

## The nonlinear effect of international tourism on income inequality: Testing the Kuznets curve hypothesis

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### ABSTRACT

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The study aims to assess the impact of international tourism on income inequality in 67 developing countries on a global scale during the period from 2005 to 2022. The Generalized Method of Moments (GMM) estimate technique is used to estimate econometric models and provide new insights. Quantitative research results indicate that tourism exerts both linear and nonlinear effects on income inequality. Thus, tourism development serves as a mechanism for reducing inequality in developing countries, following an inverted U-shaped pattern. The study's results fill the current research gap and provide a clear answer to the debates in the scientific community when considering the impact of tourism on income inequality in line with the Kuznets curve hypothesis. Furthermore, the models are categorized to examine the influence of macroeconomic factors, internal factors, and international factors on the dependent variable separately, providing a more general frame of reference when studying the relationship between tourism development and income inequality in developing countries.

### 1. Introduction

Many developing nations view tourism as a dynamic, cost-effective, and successful way to combat poverty and income inequality (Hummel & van der Duim, 2012). This has increased the demand for travel and leisure, particularly in emerging nations. Traveling is not just about seeing sights, taking a vacation, or relaxing in a particular place; it also has significant economic advantages for nations. Long regarded as a key driver of economic growth, particularly in developing countries, tourism can lessen poverty and income inequality (Badulescu et al., 2020; Folarin & Adeniyi, 2020; Li et al., 2018; Lv, 2020; Ma et al., 2019; Shahzad et al., 2017).

Furthermore, income disparity is a significant economic issue that hinders economic growth and may cause stress and conflict. According to Galor and Zeira's (1993) prediction, rising inequality positively impacts Gross Domestic Product (GDP) per capita in emerging nations but has a negative effect in comparatively prosperous ones. Acemoglu et al. (2019), Pickett and Wilkinson (2015) clearly pointed out that while increasing inequality stimulates GDP per capita growth in emerging countries by promoting investment and innovation, it negatively affects developed countries by eroding social trust and increasing crime. Therefore,

to implement effective macroeconomic policies, governments in emerging nations need to be aware of the factors contributing to income inequality. Research indicates that tourism is a key factor that significantly affects inequality (Alam & Paramati, 2016; Mahadevan & Suardi, 2019; Raza & Shah, 2017).

Nonetheless, two competing viewpoints exist on tourism's contribution to social equality. Some contend that tourism generates revenue and improves locals' quality of life as two advantages of foreign tourism (Incera & Fernández, 2015). Tourism can lessen income inequality through its pro-poor effects if it benefits a sizable portion of low-income households (Fang et al., 2021; Seetanah et al., 2023). On the other hand, several studies on the same subject also demonstrate that tourism worsens economic inequality in host nations and benefits only a relatively small group of people (Alam & Paramati, 2016; Uzar & Eyuboglu, 2019).

From the above synthesis, it is evident that researchers remain divided on the impact of tourism on inequality in host countries. Therefore, the theoretical foundation lacks high-quality studies that clearly define whether tourism has a positive or negative effect on income inequality. Thus, we conduct an estimation to further clarify tourism's impact on income inequality in emerging countries. Notably, we contribute to the ongoing discussion on the nonlinear relationship between income inequality and tourism. Based on the findings regarding the impact of international tourism on income inequality, this paper proposes policy implications aimed at promoting tourism development while simultaneously reducing income disparities across different population groups.

## **2. Literature review**

### **2.1. Theoretical background**

The Kuznets Curve concept has been widely applied in various fields, including its application to environmental impacts and the nonlinear relationship between pollution levels and tourism development. Cheng et al. (2021) demonstrated that in the early stages of tourism development, pollution levels tend to increase, but when the tourism industry reaches a certain threshold, investment in green technology and environmental protection policies helps reduce pollution. Similarly, Nguyen and Du (2020) found that the relationship between tourism growth and environmental pollution is nonlinear, depending on the economic structure and the level of investment in environmental infrastructure. Furthermore, Zhang et al. (2022) provided evidence that combining effective environmental management measures with tourism development can create a synergistic effect, contributing to sustainable development.

