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Causality relationship between economic policy uncertainty and tourism in Mediterranean countries: Evidence from dynamic symmetric and asymmetric bootstrap panel causality tests

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Abstract

This study analyses the interrelationship between economic policy uncertainty (EPU) and tourism in Mediterranean Basin countries for the period 1997–2020. The paper includes two analyses along with two models. The first analysis investigates a long-run relationship between variables and estimates long-run coefficients by using the Method of Moment Quantile Regression (MM-QR) technique, a novel approach that provides more comprehensive insights. The second analysis examines the dynamic relationship between the variables by dynamic Kónya panel symmetric and asymmetric causality tests. According to the MM-QR estimation results, the effect of EPU on international tourist arrivals (ITA) in Model I is positive across all quantiles (except at the 0.1 quantile), and this positive effect increases with quantile level. In Model II, the effect of ITA on EPU is positive for most of the quantiles (except at the 0.8 and 0.9 quantiles). However, it is statistically significant only for countries in the 0.2 quantile group. The dynamic symmetric causality findings indicate a causal relationship from tourism to EPU (except for Spain) and from EPU to tourism for all countries. The dynamic asymmetric causality test reveals an asymmetric causality in the positive component from tourism to EPU in various periods across countries (except for Greece). In the positive component from EPU to tourism, we observed causality relationships in France and Spain (in a single period) and in Greece and Italy (across multiple periods). It is first study in the literature to examine the causal relationship between EPU and tourism by using dynamic symmetric and asymmetric bootstrap panel causality tests, with a focus on Mediterranean Basin countries. It therefore addresses a significant gap in literature. It is found that there is strong sensitivity in the relationship between tourism and EPU, hence policymakers must carefully calibrate their strategies when assessing the interaction between these two critical factors.

Keywords: Economic policy uncertainty, Tourism, Dynamic symmetric and asymmetric panel causality, MM-QR, Mediterranean countries

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1. Introduction

Tourism serves as a vital catalyst for economic growth across multiple sectors and stands as one of the most significant and rapidly expanding global industries. It generates substantial foreign exchange reserves and additional revenue streams, such as income from hotels and retail, benefiting numerous destinations (Tsui *et al*., 2018). Tourism contributes to economic growth by providing foreign exchange, creating employment, attracting investment, reducing regional disparities, and supporting key sectors like construction, accommodation, transportation, and food and beverage (Wu *et al*., 2021; Wu and Wu, 2021; Akadiri *et al*., 2020). Consequently, it is essential for countries to actively promote and sustain inbound tourism efforts to attract a greater number of international visitors (Wu *et al*., 2021). Despite these critical benefits, tourism remains highly susceptible to uncertainties and crises, including economic downturns, political instability, terrorism, natural disasters, and pandemics, with extensive research examining their impacts on tourism (Wu and Wu, 2021; Nguyen *et al*., 2020; Madanoglu and Ozdemir, 2019; Gozgor and Ongan, 2017). Among these, economic crises—which encompass broader definitions of economic uncertainties—are particularly notable for their impact on tourism (Madanoglu and Ozdemir, 2019; Gozgor and Ongan, 2017). In summary, economic uncertainty, and more specifically, economic policy uncertainty (EPU), exerts a significant influence on the tourism sector.

