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Article

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European Tourism Sector Development in the Context of Energy Uncertainty

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ABSTRACT

The research is a novel to study the impact of energy uncertainty on international tourism receipt in 11 European countries namely Belgium, Croatia, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Spain and Sweden due to availability of energy uncertainty index data recently developed by Dang et al. (2023). As econometric tool, we employ a fully modified ordinary least squares (FMOLS) framework and include obtained long-run relations in a panel Vector Error Correction model (VECM). The findings suggest that 1% increase in energy uncertainty leads to 0.08% decrease in international tourism receipt in Europe. Moreover, international tourism receipt reaches the equilibrium with the adjustment speed of 23% annually. Regarding the effect of control variables, economic development has a negative relation whereas CO_2 emissions and institutional quality have a positive association with international tourism receipt. As a policy implication, enhancing renewable energy is suggested to cope with energy uncertainty consequences that might affect tourism development.

Keywords: International Tourism Receipt; Energy Uncertainty; Economic Development; CO2 Emissions, Institutional Quality
JEL Classifications: L83, Z32, O13

1. INTRODUCTION

The surge in tourism activities has led to a heightened demand for energy consumption across various domains, including accommodation, catering, infrastructure, and transportation (Švec et al., 2023; Ciarlantini et al., 2023). The tourism heightens the energy demands for heating or cooling (Margosi et al., 2022).

Energy plays an important role in the economic development of the region (Apergis and Kuziboev, 2023). In tandem with the persistent rise in energy demand driven by long-term consumption growth trends, it becomes imperative to scrutinize the correlation between tourism and electricity consumption. Tourism is recognized as one of the most fossil fuel-dependent industries, a characteristic particularly pronounced in small islands where the use of fossil fuels for tourism-related activities is deemed critical. Viewed as an economic activity from an energy needs perspective, the tourism sector primarily encompasses transportation services and the hosting of tourism consumers, alongside the requisite infrastructure. The energy consumption induced by tourism can wield a direct and substantial impact on the overall energy consumption patterns of a region (Margosi et al., 2022).

As previously highlighted, tourism industry commands substantial energy consumption, driven by both transport-related activities—encompassing travel to, from, and within destinations—and destination-related facets, including accommodation, food services, and tourist activities. Despite the surge in tourism leading to heightened fossil energy consumption, investments in energy efficiency and renewable energy solutions within the sector have

proven to yield substantial returns over a short timeframe. Existing performance indicators concentrate on consumption metrics, the adoption of alternative energy sources, and the implementation of energy-efficient and conservation programs (UNWTO, 2023).

Furthermore, quantifying energy consumption in the tourism sector poses inherent challenges, given the complexities involved. These challenges stem from difficulties in capturing the industry's indirect energy use, spanning the construction of hotels, airports, vehicles, and roads. Additionally, accounting for energy consumption in associated sectors, such as tour operators and their offices, as well as the energy utilized in the commute of those employed in the tourism industry, adds layers of intricacy to the measurement process (UNWTO, 2023).

The European Union has taken strides towards a sustainable energy transition, mandating member states to ensure that new buildings adhere to zero-energy standards as much as possible since 2021 (Paspatis et al., 2022). This directive acknowledges the pivotal role that the construction and hospitality industries play in shaping a sustainable future.

However, on the other hand, European countries suffer from a lack of adequate energy sources (Zettelmeyer et al., 2022). In addition, geopolitical issues are preventive measures in European energy supply. The Crimea annexation and Ukraine invasion by Russia makes it difficult for Europe to keep profitability of economic activities and tourism sphere as well. The interruptions in energy supply are causing an increase in energy uncertainty in European nations. Considering the tourism sector contributes to 8,7% of European GDP, the motivation emerges to investigate the impact of energy uncertainty on tourism development in Europe.

2. LITERATURE REVIEW

2.1. The Linkage between Tourism and Energy Uncertainty

The tourism industry is undergoing significant expansion, prompting a growing interest in the interconnection between energy uncertainty and its implications for tourism development, as highlighted by various authors (Aboagye and Kwakwa, 2023 or Alhawamdeh et al., 2023). This scholarly attention reinforces the findings of Osorio-Molina et al. (2023), whose research indicates an escalating interest in exploring the relationship between energy and the tourism sector.

The ongoing expansion of the global economy and improvements in living standards across diverse regions in the world contribute to a rise in both the qualitative and quantitative requirements within the energy area, encompassing the provision of goods and services. These heightened demands give rise to distinctive conditions and novel interactions across various spheres of human activities, notably impacting the tourism industry (Beer et al., 2018). Energy uncertainty, rooted in the unpredictability and volatility of resource production, distribution, and pricing, can exert a substantial impact on tourism development, particularly in terms of transport costs, accommodation services, and the overall travel experience (Adedoyin et al., 2020).

The tourism industry's high energy consumption poses understanding how energy uncertainty shapes the future of sustainable tourism development is fundamental, with a focus on concepts like green tourism and eco-friendly tourism (Wang et al., 2023; Ali et al., 2023; Ghimire et al., 2023). Tourism emerges as a driving force for growth and development; nevertheless, contemporary research indicates a substantial reliance on the energy sector within this industry. Studies state that tourism increases energy consumption (Teng et al., 2021).