According to economic theory, income disparity tends to rise in a developing nation's economy and then fall once it reaches a particular stage of development. The Kuznets Curve hypothesis is characterized by an inverted U-shape that depicts the economic growth curve in relation to the degree of income inequality. Arbulú et al. (2015), De Vita et al. (2015), Katircioglu (2014), Lee and Brahmastre (2013), Ozturk et al. (2016), Paramati et al. (2017), Zaman et al. (2016) are only a few of the numerous studies that have been conducted to evaluate the Environmental Kuznets Curve in the context of pollution levels and tourism development. Meanwhile, few studies have examined the relationship between income inequality, tourism, and the Kuznets Curve hypothesis. The long-term equilibrium relationship between tourism and income inequality was validated by Alam and Paramati (2016), who claimed that doubling tourism activity would considerably lower income inequality and thus support the Kuznets Curve theory in emerging nations. The inverted U-shaped relationship

between tourism and income inequality is supported by Uzar and Eyuboglu's (2019) findings, which also show that tourism has a favorable impact on income disparity. Conversely, there are empirical studies that challenge the Kuznets Curve theory. Mahadevan and Suardi (2019) found that income inequality and tourism are not significantly correlated; their research offers no support for the idea that tourism expansion benefits people with low incomes.

Furthermore, Lv and McCabe (2020) demonstrated that tourism has a detrimental influence on regional income disparity, indicating that boosting tourism is a valuable strategy for achieving more equitable regional development. Numerous cross-national studies have also been conducted on the relationship between tourism and inequality; authors like Alam and Paramati (2016), Mahadevan and Suardi (2019), Raza and Shah (2017) examine the direct relationship between tourism indices and income disparities among population classes. Furthermore, a growing number of recent papers have addressed the relationship between tourism and inequality in developing economies (Li et al., 2016; Marcouiller et al., 2004). Alam and Paramati (2016) provide empirical evidence on the effect of tourism on income inequality by examining previous cross-national studies. A non-linear relationship suggests that tourism contributes significantly to reducing wealth disparity in a few chosen nations if current tourism receipts double.

According to the Kuznets hypothesis, which remains a subject of academic debate, this study found that a larger sample size and more precise analytical methods were necessary to examine both linear and non-linear relationships between tourism development and income inequality. These methodological refinements are essential to validate and further expand the existing body of literature.

## ***2.2. Related studies***

Through various pathways, tourism growth substantially impacts income disparity, either lowering or raising it (Njoya & Seetaram, 2018). According to research, tourism positively impacts income disparity. The countries surveyed can lessen income disparity by boosting tourism earnings (Raza & Shah, 2017). However, depending on the institutions and degree of tourism attractiveness, not all nations achieve the tipping threshold for inequality to decline.

According to Cole and Morgan (2010), tourism has long been seen as a cause of social injustice, and as it continues to expand out of control, people need to be more aware of its effects. According to the Kuznets curve hypothesis, some research has discovered a non-linear relationship between tourism revenue and income inequality (Alam & Paramati, 2016; Kumail et al., 2023; Uzar & Eyuboglu, 2019). Previous studies have examined the effect of tourism on income distribution using a variety of research techniques, including Alam and Paramati (2016), Incera and Fernández (2015), Tosun and Timothy (2001). Research on the connection between tourism and income inequality is extensive and complex. Many factors must be considered to understand how tourism affects economic disparity and create policies supporting sustainable development and reducing inequality. Understanding these factors can contribute to the development of local communities, a sustainable tourism economy, and a reduction in income disparity, all of which will lead to a brighter future.

**Table 1***The Relationship between Tourism and Income Inequality*

<b>Author</b>	<b>Time, sample</b>	<b>Method</b>	<b>Result</b>
Lal et al. (2017)	Time: 2014 Sample: Rwanda	By linking DCGE with micro a simulation model	Assessing the impact of tourism investment as a poverty reduction strategy in Rwanda
Raza and Nida Sha (2017)	Time: 1995 - 2015 Sample: 43 top tourist countries	Applying cross-sectional augmented IPS (CIPS), bootstrap co-integration, and Pedroni unit root testing techniques	Increasing tourism revenue will help reduce income inequality
Paramati and Nguyen (2024)	Time: 1995 - 2020 Sample: 21 Asia Pacific economies	Using the panel autoregressive distributed lag (ARDL) method for empirical investigation	All tourism indicators considered have a significant negative impact on income inequality
Nguyen et al. (2021)	Time: 2002 - 2014 Sample: 97 countries	Using different econometric techniques for panel data	Both domestic and international tourism reduce income inequality
Seetanah et al. (2023)	Time: 1990 - 2019 Sample: 83 countries	Panel vector autoregressive error correction model, which takes into account both dynamic and endogenous relationships	Tourism development has the effect of reducing income inequality
Beheshti et al. (2017)	Time: 2000 - 2014 Sample: Provinces of Iran	Using panel econometric models	The development of the tourism industry significantly improves income distribution
Alam and Paramati (2016)	Time: 1991 - 2012 Sample: 49 developing economies in the world	Apply econometric techniques: cross-sectional dependence test, cross-sectional boosting, unit root test, Fisher-type Johansen panel co-integration test, and heterogeneous non-causality test	Results from long-run elasticities show that tourism significantly increases income inequality

