-0.00515*** (0.00154)	-0.00322*** (0.00102)	-0.00283*** (0.00104)	-0.000569 (0.000834)
GEX	0.0122* (0.00613)	0.0135*** (0.00466)	0.0124** (0.00555)	0.00264 (0.00463)
DIG	-0.00185 (0.00511)	-0.000923 (0.00395)	0.00761* (0.00383)	-0.000633 (0.00146)
Constant	0.276 (0.242)	0.292 (0.193)	0.397** (0.170)	0.468* (0.240)
Pseudo R ²	0.6059	0.6682	0.7252	0.7226
Overall R-Square				
No. Countries	38	38	38	38

Note(s): Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$; TDI = Tourism Development Index; POP = population growth; URB = Urbanization; GCF = Gross capital formation; GEX = Government effectiveness; DIG = Government expenditure on education; DIG = Digitalization

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

tourism's role as a stepping stone for less-developed economies but a less dominant driver at advanced stages.

For the controlled variables, population growth has a negative impact on human development across all quantiles, ranging from -0.0491 to -0.0574 . This consistent negative effect highlights the strain that rapid population growth places on public resources, resulting in overcrowded schools and poor health-care services that particularly challenge countries even at higher HDI levels. This confirms [Khan et al. \(2021\)](#), who noted that rapid population growth dilutes per capita investment in education and health care. Importantly, the uniformity of this negative impact across quantiles implies that population pressures are a pervasive barrier to sustainable human development in SSA.

Conversely, urbanization shows a progressively positive effect, increasing from 0.00147 in the 25th quantile to 0.00176 in the 75th quantile. This pattern reveals that urban growth increasingly supports human capital accumulation, particularly in mid-tier economies, by fostering formal job markets and access to services. However, the relatively modest coefficient in high-quantile countries indicates that potential urban sprawl or spatial inequality may dilute these benefits. This aligns with [López-Gay et al. \(2021\)](#), who highlighted both the opportunities and risks of urban growth in SSA. Hence, policy interventions to manage urbanization sustainably are critical to maximizing its human development benefits.

Gross capital formation has a negative effect, diminishing from -0.00515 in the 25th quantile to -0.00283 in the 75th quantile. This counterintuitive finding implies inefficiencies in translating capital investment into social services, particularly in low-HDI countries. Thus, weak governance and corruption likely undermine capital's impact on human development, corroborating [Roy \(2024\)](#). This highlights the importance of institutional quality to leverage capital flows for social gains.

Furthermore, government education spending has a strong positive effect, 0.0122 and 0.0135 at the 25th and 50th quantiles, respectively, but slightly diminishes to 0.0124 at the 75th quantile. This means that in SSA, increased education funding is most critical for boosting HD in low- and middle-development areas, whereas higher-quantile countries may require diversified approaches, including private sector involvement and systemic efficiency improvements. This reinforces [Arvin et al. \(2021\)](#), revealing diminishing returns and reflecting the complex dynamics of human capital investment across development stages.

[Table 5](#) reveals heterogeneous impacts of tourism development dimensions on human capital across the 25th, 50th and 75th quantiles. First, the enabling environment, which includes governance quality, business climate and institutional frameworks has a consistently strong positive effect across all quantiles, from 0.166 at the 25th to 0.168 at the 75th quantile, with the strongest impact at the 50th quantile (0.183). This indicates that mid-tier countries benefit most from stable governance and institutional quality, likely due to sufficient administrative capacity to channel tourism's gains into education and income improvements, without the bureaucratic inertia seen in lower tiers or the diminishing returns in mature institutions. This dynamic effect supports [Igoumenakis et al. \(2023\)](#) and extends their insights by demonstrating how institutional maturity shapes tourism's developmental potential.

Tourism policies exert the strongest impact in the 25th quantile (0.155), declining to 0.102 and 0.096 at the 50th and 75th quantiles, respectively. This confirms that foundational policy reforms such as visa facilitation and marketing are most critical in low-HDI countries, where tourism infrastructure and regulatory frameworks are underdeveloped. In advanced economies, optimized policies yield less incremental benefit, consistent with [Stec and Grzebyk \(2022\)](#). This reveals the policy priority for early-stage tourism economies.