The prevalent reliance of tourism activities on energy consumption, particularly non-renewable energy sources, stands as a formidable obstacle to achieving a model of sustainable tourism, especially making the sphere more affected by energy uncertainty. In Europe, the ongoing challenge of uncertain future energy availability is a major concern. The continent is dealing with issues like the depletion of traditional energy sources, geopolitical uncertainties impacting supply chains, and the urgent need to transition to more sustainable alternatives. This uncertainty has significant implications, especially for the vibrant tourism sector, which is a crucial component of the European economy. The tourism industry, covering travel, hospitality, and related services, relies heavily on a stable and ample energy supply for the functioning of hotels, transportation, and various amenities essential to the tourism experience. As Europe grapples with this energy uncertainty, the tourism sector faces heightened concerns about its resilience, operational costs, and overall sustainability (Satrovic and Adedoyin, 2023; Trstenjak et al., 2020).

Tourism, a cornerstone of the European economy, is not shielded from the consequences of the continent's energy challenges. The intricacies of the tourism sector, including travel, accommodation, and hospitality, necessitate a reliable energy supply. The uncertainty surrounding Europe's future energy situation raises important questions about the sector's ability to operate smoothly and sustainably. Travelers, accommodations, and transportation services all rely on consistent and efficient energy sources for optimal functioning. Consequently, the energy uncertainty in Europe has significant implications for the tourism industry, potentially impacting the quality of services, operational costs, and the overall allure of European destinations. As policymakers grapple with planning for a secure energy future, the complex interplay between energy uncertainty and the vitality of the European tourism sector becomes a crucial consideration in shaping the economic landscape of the region (Meşter et al., 2023; Steiger et al., 2022; Haller and Tacu Hârşan, 2021).

H_1: there is a negative relation between tourism and energy uncertainty.

2.2. The Linkage between Tourism and Economic Development

Economic growth is one of the pivotal factors in the development and expansion tourism sector. Most of the research on tourism economics highlighted the direct influence of the growth of economy into tourism industry (Çağlayan et al., 2012, Tang and Jang, 2009; Usman et al., 2020). Ghosh et al. (2020) scrutinized the connection

of a country's GDP per capita and the increase of marine tourism in the region of the South Pacific Ocean including a great deal of islands. The analysis implicates that when it is flourishing with excessive GDP growth, oceanic region development is expected to rise inside the country simultaneously it can support financially in tourism destinations particularly building and reconstructing hotels, restaurants, and cafes, as well as nourishment services and other infrastructural facilities in coastal area. Furthermore, Tian et al. (2021) came up with an affirmative relationship between the growth of GDP and tourism development as it is the one of pivotal source of investing and crucial resources obtainable for tourism expansion. Over a comprehensive research, León-Gómez et al. (2021) analyzed the connection of economic rise computed by GDP growth and sustainable tourism development. Additionally, Chen (2023) found out a positive link of GDP growth, GNI, foreign investment, the government tourism policy, and international tourism growth. The investigation stated that when a nation`s GDP growth ratio is high, the enterprises in tourism sector can receive distinction of resources and a competent human resource, which gave rise to enhancement in the tourism services and the considerable marketing for services in the sector. Accordingly, the correlation of the tourism and GDP is investigated by means of the following hypothesis:

H_2: there is a positive or negative relation between tourism and GDP.

2.3. The Linkage between Tourism and CO_2 Emissions

CO_2 emissions is considered as the main contributor to climate change. The issue is that climate conditions are taken account as a key resource to tourism development (Dogru et al., 2019). The issue is that climate change effects mostly happen in nature and landscapes, on which tourism industry strongly rely. More specifically, tourism depends on suitable weather conditions such as sunshine, mild temperatures for tourists to have an enjoyable experience (Atasoy and Atasoy, 2020). The coastal or seaside vacation industry is a popular sector within the tourism sector which may attract tourists (Leal Filho, 2022). However, the rises in sea-level, caused by increased global temperatures, poses a threat to coastal tourism. Additionally, changes in precipitation affect the available times for tourists to enjoy seaside holidays. Similarly, South African beaches are being affected by climate change (Friedrich et al., 2020). Furthermore, increases in temperatures are believed to be associated with decreases in snow fall (Bormann et al., 2018), affecting on the tourism types related to mountain areas with snow.

On the one hand, CO_2 emissions related decrease in tourism is related to the affected nature which tourists do not prefer to visit to. On the other hand, given high level of CO2 emissions, countries may have incentive to restrict international tourist arrivals to avoid further environmental degradation and comply international climate change rules such as Kyoto Protocol and Paris Agreement

H_3: there is a negative relation between tourism and CO_2 emissions.