Author	Time, sample	Method	Result
Dossou et al. (2023)	Time: 1996 - 2020 Sample: 30 Asian countries	Using DOLS estimation, Panel Corrected Standard Errors (PCSE) .	Tourism development exacerbates poverty, according to the Kuznets hypothesis
Incera and Fernández (2015)	Time: 2008 Sample: Household income and government revenue mechanisms in Galicia	Galicia's Social Accounting Matrix (SAM) Model	High-income households benefited more than low-income households, contributing to a slight increase in income inequality in the region
Mahadevan and Suardi (2019)	Time: 1995 - 2012; Sample: 13 tourism-intensive economies	Using Panel Vector Autoregression	Results find no improvement in income inequality due to tourism growth
Zhang (2023)	Time: 1995 - 2018; Sample: China	Dynamic Panel Data Approach	Tourism has a significant impact on China's income inequality. However, this impact is minimal
Ghosh and Mitra (2021)	Time: 1995 - 2016; Sample: A group of forty-one countries in the study period	Measured through the GINI coefficient	Developing countries exhibit an inverted Kuznets curve behavior between tourism receipts and income inequality

*Note.* Author's synthesis based on previous studies

However, prior empirical research has not consistently determined the direction and extent of tourism's impact on income inequality. While some research suggests that tourism contributes to a more equitable income distribution, others contend that it decreases economic disparity. As a result, a thorough investigation and solutions are required to close this research gap.

### 3. Methodology

#### 3.1. Research design and estimating methodology

The article uses quantitative research methods and data applications to apply linear regression techniques and nonlinear models. To get more accurate results, the author tests and corrects model defects through regression. The Generalized Method of Moments (GMM) is a modern and effective estimation method that overcomes many problems, especially model endogeneity in regression. The GMM model is a powerful tool in data analysis and allows us to capture the correlation between independent and dependent variables in econometric models (Ullah et al., 2018). Using linear and nonlinear models, it investigates how tourism impacts income inequality. The GINI coefficient measures income inequality, and the primary independent variable - the number of foreign visitors to the host nations - serves as the study's dependent variable. In order to construct a more comprehensive model of income inequality across nations, the study also incorporates additional parameters as independent variables, such as GDP per capita, education, infrastructure, inflation, foreign direct investment, foreign debt,

trade openness, and technological advancements. Depending on a nation's level of development, research has indicated a nonlinear relationship between tourism and income disparity.

The aim is to provide the most comprehensive perspective on how tourism affects income inequality in emerging countries. The estimated model of this paper is based on studies on similar topics, such as Alam and Paramati (2016), Dossou et al. (2023), Ghosh and Mitra (2021).

In Model 1, we build a comprehensive picture of the impact of tourism on income inequality and other macroeconomic factors.

$$\begin{aligned} \mathbf{Inequality}_{i,t} = & \alpha_0 + \alpha_1 \mathbf{Inequality}_{i,t-1} + \alpha_2 \mathbf{Tourism}_{i,t} + \alpha_3 \mathbf{GDP\ PC}_{i,t} + \alpha_4 \mathbf{Institutions}_{i,t} + \\ & \alpha_5 \mathbf{Education}_{i,t} + \alpha_6 \mathbf{Infrastructure}_{i,t} + \alpha_7 \mathbf{Inflation}_{i,t} + \alpha_8 \mathbf{FDI}_{i,t} + \alpha_9 \mathbf{Foreign-debt}_{i,t} + \\ & \alpha_{10} \mathbf{Trade-openness}_{i,t} + \alpha_{11} \mathbf{Technology}_{i,t} + \bar{\mathbf{O}}_{i,t} \end{aligned} \quad (1)$$