Table 5. The impact of tourism development on human development in Sub-Saharan Africa (quantiles)

Variables	Enabling environment dimension			Tourism policy and enabling environment dimension			Infrastructure and services dimension		
	(5) 25 Quant	(6) 50 Quant	(7) 75 Quant	(8) 25 Quant	(9) 50 Quant	(10) 75 Quant	(11) 25 Quant	(12) 50 Quant	
EED	0.166*** (0.0323)	0.183*** (0.0436)	0.168*** (0.0306)	0.155*** (0.0489)	0.102*** (0.0296)	0.0960*** (0.0202)	0.181*** (0.0290)	0.156*** (0.0313)	
TPEED									
ISD									
TRD									
TSD									
POP	0.0877** (0.0405)	0.0434 (0.0361)	0.0195 (0.0233)	-0.0189 (0.0603)	-0.0596 (0.0363)	-0.0573** (0.0276)	0.0183 (0.0236)	0.00668 (0.0296)	
URB	0.00194*** (0.000816)	0.00201** (0.000758)	0.00241*** (0.000602)	0.00408*** (0.00148)	0.00230*** (0.000756)	0.00242*** (0.000526)	7.30e-06 (0.000717)	0.000629 (0.000650)	
GCF	-0.00579*** (0.00191)	-0.00404** (0.00196)	-0.00188 (0.00113)	-0.00589** (0.00284)	-0.00437** (0.00169)	-0.00228 (0.00140)	-0.00226 (0.00144)	-0.00273* (0.00140)	
GEX	0.0299*** (0.00723)	0.0517*** (0.0103)	0.0431*** (0.00698)	0.0516*** (0.0135)	0.0653*** (0.00879)	0.0354*** (0.00668)	0.0145*** (0.00573)	0.0412*** (0.00639)	
DIG	-0.00571 (0.00528)	0.00444 (0.00723)	0.00586 (0.00583)	-0.00946 (0.0128)	0.00776 (0.00708)	0.00683 (0.00407)	-0.00252 (0.00523)	-0.00204 (0.00509)	
Constant	-0.634** (0.348)	-0.386 (0.355)	-0.210 (0.236)	0.0581 (0.506)	0.597* (0.295)	0.558** (0.208)	0.0391 (0.222)	0.213 (0.257)	
Pseudo R ²	0.5168	0.5267	0.6454	0.2529	0.4870	0.6134	0.5309	0.5381	
No. Countries	38	38	38	38	38	38	38	38	

Note(s): Standard errors in parentheses; ***p < 0.01, **p < 0.05 and *p < 0.1; EED = Enabling environment dimension; TPEED = Tourism Policy and Enabling Environment dimension; ISD = Infrastructure and services dimension; TRD = Tourism resources dimension; TSD = Tourism sustainability dimension; POP = population growth; URB = Urbanization; GCF = Gross capital formation; GEF = Government effectiveness; GEX = Government expenditure on education; DIG = Digitalization

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

(continued)

Table 5. Continued

Variables	Infrastructure and services dimension (13)		Tourism resources dimension (15)		Tourism sustainability dimension (18)		(19)
	75 Quant	(14) 25 Quant	50 Quant	75 Quant	25 Quant	50 Quant	75 Quant
EED							
TPEED							
ISD	0.131***						
TRD		0.139***	0.119**	0.148***			
TSD							
POP	−0.0300 (0.0253)	−0.177* (0.0977)	−0.149* (0.0847)	−0.224*** (0.0774)	0.186*** (0.0511)	0.106** (0.0487)	0.0694 (0.0610)
URB	0.000926** (0.000448)	0.000615 (0.00155)	0.000807 (0.00133)	0.000418 (0.00106)	−0.000205 (0.0557)	−0.0213 (0.0736)	−0.0103 (0.0816)
GCF	−0.00193 (0.00122)	−0.00139 (0.00147)	−0.00307 (0.00231)	−0.00319 (0.00190)	0.00223** (0.00105)	0.00161* (0.000816)	0.00269** (0.00124)
GEX	0.0935*** (0.00642)	0.0155 (0.0116)	0.061** (0.0131)	0.0318** (0.0142)	−0.00257* (0.00149)	−0.00218 (0.00143)	−0.00237 (0.00150)
DIG	0.00198 (0.00323)	0.000857 (0.00940)	−0.00439 (0.00787)	−0.00774 (0.00901)	0.0305** (0.0114)	0.0412** (0.0151)	0.0404** (0.0187)
Constant	0.550** (0.210)	1.633** (0.694)	1.546** (0.624)	2.145*** (0.597)	−0.00876 (0.00697)	−0.00106 (0.00672)	0.00933 (0.0145)
Pseudo R ²	0.6554	0.3943	0.4301	0.5145	−0.258 (0.496)	0.254 (0.567)	0.227 (0.662)
No. Countries	38	38	38	38	0.3476	0.3841	0.3575
					38	38	38

Infrastructure and services show a positive and significant impact across all quantiles, strongest at the 25th quantile (0.181) and weakening at the 75th (0.131). This diminishing return reflects saturation effects; thus, initial investments in transportation, utilities and services directly improve access to education, health care and jobs in low-HDI contexts, whereas in high-HDI countries, investments may focus on luxury sectors with fewer spillovers. [Alcalá-Ordóñez and Segarra \(2025\)](#) similarly found that tourism's GDP contribution is more impactful in lower-human-capital countries by generating low-skill employment.