2.4. The Linkage between Tourism and Institutional Quality

The interconnection between tourism and institutional quality is a center of scholarly discourse, with researchers extensively examining the significant influence of governance on the tourism industry. The nexus between tourism and institutional quality is a key factor that noticeably determines the attractiveness and sustainability of tourist destinations. Countries with high institutional quality are poised to gain a competitive advantage in the international tourism market. The reliability of institutions enhances traveler's confidence, attracting more visitors and encouraging repeat visits. On the contrary, destinations with poor institutional quality may face challenges such as political instability, corruption, and inadequate regulatory frameworks, which can deter potential visitors and limit the growth of tourism industry (Pizam and Mansfeld, 2006, Araña and León, 2008; Ghalia et al., 2019; Lee et al., 2020;). Specifically, the significance of political steadiness and its impact on destination attractiveness have been conducted research in the countries of Lebanon (Issa and Altinay, 2006), Ireland (O'Brien, 2012), Bosnia and Herzegovina (Causevic and Lynch, 2013). Moreover, Teye (1988) stated that during political conflict in a region, the authority concentrates on managing the violence and adjourns long period plans for improving tourism conveniences. The research by Fletcher and Morakabati (2008) was concerning on Fiji where negative political proceedings have substantially severe influence on tourism appeal. Additionally, Altinay and Bowen (2006) maintained the noteworthiness of public policy in endorsing the enterprises operating confidence and necessary atmosphere for tourism industry progress. They focused attention on that the struggle in coordination and development in Cyprus are aggravated attributable to political disarrangement on the island amongst Turkey and Greece where states have dissimilar proposes and expectations that influenced on tourism industry in country. Furthermore, Liu et al., (2018), Habibi (2017), Saha et al. (2017) have scrutinized the most important factors of the development of tourism industry. They highlighted that the stable political environment and corruption are one of the most significant factors that directly influences to the flow of tourist. Precisely, they concluded that touristic region with political stability and effective control of bribery is expected to entice more travelers into destinations. Tang (2018) stated that foreign trippers are not aware of voice and responsibility, but rather than they are extremely anxious about the stable political environment, the level of corruption, effective government, the quality of regulation, and rule of law in their selection of travelling area. Moreover, Tang (2018) emphasized about the improvement of excellence of governance and the quality of institutions by politician in Malaysia. Good governance together with institutions in creating an environment conducive to tourism-related activities is very important. Understanding and nurturing this connection is crucial for policymakers, as improvements in institutional quality can lead to increased tourist flows, economic benefits, and the overall development of the tourism industry in each destination.

Following the research findings above mentioned and Tang (2018), this study employs government effectiveness index as a governance factor.

H_4: there is a positive relation between tourism and institutional quality.

3. DATA

To empirically examine the association among tourism, energy uncertainty, economic development, CO_2 emissions and institutional quality, balanced panel data including 11 European countries, namely Belgium, Croatia, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Spain, and Sweden, is created spanning the period 1996-2022 employing annual data. In the study, tourism, measured in % of total exports, is used as the explained variable, whereas energy uncertainty, measured in index, is applied as the core explanatory variable. Economic development, measured in Gross Domestic Product per capita in USD, CO_2 emissions, measured in metric tons per capita and institutional quality, measured in index are used as control variables. All data are obtained from World Development Indicators. Table 1 provides the definition and sources of the employed variables.

According to the descriptive statistics of the variables given in Table 2, international tourism receipts of European countries averagely make 11.1% of total exports. Mean value of the energy uncertainty index is 23.9 for given states. Gross domestic product shares 36095.97 USD per person on average. Each person averagely emits 7.30 metric tons of carbon dioxide. Perceptions of the quality of public services is estimated as 1.31 on average.

4. METHODOLOGY

The study examines the relationship among tourism (ITR), energy uncertainty (EUI_LOG), economic development (PGDP_LOG), CO_2 emissions (CO_2_LOG) and institutional quality (IQ_LOG) in the long-run relation. To examine the long-run equilibrium, a Panel Vector Error Correction Model (VECM) is employed, taking the following general representation:

$$\Delta Y_{i,t} = \alpha\left(\beta' Y_{i,t-1}\right) + \Gamma \Delta Y_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

where $Y_{i,t}$ is a country-specific vector of modelled variables including $ITR_{2,i,t}$, $EUI\_LOG_{i,t}$, $PGDP\_LOG_{i,t}$, $CO2\_LOG_{i,t}$, $IQ\_LOG_{i,t}$, $\varepsilon_{i,t}$ is the model error and might be further detailed with the specification of unobserved heterogeneity, and Δ is the first difference operator. In addition, we introduce a single lag using SIC criterion. Furthermore, we highlight that the short-term parameters Γ, the adjustment coefficients α, and the cointegrating equation coefficients β are constant across all subjects (countries) of our sample. Finally, we note that the term in parentheses, $\beta' Y_{i,t-1} = \mu_t$, is also called the cointegration residual or error correction term. We observe that, from an economic perspective, the parameters in the β' vector are also defined long-run multipliers. Notably, a two-step estimation approach might be used (Sims, 1980), where in a first stage the long-run parameters, that is the β' vector, are estimated by appropriate methods (for instance Dynamic OLS or Fully Modified OLS), then the cointegration residuals are evaluated and, given their stationarity, the short-term dynamic parameters and the adjustment coefficients are estimated by least squares methods. Such a two-step procedure allows for the specification of more flexible long-run equations.

In the empirical analysis, we will evaluate the existence of unit roots for the variables of interest and the occurrence of cointegration among them. Specifically, we consider panel unit root test to verify the presence of unit roots in our variables: we use the Levin, Chin and Chu t*-test (Levin et al., 2002). We also apply the Fisher (or combined Johansen) cointegration test to identify the existence of a long-run relationship among the studied variables.