In Model 2, we test the non-linear impact of international tourism on inequality according to the Kuznets curve hypothesis and other macroeconomic factors affecting the GINI variable in the model.

$$\begin{aligned} \mathbf{Inequality}_{i,t} = & \beta_0 + \beta_1 \mathbf{Inequality}_{i,t-1} + \beta_2 \mathbf{Tourism}_{i,t} + \beta_3 \mathbf{Tourism}^2_{i,t} + \beta_4 \mathbf{GDP\ PC}_{i,t} + \beta_5 \\ & \mathbf{Education}_{i,t} + \beta_6 \mathbf{Infrastructure}_{i,t} + \beta_7 \mathbf{Inflation}_{i,t} + \beta_8 \mathbf{FDI}_{i,t} + \beta_9 \mathbf{Foreign-debt}_{i,t} + \beta_{10} \mathbf{Trade-} \\ & \mathbf{openness}_{i,t} + \beta_{11} \mathbf{Technology}_{i,t} + \bar{\mathbf{O}}_{i,t} \end{aligned} \quad (2)$$

In Model 3, we analyze the internal macroeconomic factors, representing aspects of the economy that affect income inequality in the relationship between international tourism and the income gap between the population classes of the receiving countries.

$$\begin{aligned} \mathbf{Inequality}_{i,t} = & \theta_0 + \theta_1 \mathbf{Inequality}_{i,t-1} + \theta_2 \mathbf{Tourism}_{i,t} + \theta_3 \mathbf{GDP\ PC}_{i,t} + \theta_4 \mathbf{Education}_{i,t} + \\ & \theta_5 \mathbf{Infrastructure}_{i,t} + \theta_6 \mathbf{Inflation}_{i,t} + \bar{\mathbf{O}}_{i,t} \end{aligned} \quad (3)$$

In Model 4, we test the nonlinear relationship of international tourism to the dependent variable along with the internal macroeconomic factors included in the estimated model.

$$\begin{aligned} \mathbf{Inequality}_{i,t} = & g_0 + g_1 \mathbf{Inequality}_{i,t-1} + g_2 \mathbf{Tourism}_{i,t} + g_3 \mathbf{Tourism}^2_{i,t} + g_4 \mathbf{GDP\ PC}_{i,t} + \\ & g_5 \mathbf{Education}_{i,t} + g_6 \mathbf{Infrastructure}_{i,t} + g_7 \mathbf{Inflation}_{i,t} + \bar{\mathbf{O}}_{i,t} \end{aligned} \quad (4)$$

In Model 5, we analyze international macroeconomic factors, representing the remaining aspects of the economy that affect income inequality.

$$\begin{aligned} \mathbf{Inequality}_{i,t} = & \mathbf{d}_0 + \mathbf{d}_1 \mathbf{Inequality}_{i,t-1} + \mathbf{d}_2 \mathbf{Tourism}_{i,t} + \mathbf{d}_3 \mathbf{FDI}_{i,t} + \mathbf{d}_4 \mathbf{Foreign-debt}_{i,t} + \\ & \mathbf{d}_5 \mathbf{Trade-openness}_{i,t} + \mathbf{d}_6 \mathbf{Technology}_{i,t} + \bar{\mathbf{O}}_{i,t} \end{aligned} \quad (5)$$

In Model 6, we test the nonlinear relationship of international tourism to the dependent variable along with the international macroeconomic factors included in the estimated model.

$$\begin{aligned} \mathbf{Inequality}_{i,t} = & \S_0 + \S_1 \mathbf{Inequality}_{i,t-1} + \S_2 \mathbf{Tourism}_{i,t} + \S_3 \mathbf{Tourism}^2_{i,t} + \S_4 \mathbf{FDI}_{i,t} + \S_5 \mathbf{Foreign-} \\ & \mathbf{debt}_{i,t} + \S_6 \mathbf{Trade-openness}_{i,t} + \S_7 \mathbf{Technology}_{i,t} + \bar{\mathbf{O}}_{i,t} \end{aligned} \quad (6)$$

These models are also applied to the group of countries belonging to the group of developing countries, with the overall sample having  $N = 67$  and  $t = 17$ . Therefore, quantitatively, the models ensure a relatively large number of observations to ensure the technical validity of econometric regression, with impact coefficients and errors  $\bar{\mathbf{O}}$ .