Tourism resources have a positive impact across quantiles, with a U-shaped pattern that dips before rebounding at the 75th quantile (0.148). This means that while low-HDI countries may lack the capacity to fully leverage natural and cultural assets beyond basic tourism, higher-HDI countries enhance their value through better resource management and the creation of skilled jobs in eco-tourism and heritage conservation. This finding parallels [Hussain et al. \(2025\)](#), who observed a shift toward knowledge-intensive industries in advanced economies diminishing tourism's marginal economic contribution.

Finally, tourism sustainability shows its strongest effect in low-HDI nations (0.186 at the 25th quantile), emphasizing the importance of preserving natural and cultural resources to support long-term, community-based tourism benefits. In higher-HDI countries, the institutionalization of sustainability or competing economic priorities reduces this relative impact, highlighting the evolving role of sustainability along development paths, confirming [Cavalheiro et al.'s \(2020\)](#) findings.

These findings emphasize the methodological value of quantile regression in capturing heterogeneity across development stages and reveal policy-relevant nonlinearities. Unlike existing studies that generalize tourism's effect, this study delineates how tourism development's contribution varies across SSA's development spectrum, offering targeted insights. Also, situating tourism within the capabilities framework, the findings indicate that sectoral growth, when embedded in governance and education strategies, enhances agency and well-being, particularly for the underserved.

4.3 Threshold impact of tourism development dimensions on human development

Beyond the direct effects captured in quantile regressions, this study applies threshold regression to explore nonlinear relationships between tourism development dimensions and human development in SSA based on the region's developmental heterogeneity. The results in [Table 6](#) identify critical thresholds at which the developmental impact of tourism transitions is felt when operationalizes through Sen's capabilities framework by identifying the structural conditions under which tourism expands people's real freedoms, particularly access to health, education and dignified work.

Thus, the enabling environment dimension exhibits a threshold of 3.8540, beyond which its positive effects on human capital begin to plateau. Below this threshold, with a coefficient of 0.0416, improvements in governance and regulatory frameworks, such as reducing bureaucratic inefficiencies or enhancing public service delivery, drive significant gains in education. However, once the threshold is surpassed with a coefficient of 0.0415, incremental improvements yield diminishing returns, signaling the need for complementary investments in sectors like technology or vocational training to sustain progress. These results extend the work of [Cárdenas-García et al. \(2024\)](#) on a nonlinear relationship between tourism and growth, where lower-human-capital countries benefit more from tourism, while higher-human-capital nations reach a threshold beyond which tourism's impact weakens.

Similarly, the tourism policy and enabling environment dimension reveals a significant threshold at 3.8282, and below this threshold, the impact is negative with a coefficient of

Table 6. The threshold impact of tourism development dimensions on human development in Sub-Saharan Africa

Variables	Enabling environment dimension (20)	Tourism policy and enabling environment dimension (21)	Infrastructure and services dimension (22)	Tourism resources dimension (23)	Tourism sustainability dimension (24)
Threshold	3.8540 [3.6211–3.8934]]	3.8282 [3.7730–3.8488]	2.2815 [2.2707–2.3460]	1.8101 [1.7399–1.8145]	3.9618 [3.9139–3.9904]
C.I	0.0416*** (0.0100)				
$\beta_0 EED$	0.0415*** (0.0194)				
$\beta_1 EED$		–0.0249* (0.0131)			
$\beta_0 TPEED$		0.0273* (0.0127)			
$\beta_1 TPEED$			0.0379*** (0.0109)		
$\beta_0 ISD$			0.0418*** (0.0105)		
$\beta_1 ISD$				–0.489*** (0.154)	
$\beta_0 TRD$				0.122** (0.0427)	
$\beta_1 TRD$					–0.0225* (0.0124)
$\beta_0 TSD$					0.0279** (0.0118)
$\beta_1 TSD$					–0.382** (0.149)
POP	–0.3632*** (0.135)	0.222 (0.266)	0.187*** (0.097)	–0.261** (0.124)	–0.00446 (0.00558)
URB	–0.00921 (0.00599)	–0.0114** (0.00503)	–0.00798** (0.00364)	–0.00144 (0.00429)	–0.000175 (0.000619)
GCF	–0.000154 (0.000741)	–0.000880 (0.000647)	–0.000175 (0.000410)	–0.000662 (0.000489)	0.0364*** (0.00219)
GEX	0.0301*** (0.00225)	0.0253*** (0.00163)	0.0330*** (0.00126)	0.0195*** (0.00141)	0.000841 (0.00117)
DIG	0.00198 (0.00145)	0.00184 (0.00106)	0.000182 (0.000813)	0.00158 (0.000906)	2.000 (2.250)
Constant	1.288 (2.169)	–0.403 (1.708)	0.698 (1.267)	1.592 (1.434)	
No.	38	38	38	38	38
Countries	38	38	38	38	38
R-squared	0.552	0.700	0.829	0.790	0.626