From a theoretical point of view, and coherently with the previously cited literature, we might postulate the existence of a single long-run relationship, associated with the tourism-energy uncertainty. Consequently, if this claim is supported by the data, we will specify the following long-run equation, representing the tourism-energy uncertainty relationship with parameters common to European countries

$$ITR_{i,t} = \delta_0 + \beta_2 EUI\_LOG_{i,t} + \beta_3 PGDP\_LOG_{i,t} + \beta_4 CO2\_LOG_{i,t} + \beta_5 IQ\_LOG_{i,t} + \mu_{i,t} \quad (2)$$

where we included an intercept, this to be coherent with the presence of a trend in the variables in levels (and where we set the usual normalization with $\beta_1 = 1$ in the vector β'), and the residual is the error correction term.

For estimation of the model we follow a two-step procedure mentioned above. At first, we estimate the cointegration relation of equation (2) using Fully Modified Least Squares put forward by Phillips and Hansen (1990).

The interpretation of the estimated coefficients will allow a first evaluation of the tourism-energy uncertainty relation in Europe.

Table 1: Definition and sources of the variables

Variable types	Notation	Name	Definition	LOG transformation	Data source
Explained variable	ITR	Tourism	International tourism, receipts (% of total exports)	-	World development indicators
Core explanatory variable	EUI	Energy uncertainty	The energy-related uncertainty index	ENU_LOG	Economic uncertainty web portal
Control variables	PGDP	Economic development stage	GDP per capita, constant 2015 USD	PGDP_LOG	World development indicators
	CO_2	CO_2 emissions	Carbon dioxide emissions, metric tons per capita	CO_2_LOG	
	IQ	Institutional quality	Government effectiveness, index	IQ_LOG	

ITR: Relationship among tourism, EUI: Energy uncertainty, GDP: Gross domestic product, IQ: Institutional quality

In a second step we proceed to estimation of the adjustment coefficients and of the short-term dynamics, giving us additional insights on the adjustment of the variables after deviations from the tourism-energy uncertainty equilibrium. In this case we apply a Panel VECM model of equation (1). This approach was put forward by Sims (1980), introducing the estimated error correction term as an explanatory (stationary) variable. Therefore, we estimate the following specification in first differences:

$$\Delta Y_{i,t} = \alpha \hat{\mu}_{i,t-1} + \Gamma \Delta Y_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

where the equation of *ITR* reads as

$$\Delta ITR_{i,t} = \alpha_1 \hat{\mu}_{i,t-1} + \gamma_{1,1} \Delta ITR_{i,t-1} + \gamma_{1,2} \Delta EUI\_LOG_{i,t-1} + \gamma_{1,3} \Delta PGDP\_LOG_{i,t-1} + \gamma_{1,4} \Delta CO2\_LOG_{i,t-1} + \gamma_{1,5} \Delta IQ\_LOG_{i,t-1} + \varepsilon_{1,i,t} \quad (4)$$

and the other equations have a similar structure. For this second stage, our interest will be focused on the adjustment coefficients as well as on the relevance of the various variables in the short-term dynamic model.

5. EMPIRICAL SECTION

We first consider the unit root tests on the variables of interest, which are reported in Table 3. For ITR, EUI_LOG, PGDP_LOG, CO_2_LOG and IQ_LOG we have clear empirical evidence of the presence of a unit root. Both the t* statistics of Levan et al. (2002), The W-stat of Im et al. (2003), the ADF- Fisher-Chi-square and the PP-Fisher-Chi-square are coherent in detecting a unit root. All the variables are stationary once taken in first differences.

For all tests (Levin, Lin&Chu t*,Im, Pesaran and Shind W-stat, ADF-Fisher-Chi-square, PP-fisher-Chi-square) we report only the P-values. Lags have been selected using the SIC (lag was set to 1 in all cases, and only the individual intercept has been considered). The null hypothesis is the presence of a unit root. Asterisks *** denote the rejection of the null at the 1% confidence level.

Given the evidence that the integration order of the variables is one, we proceed with the evaluation of the presence of cointegration by using the Fisher (combined Johansen) cointegration test. The results are reported in the Table 4. The results highlight coherence between the two statistics, as both the trace and max-eigen tests suggest the existence of a single cointegration relation among variables. Consequently, this allows us to proceed with the estimation of the Panel VECM model.

Table 2: Descriptive statistics of the studied variables

	ITR	EUI	PGDP	CO_2	IQ
Mean	11.18775	23.99969	36095.97	7.302932	1.317767
SD	12.62411	9.035383	13951.54	2.392902	0.5741146
Minimum	−25.19037	5.94705	7852.58	2.575186	0.0380256
Maximum	52.13203	60.9522	98561.6	13.94149	2.347191
Observations	297	297	297	297	297

SD: Standard deviation, ITR: Relationship among tourism, EUI: Energy uncertainty, GDP: Gross domestic product, IQ: Institutional quality

Table 3: Unit root tests

Definition of the test	ITR_LOG		EUI_LOG		PGDP_LOG		CO_2_LOG		IQ_LOG	
	Level	1st difference	Level	1st difference	Level	1st difference	Level	1st difference	Level	1st difference
Null: Unit root (assumes common unit root process)										
Levin, Lin and Chu t*	−60.69***	−49.54***	−6.94***	−18.89***	−3.02***	−11.95***	9.72	−3.09***	−0.02	13.49***
Null: Unit root (assumes individual unit root process)										
Im, Pesaran and Shind W-stat	−11.04***	−19.42***	−6.53***	−18.70***	−0.68	−10.77***	11.64	−4.04***	0.48	−12.75***
ADF-Fisher-Chi-square	21.73	63.57***	81.64***	246.17***	26.29	139.72***	0.63	76.75***	15.13	168.10***
PP-Fisher-Chi-square	4.96	74.43***	80.07***	289.40***	46.84***	150.65***	1.83	95.08***	16.72	160.86***