### 3.2. Data

The study is designed by using the GINI variable as a proxy for the level of income inequality. The GINI index is a popular statistical measure reflecting the distribution of income in an economy, with values ranging from 0 (perfect equality) to 1 (perfect inequality). Usually, for easy comparison and visualization of data, this index can also be converted to a 0 - 100 scale. The World Bank is the original data source; the secondary data sources used in this study are gathered yearly. This study uses a panel dataset that spans the years 2005 - 2022 and includes data from 67 developing and emerging economies worldwide.

**Table 2**

*Definition of Variables in The Model*

Variable	Define and units	Source
Inequality	Gini index (0 - 100 ranking)	
Tourism	International tourism (million people )	
GDP PC	GDP per capita growth (annual %)	
Education	Government expenditure on education, total (% of GDP)	
Infrastructure	Individuals using the Internet (% of population)	World Bank
Inflation	Inflation, consumer prices (annual %)	(2024)
FDI	Foreign direct investment, net inflows (% of GDP)	
Foreign debt	External debt stocks, total (billion US\$)	
Trade-openness	Merchandise trade (% of GDP)	
Technology	High-technology exports (% of manufactured exports)	

Note. Author's synthesis

## 4. Result and discussion

### 4.1. Descriptive statistical analysis

Data related to income inequality in developing countries have been collected and compiled in Table 3:

**Table 3**

*Statistical Table Describing Variables in The Model*

Variable	Obs	Mean	Std. Dev.	Min	Max
Inequality	1,155	40.28	7.120	25.1	61
Tourism	971	6.877	20.53	0.005	162.5
GDP PC	1,193	2.288	4.265	-29.92	19.93
Education	941	3.931	1.545	0.691	10.31
Infrastructure	1,118	24.61	23.33	0.065	97.39
Inflation	1,149	8.791	24.35	-10.06	557.2
FDI	1,192	3.408	4.791	-37.17	43.91
Foreign debt	1,078	51.82	109.1	0.278	612.8
Trade-openness	1,198	55.079	28.55	10.20	187.5
Technology	791	8.506	11.74	0	67.04

Note. Author's calculation from research data

The table above shows that there are fluctuations between the variables in the dataset under study:

The income inequality variable has an average value of 40.28, with the minimum value being 25.1 and the maximum value being 61, while the standard deviation is 7.120. This indicates a significant disparity in income distribution among the countries in the dataset. The tourism variable has an average value of 6.877. However, this variable exhibits considerable variation, as some countries attract very few tourists, with the lowest recorded figure being 0.005 million visitors, while others receive a substantially higher number of tourists, reaching a peak of 162.5 million visitors.

The average GDP per capita across the entire sample is 2.288. Additionally, the statistical results highlight differences between countries, with a standard deviation of 4.265. Education expenditure varies significantly across countries, with the highest spending level reaching 10.31% of GDP, while some countries allocate as little as 0.691% of GDP. This disparity reflects variations in education development policies and structural differences among emerging economies. The infrastructure variable, measured by the percentage of the population with Internet access, has an average value of 24.61. This variable also exhibits significant variation, with a standard deviation of 23.33.

Inflation, across the entire sample, has an average value of 8.791%. Some countries have experienced extremely high inflation rates, peaking at 557.2%, while others have recorded deflation, with rates as low as -10.06%. This suggests that the economic development trajectories of the selected countries are highly uneven. Foreign Direct Investment (FDI) inflows average 3.408% of GDP. However, there is considerable variation in foreign capital attraction. Notably, one country recorded the highest FDI inflow at 43.91% of GDP, while another experienced net FDI outflows, reaching -37.17% of GDP. External debt levels vary significantly, with the highest debt among the selected countries reaching 612.8 billion USD, while some nations maintain very low debt levels, as low as 0.278 billion USD. Trade openness, an indicator of economic integration, also varies considerably, with some countries exhibiting high levels of openness, reaching 187.5% of GDP, while others maintain lower levels, at only 10.20% of GDP. The average value across the dataset is 55.079% of GDP. The high-tech exports variable also demonstrates significant variation, with one country reporting an export level as high as 67.04% of GDP, highlighting the technological advancement of its economy. In contrast, some countries recorded near-zero high-tech exports in certain years.