EPU refers to conditions in which consumers and businesses lack adequate quantitative insight into both the current and future economic landscape (Van Aarle and Moons, 2017). EPU embodies the level of confidence held by consumers and businesses regarding economic prospects (Hadood and Irani, 2021) and reflects their concerns about future economic conditions (Dragouni *et al*., 2016). A rise in EPU has far-reaching repercussions for all economic actors. In an environment marked by economic instability—characterized by unpredictable future taxes, regulations, and interest rates—consumers often respond by mitigating risk through reduced consumption and expenditures, opting instead to save (Madanoglu and Ozdemir, 2019; Baker *et al*., 2016; Hadood and Irani, 2021; Gozgor and Ongan, 2017). Heightened uncertainty signals unfavourable economic conditions, leading to lower consumer income (Demir and Ersan, 2018), decreased consumption and spending (Dragouni *et al*., 2016), increased individual savings (Giavazzi and McMahon, 2012), and an overall economic slowdown or contraction (Madanoglu and Ozdemir, 2019; Gozgor and Ongan, 2017). In response to high EPU, businesses frequently suspend hiring and defer or cancel investment plans due to the increased cost of financing under uncertain conditions (Madanoglu and Ozdemir, 2019). Companies prioritize liquidity over capital investments in such climates (Hadood and Irani, 2021), as uncertainty discourages investment, fostering a "wait-and-see" approach that limits favourable investment opportunities. Consequently, businesses tend to delay investments until economic policies show stability (Altaf, 2022). Furthermore, EPU influences government economic policy, public investment, and spending decisions (Brogaard and Detzel, 2015). Given the scale of government expenditure, EPU exerts a notable impact on governmental economic performance (Madanoglu and Ozdemir, 2019).

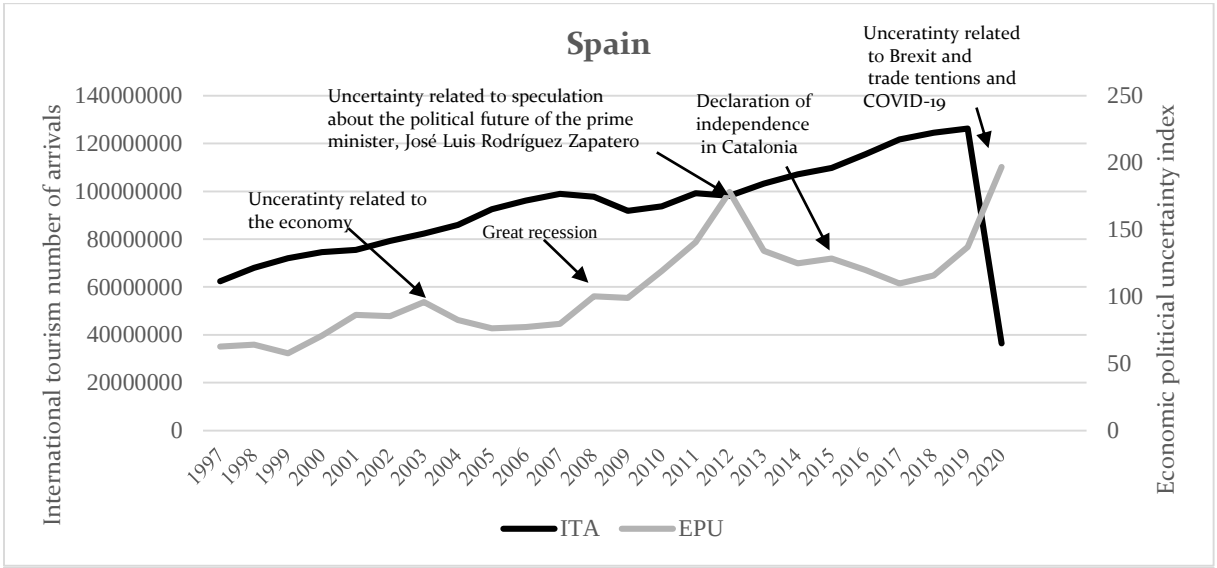
In general, the tourism sector is notably sensitive to economic fluctuations, and political or social instability. During this period the demand for tourism services declines more sharply than demand for less vulnerable goods and services. In times of crisis, tourism-related expenditures are often among the first to be curtailed or deferred, resulting in reduced visitor numbers and a decrease in tourism revenues (Madanoglu and Ozdemir, 2019). Economic uncertainty and adverse conditions prompt consumers to cancel or delay travel and accommodation plans, which are frequently perceived as non-essential or luxury expenses. Instead, consumers prioritise essential spending on necessities such as food, shelter, and healthcare, and consumers are focusing on cautious and efficient financial management. And this often leads to a decrease in willingness to travel internationally (Gozgor and Ongan, 2017; Demir and Gozgor, 2018; Dragouni *et al*., 2016; Hadood and Irani, 2021; Wu and Wu, 2019; Demir and Ersan, 2018; Wu and Wu, 2021). There are a lot of studies show that political and economic uncertainty within a