ITR: Relationship among tourism, EUI: Energy uncertainty, GDP: Gross domestic product, IQ: Institutional quality

Table 4: Johansen Fisher Panel cointegration test

Hypothesized number of CE (s)	Fisher statistic*(from trace test)	P	Fisher statistic*(from maximum-eigen test)	P
None	197.8	0.00***	130.2	0.00***
At most 1	84.73	0.00***	70.02	0.00***
At most 2	33.87	0.05*	22.11	0.45
At most 3	26.33	0.23	21.39	0.49
At most 4	33.16	0.05*	33.16	0.05*

***at 1% level and * at 10% level

The table shows the trace and maximum eigenvalue tests of Johansen Fisher for panel cointegration and their P-values. The null hypothesis is associated with the cointegration ranks (i.e., the number of cointegrating relations) reported over the rows of column 1. Asterisk represent statistical significance, *** at 1% level and * at 10% level. We set the lag to 1 using SIC.

Table 5 reports the estimated coefficients of the cointegration equation by the means of FMOLS method. The estimations in the column confirm the existence of a long-run association between the variables: with the coefficients statistically significant, in particular ITR, EUI_LOG, PGDP_LOG, GEF_LOG and CO_2_LOG. In addition, EUI_LOG and PGDP_LOG variables negatively impact ITR whereas GEF_LOG and CO_2_LOG influence positively. It should be noted that Hypothesis 1, 2 and 4 are validated while Hypothesis 3 is not justified.

More specifically, an increase in energy uncertainty is associated with less international tourism receipts in Europe in the long-run. This could be because this association may be attributed to several factors, each contributing to a complex interplay between energy-related uncertainties and the tourism industry. These factors could be rising travel costs, consumer behavior and spending, impact on aviation industry, environment concerns, global economic impact, or tourism infrastructure investments. Fluctuations in energy prices may increase operational costs for the tourism industry. Higher energy prices can influence transportation costs, which, in turn, are likely to be passed on to travellers in the form of increased ticket prices and accommodation expenses. This is supported by Awan et al. (2023) who state that tourism is directly impacted by the cost of the transportation-related energy. Consequently, potential tourists may be deterred by the prospect of higher overall travel costs, impacting the number of international visitors. The aviation industry is sensitive to energy prices, given its heavy reliance on fuel. If energy uncertainty translates into volatile and high fuel prices, airlines can encounter increased operational costs. As consequences, it can lead to reducing flight frequencies, higher ticket prices, or even route cancellations, limiting accessibility for potential tourists and negatively affecting the tourism industry, as confirm Miyoshi and Fukui (2018).

Moreover, higher per capita GDP leads to a decrease in international tourism receipts in Europe in the long-run. Heightened energy uncertainty may contribute to consumer anxiety and a general sense of economic instability, confirmed by Varigonda (2013) who agree that energy uncertainty impact the state and economic stability. As a result, individuals may become more cautious about discretionary spending, including travel expenses. This change in consumer behavior can lead to decreasing demand for international tourism services, resulting in a reduction in overall tourism receipts. Economic downturns can have a direct impact on disposable income, affecting individuals' ability and willingness to engage in international travel. A decrease in consumer confidence, along with concerns about job security, can lead to a reduction in tourism expenditures.

Table 5: Fully modified ordinary least squares estimation results of cointegration equation

Dependent variable=ITR	
Variables	**Coefficients**
EUI_LOG	−0.08** (0.05)
PGDP_LOG	−0.95** (0.41)
CO_2_LOG	0.82*** (0.26)
IQ_LOG	0.24*** (0.08)

*** and ** for 1% and 5% levels, respectively. SE are in parenthesis. Asterisks represent statistical significance. SE: Standard error, ITR: Relationship among tourism, EUI: Energy uncertainty, GDP: Gross domestic product, IQ: Institutional quality

Environmental degradation, an increase in CO_2 emissions, causes a rise in international tourism receipts in Europe in the long-run. The results of Paramati et al. (2017) shows that a 1% growth in tourism receipts correlates with a 0.124% increase in economic growth and a 0.122% rise in CO_2 emissions in EU countries. The connection between environmental degradation, CO_2 emissions, and the rise in international tourism receipts in Europe presents a complex synergy between factors. While certain immediate economic benefits may be evident, the enduring sustainability of this connection raises concerns about the potential negative impacts on both the environment and the tourism sector. Balancing economic interests with environmental conservation is essential for fostering a resilient and responsible tourism industry in the face of ongoing environmental challenges.