Through the table above, it is evident that the variables in the model exhibit substantial statistical variation. However, the standard deviation remains within an acceptable range, indicating that the data points are relatively concentrated around the mean. In other words, the dataset exhibits low dispersion and high consistency.

#### **4.2. Correlation analysis**

The correlation between the variables in the research model is tested using the Pearson Correlation coefficient. The coefficient results show the degree of correlation between the variables in the study model and assist in identifying multicollinearity between independent variables, which significantly impacts the regression model's outcomes.

**Table 4***The Correlation Matrix Analysis*

Variable	Inequality	Tourism	GDPPC	Education	Infrastructure	Inflation	FDI	Foreign debt	Openness	Technology
Inequality	1.000									
Tourism	0.0507	1.000								
GDPPC	-0.0835*	0.1264*	1.000							
Education	0.2768*	0.0323	-0.0928*	1.000						
Infrastructure	0.0314	0.2259*	-0.1075*	0.2216*	1.000					
Inflation	0.0014	-0.0325	-0.1328*	-0.0438	0.0051	1.000				
FDI	-0.0354	-0.0724	0.1029*	0.0843*	-0.1007*	-0.0271	1.000			
Foreign debt	0.1109*	0.3451*	-0.0044	0.1348*	0.4125*	-0.0291	-0.0642	1.000		
Trade-openness	0.0828*	0.1839*	0.1100*	0.2629*	0.1336*	-0.0595	0.3229*	-0.1125*	1.000	
Technology	-0.0430	0.1701*	0.0413	0.0720	0.3603*	-0.0732	0.0653	0.2181*	0.3465*	1.000

Note. \*  $p < 0.10$ . Author's calculation from research data

Income inequality and the number of foreign visitors are positively correlated, as evidenced by the correlation coefficient between the variables (inequality) and (tourism), which is  $0.0507 > 0$ . An increase in tourists leads to a growth in economic disparity. Through the correlation coefficients of these variables, it can be seen that international tourism not only does not reduce inequality but also aggravates the income gap between the population classes in the receiving countries. However, when evaluating the correlation of these coefficients, it is only correct in terms of linearity; it is still impossible to conclude the negative relationship between the variables because it also depends on the nonlinear econometric regression model in the following section. The independent variables all have VIF values below 2, indicating the absence of multicollinearity. Consequently, the regression coefficients are likely to be unbiased and provide more reliable interpretations of the variables' effects within the model.

**4.3. Panel data regression analysis****Table 5***GMM Estimation Results*

Variable	Income inequality: Dependent variable					
	1	2	3	4	5	6
<b>Inequality _1</b>	0.037 [ 0.70 ]	0.121*** [ 3.60 ]	-0.088 [ -1.49 ]	0.122 [ 1.47 ]	0.377*** [ 9.07 ]	0.135*** [ 27.28 ]
<b>Tourism</b>	0.038*** [ 3.43 ]	0.020*** [ 3.60 ]	0.01*** [ 7.47 ]	0.048** [ 2.44 ]	0.01*** [ 3.89 ]	0.025*** [ 6.17 ]
<b>Tourism<sup>2</sup></b>		- 0.0001*** [ - 4.99 ]		- 0.0002** [ - 1.96 ]		-0.0004* [ - 1.65 ]
<b>GDP PC</b>	-0.019 [ -1.49 ]	- 0.0 14*** [ -3.12 ]	-0.0 93 *** [ - 4.56 ]	-0.158 * ** [ - 5.17 ]		
<b>Education</b>	- 0.1 7 * * [ -2.58 ]	-0.258* ** [ -7.86 ]	-1.084** ** [ -3.95 ]	-0.746 ** [ - 2.41 ]		
<b>Infrastructure</b>	-0.043 *** [ - 16.25 ]	- 0.038*** [ - 13.01 ]	-0.044 *** [ - 7.29 ]	-0.059 *** [ - 10.66 ]		
<b>Inflation</b>	0.082*** [ 4.77 ]	0.0 74*** [ 21.87 ]	0.0 60** [ 2.39 ]	0.0 55* [ 1.86 ]		
<b>FDI</b>	-0.0436 *** [ - 8.12 ]	-0.045 *** [ - 13.94 ]			- 0.044 [ - 1.53 ]	-0.022*** [ -3.57 ]