Note(s): Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. EED = Enabling environment dimension; TPEED = Tourism Policy and Enabling Environment dimension; ISD = Infrastructure and services dimension; TRD = Tourism resources dimension; TSD = Tourism sustainability dimension; POP = population growth; URB = Urbanization; GCF = Gross capital formation; GEX = Government effectiveness; GEX = Government expenditure on education; DIG = Digitalization

The coefficients β_0 represent the effect before the threshold, while β_1 represents the effect after the threshold

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

–0.0249, indicating that poorly designed tourism policies, including weak labor protections or opaque licensing regimes, can undermine human development by fostering informal employment or facilitating capital flight. However, crossing this threshold triggers the reversal with a coefficient of 0.0273, implying that where coherent policies formalize jobs, fund public health initiatives and incentivize language and hospitality training. This shift reveals the foundational role of policy frameworks in transforming tourism from a fragmented sector into a structured driver of human development. This mirrors the findings by [Elsharnouby and Elbanna \(2021\)](#) and contextualizes them within SSA's unique institutional challenges.

The infrastructure and services dimension, with a lower threshold of 2.2815, highlights infrastructure's dual role as both a basic necessity and a catalyst for advanced growth. Below this threshold, the impact is 0.0379, reflecting that SSA countries experience modest gains from infrastructure projects like road construction or hospital upgrades, which directly improve access to schools and clinics. However, surpassing the threshold amplifies these benefits with a coefficient of 0.0418, especially in middle-income SSA countries transitioning from basic infrastructure to advanced tourism services such as IT-enabled bookings or specialized clinics. These findings support the argument that infrastructure fosters functioning beyond physical access, contributing to capabilities such as mobility, education continuity and occupational health. In contrast to linear models, this highlights the compounding returns of strategic infrastructure once foundational deficits are addressed.

In contrast, tourism resources follow a J-shaped path with a threshold of 1.8101. Below this value, the impact is sharply negative with a coefficient of –0.489, indicating that unmanaged exploitation of natural and cultural assets may damage local communities and biodiversity, reinforcing deprivation. This finding critically qualifies prior studies by showing that tourism resource abundance is not inherently beneficial; it depends on institutional capacity and environmental regulation. The large size of the coefficient indicates how important tourism resources are relative to the other dimensions in driving human development. Above the threshold, the coefficient changes to 0.122, meaning that countries appear to unlock the potential of eco-tourism and cultural heritage preservation to create high-skill employment and educational linkages. This evidence reflects how resource-based tourism, when professionally managed, can expand real freedoms such as job mobility, cultural preservation and intergenerational education, key to Sen's framework and consistent with the study of [Cárdenas-García et al. \(2024\)](#).

Finally, the tourism sustainability dimension highlights a high threshold at 3.9618. Below this, the impact on human development is negative with a coefficient of –0.0225, possibly because sustainability efforts such as eco-certifications and community-based tourism consume limited administrative and fiscal resources that could otherwise support primary education or sanitation. However, the impact changes to positive with a coefficient of 0.0279; thus, advanced economies operating above this threshold use sustainability as a competitive advantage. Therefore, through marketing eco-tourism and marine conservation projects, they attract high-spending tourists, generating revenues that fund scholarships, green jobs and public health innovations. This reinforces [Elsharnouby and Elbanna's \(2021\)](#) emphasis on sustainability as a development multiplier when institutions are mature enough to integrate it systemically.

4.4 Implications

This study advances tourism-for-development discourse by showing how tourism shapes human capital in African countries, beyond economic metrics, through governance, infrastructure, digitalization and sustainability. It highlights integrated policies aligning

tourism with urbanization and governance reforms, emphasizing differentiated impacts under varying institutional conditions, particularly in mid-tier economies, and framing tourism as central to structural transformation and human development. It notes that policies to strengthen institutional quality, ensure sustainable urban growth and leverage tourism competitiveness pillars such as infrastructure, environmental sustainability and cultural resource management must be pursued.