Institutional quality positively impacts on international tourism receipts in Europe in the long-run. The positive impact of institutional quality on international tourism receipts in Europe is a crucial aspect that warrants discussion, in long term. Institutional quality is associated with effectiveness, reliability, and transparency of a country's institutions, including its legal and regulatory framework, governance structures, and overall institutional environment. Strong institutional quality fosters a favorable business environment, providing a secure and predictable foundation for the tourism industry, it is often related to political stability and good governance and contribute to infrastructure development, ensuring that tourism-related facilities and services meet high standards. Well established legal and regulatory framework likely attract international tourists because they perceive a lower risk of legal issues or fraud during the stay.

Table 6: The results of vector error correction model model

	D (ITR)	D (EUI_LOG)	D (PGDP_LOG)	D (IQ_LOG)	D (CO_2_LOG)
D (ITR (−1))	0.79***	−0.20	−0.04	0.03	0.08**
D (EUI_LOG (−1))	−0.02	−0.25***	−0.00	0.00	−0.00
D (PGDP_LOG (−1))	0.36	3.68***	0.25***	−0.28	0.29**
D (IQ_LOG (−1))	−0.02	−0.39**	0.01	0.04	−0.00
D (CO_2_LOG (−1))	0.30	−0.90	0.05	0.24	0.19**
C	−0.02**	−0.05	0.01***	0.00	−0.02***
ECM (−1)	−0.23***	−0.27	−0.01	0.13	−0.01

*** and ** for 1% and 5% levels, respectively. Asterisks represent statistical significance. ITR: Relationship among tourism, EUI: Energy uncertainty, GDP: Gross domestic product, IQ: Institutional quality

Tourists are more inclined to choose destinations with stable political conditions, as political unrest or uncertainty can deter travel plans. In destination, where institutional quality is high positively influences the overall attractiveness of the destination for international tourists. The positive association between institutional quality and international tourism receipts in Europe suggests that countries with well-functioning and transparent institutions are more likely to experience sustained growth in their tourism industry. These results are supported by Young-Rae et al. (2018).

We proceed to the evaluation of the VECM model, equation (3), for the linear case only, given the previous evidence. We focus only the adjustment coefficients, showing the impact of the disequilibrium (the error correction term) on the series' first differences in Table 6.

Notably, the adjustment coefficient of the equation of ITR is statistically significant and in the length ($-1<ECM(-1)=-0.23<0$). This validates that international tourism receipt will reach equilibrium with the speed of 23% annually in Europe when taking energy uncertainty, economic development, CO_2 emissions and institutional quality into the consideration.

6. CONCLUSION

The study employs a Panel VECM in a two-step approach to investigate the long-run association among international tourism receipt, energy uncertainty, economic development, environmental degradation and institutional quality in Europe, applying annual data during the period of 1996-2022. The results reveal that the rise of energy uncertainty causes the decline on international tourism receipt in Europe.

To cope with the negative consequences of energy uncertainty impacting on tourism sector in Europe, a shift towards prioritizing renewable energy sources, such as hydropower, is imperative. Research suggests that governments, politicians, and stakeholders in European tourism services should actively seek to replace fossil fuels with hydropower to enhance sustainability within the sector (Alsaleh et al., 2022).

The commitment to sustainability extends beyond energy sources to transportation, an integral part of the tourism experience. Transport-related activities contribute significantly to pollution in the tourism sector, encompassing travel to and from tourist attractions as well as destination-related activities like those in hotels and restaurants. The imperative for decarbonization in the tourism sector necessitates a transition from fossil fuels to renewable sources in transportation (Gurrì et al., 2023; Satrovic and Adedoyin, 2023).

Recognizing the significance of consuming renewable energy resources is crucial for fostering sustainable practices in the tourism sector (Qamruzzaman, 2023). In addition, efforts to enhance the energy efficiency of tourism services result in cost savings (Arimany-Serrat and Gomez-Guillen, 2023), mitigating the negative consequences of energy uncertainty in tourism sector.

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REFERENCES

Aboagye, S., Kwakwa, P.A. (2023), The role of international tourism, trade openness and renewable energy in the financial development of selected African countries. Research in Globalization, 7, 100170.

Adedoyin, F., Nathaniel, S., Adeleye, N. (2020), An investigation into the anthropogenic nexus among consumption of energy, tourism, and economic growth: do economic policy uncertainties matter? Environmental Science and Pollution Research, 28, 2835-2847.

Alhawamdeh, H., Al-Saad, S., Almasarweh, M., Al.Hamad, A.A., Ahmad, A.Y., Ayasrah, F.T. (2023), The role of energy management practices in sustainable tourism development: A case study of Jerash, Jordan. International Journal of Energy Economics and Policy, 13(6), 321-333.

Ali, S., Hamid, A.B., Ya'akub, N.I., Iqbal, S. (2023), Environmental impacts of international tourism: Examining the role of policy uncertainty, renewable energy, and service sector output. Environmental Science and Pollution Research, 1-14.

Alsaleh, M., Yang, Z., Chen, T., Abdul-Rahim, A. (2022), Unveiling the linkage between hydropower growth and tourism sustainability in EU27 region: An empirical analysis. Sustainable Development, 31(3), 1704-1719.

Altinay, L., Bowen, D. (2006), Politics and tourism interface: The case of Cyprus. Annals of Tourism Research, 33(4), 939-956.

Apergis, N., Kuziboev, B. (2023), The validity of Okun's Law in the case of Central Asia: The role of weather and energy factors.