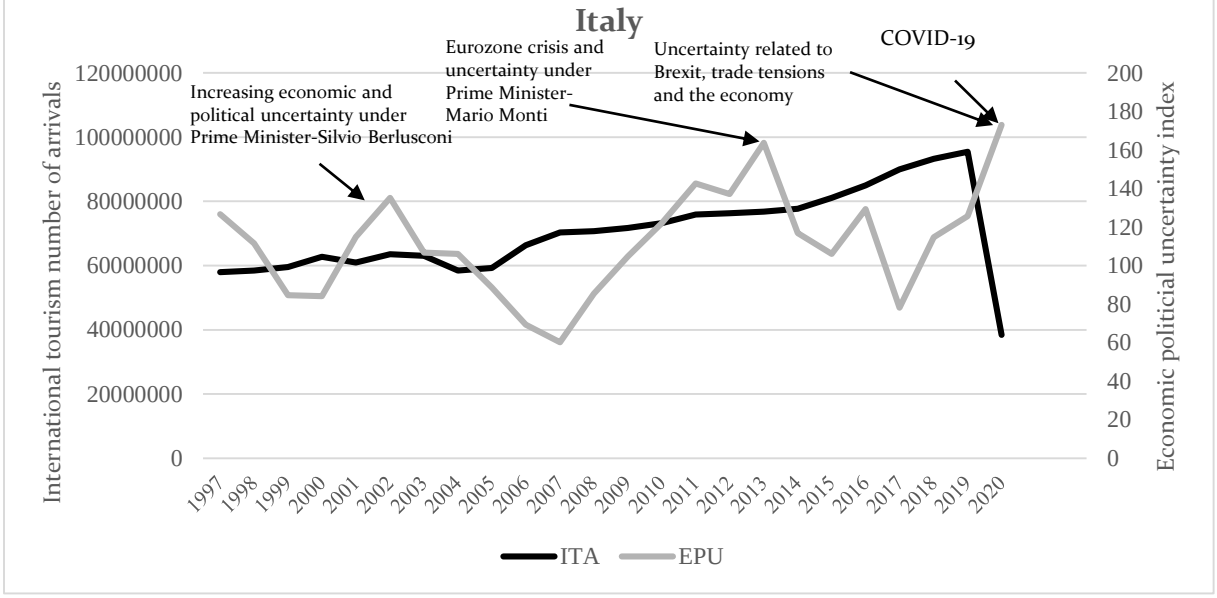
country may significantly reduce the influx of foreign tourists, consequently stifling tourism growth (Tsui *et al.*, 2018; Akadiri *et al.*, 2020). During EPU, tourism businesses tend to downsize, reducing workforce numbers and limiting capital investments, which further leads to a slowdown or deferral in tourism investments and consumer spending on tourism sector (Demir and Ersan, 2018; Altaf, 2022). On the other hand, a surge in tourism demand may also reveal unexpected economical issues. Additionality a rise in tourism activity may require environmental and socio-economic initiatives. Rapid tourism expansion may lead to overcrowding in popular cities and destinations, a phenomenon known as overtourism, prompting governments to consider economic policies to address these pressures (Akadiri *et al.*, 2020).

This study examines the causal relationship between EPU and inbound tourism in Mediterranean Basin countries, utilizing dynamic symmetric and asymmetric bootstrap panel causality tests. The EPU index developed by Baker *et al.* (2016) has become a key metric in recent research for assessing the effects of economic uncertainty across various sectors (Gozgor and Ongan, 2017; Altaf, 2022). This index offers a unique perspective by incorporating a broad view of uncertainty, considering the policymakers involved, potential impacts, and specific economic policies enacted (Akron *et al.*, 2020). In this study, Baker *et al.*'s (2016) EPU index serves as the measure of economic uncertainty. Identifying the causal link between EPU and tourism activities is crucial for policymakers seeking to better understand the factors influencing international tourist arrivals (Akadiri *et al.*, 2020; Wu and Wu, 2021).