Variable	Income inequality: Dependent variable					
	Model					
	1	2	3	4	5	6
<b>Foreign debt</b>	- 0.002 [- 1.32 ]	-0.008*** [- 9.14 ]			- 0.007 *** [- 5.23 ]	-0.007 *** [- 134.38 ]
<b>Trade- openness</b>	- 0.0 34* ** [- 7.31 ]	- 0.0 32*** [- 17.69 ]			-0.033*** [- 5.31 ]	-0.007** * [- 23.37 ]
<b>Technology</b>	-0.0 012 [- 0.16 ]	-0.015* [- 1.74 ]			-0.0 67** [- 2.34 ]	-0.0 17* [- 1.94 ]
<b>AR2</b>	Z = -0.41 Pr > z = 0.684	Z = -0.21 Pr > z = 0.830	Z = -0.40 Pr > z = 0.687	Z = 0.08 Pr > z = 0.936	Z = 0.01 Pr > z = 0.996	Z = 0.22 Pr > z = 0.825
<b>Sargan test</b>	Chi2(40) = 44.67 Prob > chi2 = 0.282	Chi2(42) = 50.40 Prob > chi2 = 0.175	Chi2(24) = 9.91 Prob > chi2 = 0.995	Chi2(22) = 7.52 Prob > chi2 = 0.988	Chi2(16) = 6.29 Prob > chi2 = 0.985	Chi2(24) = 13.39 Prob > chi2 = 0.959

Note. \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01, [ ] t-value. Author's calculation from research data

First, the lagged variable *Inequality\_1* shows a positive relationship with income inequality. This indicates that income inequality in the current year affects income inequality five years later. AR(2), the Sargan test all confirm the appropriateness of the estimated models using the GMM regression method. The t-values differ from zero, indicating that the independent variables affect the dependent variable.

Second, the key independent variable in this model is *Tourism*, which represents the number of international tourists visiting host countries. According to the correlation analysis above, the results show that only a small segment of the population benefits from tourism when its economic gains are not equitably distributed, exacerbating the income gap between different socioeconomic groups. The regression coefficients (0.038; 0.020; 0.010; 0.048; 0.010 and 0.025) are all statistically significant and positive, suggesting that an initial increase in tourism may exacerbate income inequality in developing countries. This reflects the fact that in the early stages of tourism development, economic benefits are mainly concentrated in a small group of large enterprises or those with resources, while the unskilled labor and disadvantaged communities benefit less.

However, when considering the non-linear model within the framework of the Kuznets curve hypothesis, the relationship takes an inverted U-shape. When tourism expands beyond a certain threshold, its impact becomes positive. The *Tourism Squared* variable suggests that a substantial increase in tourism facilitates a more widespread distribution of economic benefits within the community. With relatively high regression coefficients and strong statistical reliability in all three non-linear models, the negative coefficient implies that income inequality declines as tourism experiences significant growth. This finding aligns with previous studies by Alam and Paramati (2016), Raza and Shah (2017), Uzar and Eyuboglu (2019), providing robust empirical evidence supporting the Kuznets hypothesis on the relationship between income inequality and tourism in developing countries.

Third, variables representing domestic economic factors, such as per capita income, public expenditure on education, and infrastructure development, serve as mitigating factors for income inequality. The consistent negative signs in the regression coefficients across all models reinforce their statistically significant impact. This result indicates that increasing investment in education, enhancing household income, and strengthening infrastructure development contribute significantly to narrowing income disparities. Among these factors, education emerges as the most influential in reducing inequality, as reflected in Model 3, where the regression coefficient is -1.084 with a 1% significance level. In contrast, inflation is identified as one of the factors that increases income inequality. The regression coefficient of inflation in model 1 has a value of 0.082 with a statistical significance level of 1%, indicating that when inflation increases, the purchasing power of people, especially low-income groups, will decline, thereby exacerbating the income gap. Although inflation may be a result of rapid economic growth, if not well controlled, it can have a negative impact on income distribution and reduce people's quality of life. The research results show that while factors such as education, per capita income, and infrastructure investment play an important role in reducing inequality, inflation is a major risk that needs to be controlled.

Fourth, the international economic variables, including Foreign Direct Investment (FDI), trade openness, external debt, and high-tech exports, all exhibit statistically significant negative coefficients across the regression models. The findings suggest that greater global

economic integration plays a crucial role in reducing income inequality. FDI inflows, for instance, enable multinational corporations to create employment opportunities for local workers. Similarly, foreign debt, when effectively reinvested, can generate economic benefits for a broader segment of the population. Deepening trade integration fosters business expansion and increases employment prospects for both skilled and unskilled workers. Furthermore, technological advancement contributes positively to narrowing the income gap, benefiting the broader community.