Environmental Science and Pollution Research, 30(47), 104233-104232.
Araña, J.E., León, C.J. (2008), The impact of terrorism on tourism demand. Annals of Tourism Research, 35(2), 299-315.
Arimany-Serrat, N., Gomez-Guillen, J. (2023), Sustainability and environmental impact of the tourism sector: Analysis applied to swimming pools in the hotel industry on the costa brava. Environmental Processes, 10, 55.
Atasoy, M., Atasoy, F.G. (2020), The impact of climate change on tourism: A causality analysis. Turkish Journal of Agriculture - Food Science and Technology, 8(2), 515-519.
Awan, A., Bibi, M., Bano, F., Shoukat, S. (2023), A bibliometric analysis on fuel prices fluctuations and tourism under the era of sustainable development. Pakistan Journal of Humanities and Social Sciences, 11(2), 792-813.
Beer, M., Rybár, R., Kaľavský, M. (2018), Renewable energy sources as an attractive element of industrial tourism. Tourism, 21(18), 2147-2159.
Bormann, K.J., Brown, R.D., Derksen, C., Painter, T.H. (2018), Estimating snow-cover trends from space. Nature Climate Change, 8(11), 924-928.
Çağlayan, E., Şak, N., Karymshakov, K. (2012), Relationship between tourism and economic growth: A panel Granger causality approach. Asian Economic and Financial Review, 2(5), 591-602.
Causevic, S., Lynch, P. (2013), Political (in) stability and its influence on tourism development. Tourism Management, 34, 145-157.
Chen, Q. (2023), The impact of economic and environmental factors and tourism policies on the sustainability of tourism growth in China: Evidence using novel NARDL model. Environmental Science and Pollution Research, 30(7), 19326-19341.
Ciarlantini, S., Madaleno, M., Robaina, M., Monteiro, A., Eusébio, C., Carneiro, M.J., Gama, C. (2023), Air pollution and tourism growth relationship: Exploring regional dynamics in five European countries through an EKC model. Environmental Science and Pollution Research, 30, 42904-42922.
Dang, T.H.N., Nguyen, C.P., Lee, G.S., Nguyen, B.Q., Le, T.T. (2023), Measuring the energy-related uncertainty index. Energy Economics, 124, 106817.
Dogru, T., Marchio, E.A., Bulut, U., Suess, C. (2019), Climate change: Vulnerability and resilience of tourism and the entire economy. Tourism Management, 72, 292-305.
Fletcher, J., Morakabati, Y. (2008), Tourism activity, terrorism and political instability within the Commonwealth: The cases of Fiji and Kenya. International Journal of Tourism Research, 10(6), 537-556.
Friedrich, J., Stahl, J., Hoogendoorn, G., Fitchett, J.M. (2020), Exploring climate change threats to beach tourism destinations: Application of the hazard-activity pairs methodology to South Africa. Weather, Climate, and Society, 12(3), 529-544.
Ghalia, T., Fidrmuc, J., Samargandi, N., Sohag, K. (2019), Institutional quality, political risk and tourism. Tourism Management Perspectives, 32, 100576.
Ghimire, B., Muneenam, U., Techato, K. (2023). Renewable energy use in green hotels for sustainability: A systematic review. International Journal of Energy Economics and Policy, 13(6), 618-627.
Ghosh, C., Liang, M., Petrova, M.T. (2020), The effect of fair value method adoption: Evidence from real estate firms in the EU. The Journal of Real Estate Finance and Economics, 60, 205-237.
Gurrì, S., Santacaterina, E., Guarrera, M., Chiara, B.D. (2023), Driving modal shift on low-traffic railway lines through technological innovation: A case study in Piedmont (Italy) including hydrogen fuel-cells as an alternative. Transportation Research Procedia, 69, 99-106.
Habibi, F. (2017), The determinants of inbound tourism to Malaysia: A panel data analysis. Current Issues in Tourism, 20(9), 909-930.
Haller, A.P., Tacu Hârşan, G.D. (2021), Causes of sustainable tourism resilience in central and Eastern Europe. The case of three countries: Romania, Bulgaria and Poland. Proceedings of the International Conference on Business Excellence, 15(1), 1251-1268.
Im, K.S., Pesaran, M.H., Shin, Y. (2003), Testing for unit roots in heterogeneous panels. Journal of Economics, 115, 53-74.
Issa, I.A., Altinay, L. (2006), Impacts of political instability on tourism planning and development: The case of Lebanon. Tourism Economics, 12(3), 361-381.
Leal Filho, W. (2022), Will climate change disrupt the tourism sector? International Journal of Climate Change Strategies and Management, 14(2), 212-217.
Lee, H., Lee, S., Har, W. (2020), Roles of institutional quality on the relationship between tourism and economic development in Malaysia. Journal of Environmental Treatment Techniques, 8(1), 119-124.
León-Gómez, A., Ruiz-Palomo, D., Fernández-Gámez, M.A., García-Revilla, M.R. (2021), Sustainable tourism development and economic growth: Bibliometric review and analysis. Sustainability, 13(4), 2270.
Levin, A., Lin, C.F., Chu, C.S.J. (2002), Unit root tests in panel data: Asymptotic and finite-sample properties. Journal of Econometrics, 108, 1-24.
Liu, Y., Li, Y., Li, L. (2018), A panel data-based analysis of factors influencing market demand for Chinese outbound tourism. Asia Pacific Journal of Tourism Research, 23(4), 667-676.
Margosi, M., Palaiogiannis, F., Vasilakis, A., Koukoufikis, G. (2022), Energy, Tourism and Covid-19: An Analysis of Energy Consumption Trends in EU Islands during the Pandemic. Luxembourg: Publications Office of the European Union.
Meșter, I., Simuț, R., Meșter, L., Bâc, D. (2023), An investigation of tourism, economic growth, CO_2 emissions, trade openness and energy intensity index nexus: Evidence for the European Union. Energies, 16(11), 4308.
Miyoshi, C., Fukui, H. (2018), Measuring the rebound effects in air transport: The impact of jet. Transportation Research, 112, 71-84.
O'Brien, A. (2012), Wasting a good crisis: Developmental failure and Irish tourism since 2008. Annals of Tourism Research, 39(2), 1138-1155.
Osorio-Molina, F.M., Muñoz-Benito, R., Pérez-Neira, D. (2023), Empirical evidence, methodologies and perspectives on tourism, energy and sustainability: A systematic review. Ecological Indicators, 155, 110929.
Paramati, S.R., Shahbaz, M., Alam, M.S. (2017), Does tourism degrade environmental quality? A comparative study of Eastern and Western European Union. Transportation Research Part D: Transport and Environment, 50, 1-13.
Paspatis, A., Fiorentzis, K., Katsigiannis, Y., Karapidakis, E. (2022), Smart campus microgrids towards a sustainable energy transition- the case study of the hellenic Mediterranean University in Crete. Mathematics, 10(7), 1065.
Phillips P.C.B., Hansen, B.E. (1990), Statistical inference in instrumental variables regression with I(1) processes. The Review of Economic Studies, 57(1), 99-125.
Pizam, A., Mansfeld, Y. (2006), Toward a theory of tourism security. In: Tourism, Security and Safety. London: Routledge, p.1-27.
Qamruzzaman, M. (2023), Clean energy-led tourism development in Malaysia: Do environmental degradation, FDI, Education and ICT matter? Heliyon, 9(11), e21779.
Saha, S., Su, J.J., Campbell, N. (2017), Does political and economic freedom matter for inbound tourism? A cross-national panel data estimation. Journal of Travel Research, 56(2), 221-234.
Satrovic, E., Adedoyin, F.F. (2023), The role of energy transition and international tourism in mitigating environmental degradation: Evidence from SEE Countries. Energies, 16, 1002.