This study is anticipated to make several contributions to the literature. (i) Research examining the relationship between EPU and tourism has been conducted using single-country samples (Shahzad *et al.*, 2022; Zhang *et al.*, 2022) and multi-country samples (Sharma and Khanna, 2023; Zhao *et al.*, 2023). However, to our knowledge, no study has specifically targeted countries in the Mediterranean Basin, a region that serves as one of the world's most popular tourist destinations. According to 2022 data, France, Spain, Türkiye, Italy, Greece, and Croatia rank among the top 20 countries globally in terms of visitor numbers, collectively accounting for 31% of global tourist arrivals with around 295 million tourists (UNWTO, 2023). Recently, these countries have also faced considerable economic and political uncertainty (see Figure 1). For the period 1997–2020, however, EPU index data are available only for France, Spain, Italy, and Greece, which presents a limitation of this study. (ii) Traditional methods have been used to assess causality between EPU and tourism (Wu *et al.*, 2022; Navarro-Chavez *et al.*, 2022). However, causation's direction and existence may vary over time due to wars, economic crises, financial instability, natural disasters, and pandemics. Traditional causality tests assume a constant causal link across the entire sample period, which prevents the examination of these variations. When a structural change occurs in the model or causal link within subsamples, this assumption of permanence is violated, potentially leading to misleading results and incomplete policy recommendations. This study employs dynamic versions of causality tests to accommodate shifts in causal relationships within subsamples, allowing identification of the specific periods during which causality is present. By pinpointing these time frames, the study can uncover the sources of causality and offer targeted policy recommendations. The proposed asymmetric dynamic panel bootstrap causality tests are also advantageous over alternative methods. For example, while Sim and Zhou's (2015) quantile-on-quantile approach addresses asymmetries, it also accounts for instabilities. To the best of our knowledge, this study is the first to investigate the causal relationship between EPU and tourism using dynamic symmetric and asymmetric bootstrap panel causality tests.

The analysis is structured as follows: First, a brief review of previous research on the relationship between EPU and tourism is provided. Section three presents the study's data, methodology, and empirical findings. Finally, the paper concludes with a discussion of the results.


Spain
Uncertainty related to speculation about the political future of the prime minister, José Luis Rodríguez Zapatero
Declaration of independence in Catalonia
Unceratinty related to Brexit and trade tentions and COVID-19
Unceratinty related to the economy
Great recession
International tourism number of arrivals
Economic politicial uncertainty index
ITA
EPU


Italy
Increasing economic and political uncertainty under Prime Minister-Silvio Berlusconi
Eurozone crisis and uncertainty under Prime Minister-Mario Monti
Uncertainty related to Brexit, trade tensions and the economy
COVID-19
International tourism number of arrivals
Economic politicial uncertainty index
ITA
EPU