Comparison with previous studies by Ghosh and Mitra (2021), Kumail et al. (2023), Uzar and Eyuboglu (2019). The results of the current study not only confirm the similar findings but also extend the theoretical framework through the application of GMM models and nonlinear models to test the Kuznets curve hypothesis. The combination of internal and international factors in the same analytical framework further increases the practicality and applicability of the study in proposing socio-economic policies to narrow the gap between rich and poor.

Through the regression results, we gain empirical validation of the Kuznets hypothesis in analyzing the relationship between income inequality and tourism development. Additionally, this study identifies the key factors that contribute to reducing income disparities while pinpointing those that exacerbate them. The statistical significance of the model variables, confirmed through econometric tests, ensures the reliability of these findings. Building on this empirical foundation, the authors propose targeted policy recommendations for governments in developing countries, which are discussed in the Section.

## **5. Conclusions and policy implications**

Through empirical analysis of 67 developing countries from 2005 to 2022, we have found the validity of the Kuznets curve hypothesis when studying the topic of inequality. This study also examines the dynamic nature of international tourism and its relationship with income inequality, revealing an inverted U-shaped pattern. Building on these findings, the research offers valuable insights for the academic community into the complex interplay between international tourism and income distribution. Furthermore, the paper outlines practical policy implications aimed at reducing income inequality and promoting sustainable tourism development.

Firstly, promoting the development of international tourism is a key factor in reducing inequality, as attracting a sufficiently large number of tourists ensures that economic benefits are distributed more equitably, thereby reducing income disparity. Expanding tourism sectors, creating unique and distinct cultures, diversifying cuisine, enhancing connections with nature, and developing resorts are effective policies to attract more international tourists. The more tourists a country attracts, the lower the inequality becomes, as benefits are more evenly shared. This is a crucial factor in fostering political stability and economic development.

Secondly, investment in education is recognized as a key strategy for poverty reduction and improving the quality of human resources. The results of this study show that higher investment in education significantly enhances poverty reduction. Expanding access to education benefits a large part of the population, creating a solid foundation for socio-economic development.

Thirdly, developing modern infrastructure, especially in transportation and telecommunications, not only facilitates business and tourism activities but also helps connect economic regions, contributing to narrowing the gap between the rich and the poor.

Fourthly, strengthening international integration and attracting foreign investment create opportunities to access advanced technology, abundant capital, and management experience, thereby supporting domestic enterprises in their development, creating jobs, and improving workers' income.

Finally, applying technology to production and economic management is an essential trend that enhances operational efficiency, reduces costs, and generates added value, thereby contributing to reducing inequality and promoting sustainable development.

However, the study also has certain limitations. Focusing on only 67 countries over the 2005 - 2022 time frame may not fully reflect macroeconomic fluctuations in other countries due to data limitations. In addition, some indicators of inequality, such as tourism, education, and infrastructure, depend on different measurement methods and data sources, which may affect the reliability of the analysis results. Furthermore, the study did not delve into the analysis of the transmission mechanism of the impact of tourism or education on inequality, nor did it fully consider the differences in institutional and cultural contexts between countries. Therefore, future studies need to expand the data scope, improve the measurement method, and focus on analyzing the transmission channels of impacts, thereby drawing more practical policy implications for developing countries.

## SCIENTIFIC CONTRIBUTION

The manuscript clearly identifies a research gap; the manuscript proposes a new theoretical or analytical model; the manuscript opens new directions for further research.

## AUTHOR CONTRIBUTIONS

CRedit: **Pham Nang Thang**: Conceptualization, Methodology, Formal Analysis, Writing Original Draft; **Truong Trung Tin**: Data Curation, Software, Formal Analysis, Writing Review & Editing; **Do Le Minh Thu**: Data Curation, Validation, Visualization, Writing Review & Editing; **Nguyen Tran Thang**: Data Curation, Supervision, Methodology, Validation, Writing Review & Editing; **Do Thi Thu Thao**: Literature Review, Validation, Investigation, Writing Review & Editing.

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## NO CONFLICT OF INTEREST STATEMENT

All authors declare that they have no conflict of interest.

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