Sims, C.A. (1980), Macroeconomics and reality. Econometrica. Econometric Society, 48(1), 1-48.
Steiger, R., Demiroglu, O.C., Pons, M., Salim, E. (2022), Climate and carbon risk of tourism in Europe. Journal of Sustainable Tourism, 1-13.
Švec, R., Pícha, K., Martinát, S., Navrátil, J. (2023), Direct or indirect energy savings in food and beverage services? Visitors′ preferences in hotel restaurants. Heliyon, 9(7), e17519.
Tang, C.F. (2018), The impacts of governance and institutions on inbound tourism demand: Evidence from a dynamic panel data study. Asia Pacific Journal of Tourism Research, 23(3), 1-8.
Tang, C.H.H., Jang, S.S. (2009), The tourism-economy causality in the United States: A sub-industry level examination. Tourism Management, 30(4), 553-558.
Teng, Y., Cox, A., Chatziantoniou, I. (2021), Environmental degradation, economic growth and tourism development in Chinese regions. Environmental Science and Pollution Research, 28, 33781-33793.
Teye, V.B. (1988), Coups d'etat and African tourism: A study of Ghana. Annals of Tourism Research, 15(3), 329-356.
Tian, X.L., Bélaïd, F., Ahmad, N. (2021), Exploring the nexus between tourism development and environmental quality: Role of Renewable energy consumption and Income. Structural Change and Economic Dynamics, 56, 53-63.
Trstenjak, A., Žiković, S., Mansour, H. (2020), Making nautical tourism greener in the Mediterranean. Sustainability, 12(16), 6693.
UNWTO. (2023), Sustainable Development Goals. Energy Management. Available from: https://www.unwto.org/sustainable-development/unwto-international-network-of-sustainable-tourism-observatories/tools-energy-management [Last accessed on 2023 Dec 01].
Usman, O., Bekun, F.V., Ike, G.N. (2020), Democracy and tourism demand in European countries: Does environmental performance matter? Environmental Science and Pollution Research, 27, 38353-38359.
Varigonda, K.C. (2013), An assessment of the impact of energy insecurity on state stability. Energy Policy, 62, 1110-1119.
Wang, Q.C., Lou, Y., Liu, X., Jin, X., Li, X., Xu, Q. (2023), Determinants and mechanisms driving energy-saving behaviours of long-stay hotel guests: Comparison of leisure, business and extended-stay residential cases. Energy Reports, 9, 1354-1365.
Young-Rae, K., Shrabani, S., Ilan, V., Chansoo, P. (2018), The impact of national institutional quality on international tourism inflows: A cross-country evidence. Tourism Analysis, 23(4), 533-551.
Zettelmeyer, J., Tagliapietra, S., Zachmann, G., Heussaff, C. (2022), Beating the European Energy Crisis. United States: International Monetary Fund.