The findings offer four practical implications. First, strengthening governance is essential; transparent institutions ensure tourism revenues are effectively reinvested into education, health care and workforce development. Second, digital infrastructure must be prioritized alongside physical infrastructure, as digitally enabled tourism enhances efficiency and high-skilled employment opportunities. Third, sustainability through eco-tourism, cultural preservation and community-based initiatives supports long-term social and economic gains, especially in marginalized regions.

Fourth, the study addresses a critical empirical gap by focusing on SSA, using quantile and threshold regression to capture distributional heterogeneity and nonlinear effects. Finally, tourism must be embedded in broader development strategies, including vocational training, innovation, public–private partnerships and economic diversification, to reduce sectoral vulnerability and promote a more resilient, knowledge-driven economy.

5. Conclusion and recommendations

This study aimed to investigate the effect of tourism development on human development in SSA, with a focus on how distinct dimensions of tourism development exert differential effects across varying developmental stages and critical thresholds. The quantile regression approach was used to assess the heterogeneous impacts across countries stratified by their human development levels. The threshold regression analysis was used to identify the critical tipping points where tourism dimensions transitioned between regimes of negative or muted effects to significant positive contributions.

The findings confirm tourism's significant, positive impact on human development in SSA, especially in lower-HDI countries. Its contributions are evident in improving education, health and workforce skills, though these effects taper with economic advancement. Among structural determinants, government expenditure and urbanization consistently enhance human development, emphasizing the role of public investment and spatial planning. Conversely, population growth and capital formation often exert negative effects, likely due to infrastructural strain or inefficient investment.

The threshold analysis reveals nonlinear dynamics across tourism dimensions. Tourism sustainability exhibited the highest threshold (3.90), showing minimal impact below this level but significant gains once surpassed, highlighting the need for institutional maturity and scale in sustainability efforts. Similarly, enabling environment (threshold: 3.85) and tourism policy (3.82) dimensions only drive development when the rule of law, governance efficiency and policy coherence are sufficiently established. These results emphasize that tourism's impact is neither automatic nor linear. Its effectiveness depends on enabling conditions and evolves with developmental progress. Thus, tourism must be embedded in broader diversification strategies, especially into service and knowledge sectors. Long-term developmental gains require parallel investments in governance, infrastructure and human capital. Strengthening institutions and ensuring inclusive service access are essential to harnessing tourism's full developmental potential.

This study contributes to theory by augmenting human capital theory, which emphasizes education and training as primary determinants of human development, with Sen's capability approach, which highlights noneducational determinants such as tourism policy, enabling

environments, infrastructure and service quality, natural resources and sustainability policies. This integration extends existing TD–HD models by demonstrating how tourism competitiveness factors can expand individual capabilities beyond traditional human capital dimensions.

Despite the study's contributions, certain limitations must be acknowledged. First, the relatively short-period panel, based on data availability, may constrain the ability to observe longitudinal dynamics of tourism development on human development. Therefore, future research can revisit the analysis when the WEF and UNDP release more data in the future. Second, the limited set of control variables and other contextual factors introduces the possibility of omitted variable bias. Accordingly, future research can expand the analytical model with additional explanatory variables to strengthen robustness and generalizability. These enhancements would offer deeper insight into the mechanisms through which tourism influences human development across differing socio-economic and institutional contexts.

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Supplementary material

The supplementary material for this article can be found online.

About the authors

David Aboagye Danquah is a finance professional, academic researcher and development economist with growing expertise in financial sector policy and international trade. He currently serves as Senior Finance Officer at the National Sports Authority, Ghana, a role he has held since 2021. Prior to this, he contributed to national research and education efforts through positions at the Ghana Revenue Authority, Ghana National Banking College and the University of Professional Studies Accra (UPSA), where he supported both research and teaching in finance and economics. David holds a PhD in Management Studies (Finance) from the University of South Africa, and his research focuses on the interplay between financial development, trade and economic growth in sub-Saharan Africa. His work has appeared in reputable journals such as *SN Business and Economics* and *Economic Research – Ekonomika Istraživanja*. He has benefited from competitive academic awards, including the University of South Africa Research Bursary and a Government of Ghana Scholarship. David's interdisciplinary approach draws on practical experience and academic rigor, with active participation in scholarly conferences and policy research engagements. David Aboagye Danquah is the corresponding author and can be contacted at: david_a.danquah@yahoo.com

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