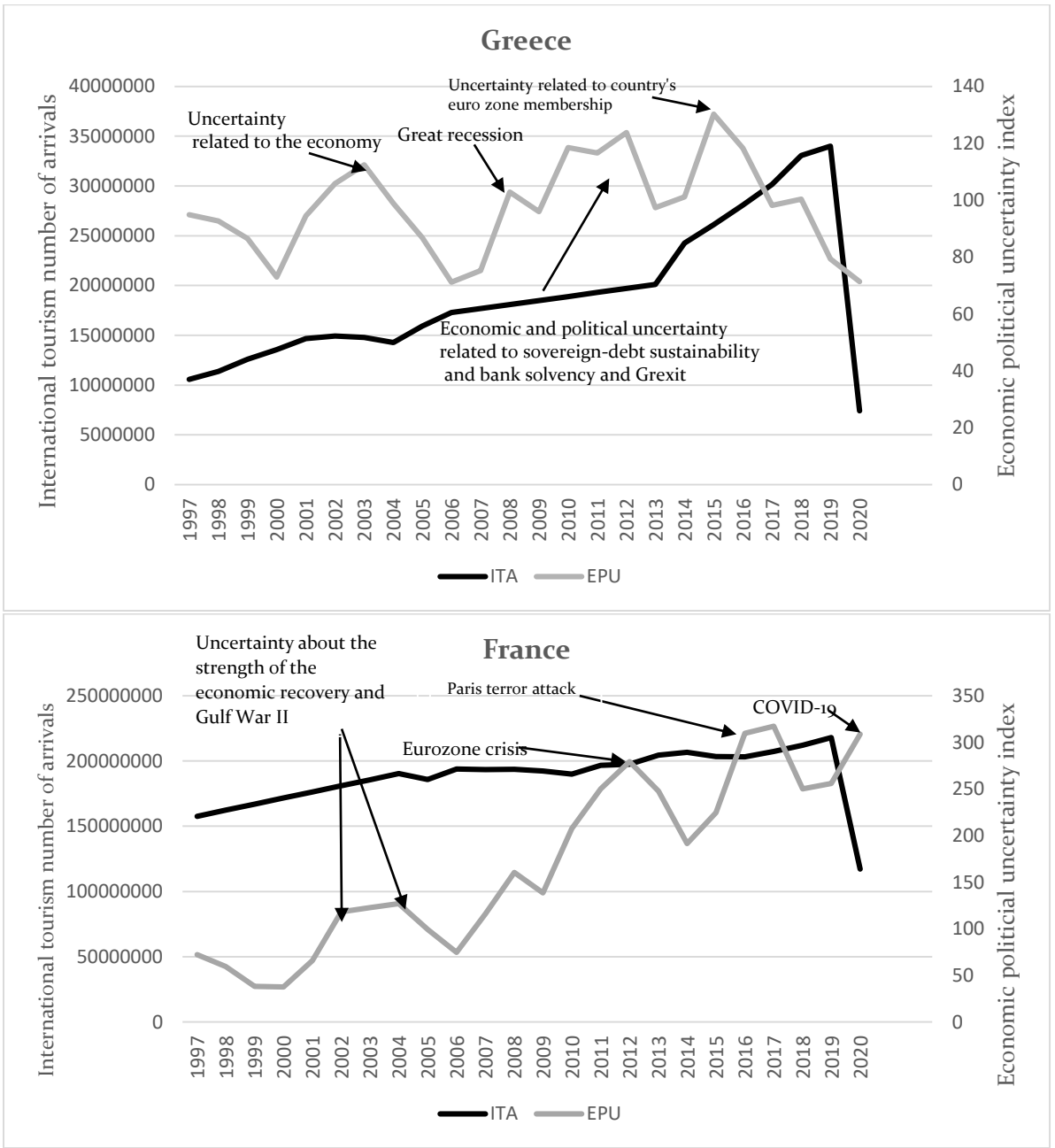


Figure 1. *EPU and tourism relationship.* ***Source:*** *Authors'*

2. Literature review

The prevailing belief is that ongoing economic uncertainty significantly impacts future travel plans, as the tourism sector is particularly sensitive to economic fluctuations. Numerous studies indicate that economic uncertainty can stifle the growth of a country's tourism sector by reducing the number of foreign visitors (Tsui *et al.*, 2018). To explore this impact, Baker *et al.* (2016) developed the EPU index, a tool that has proven valuable for researchers studying this sector. Consequently, the relationship between EPU and tourism demand has become a prominent topic in tourism economics literature

(Hailemariam and Ivanovski, 2022). There has been a gradual increase in studies examining the causal relationship between EPU and tourism activities (Wu and Wu, 2021), establishing it as a popular area of research (Wu *et al*., 2021). A detailed overview of these parameters is presented in Table 1.

Table 1. *Selected prior studies on the association between EPU and tourism.*

Author(s)	**Region/sample period**	**Technique**	**Findings**
Gozgor and Ongan (2017)	USA/ 1998-2015	Cointegration	EPU↑ ↓ TS
Tsui *et al*. (2018)	New Zealand/ 2008-2015	Panel gravity	EPU↑ ↓ TA
Wu and Wu (2019)	Portugal, Ireland, Italy, Greece, and Spain/ 1995-2015	Wavelets, Granger	Short run: EPU → ITR Long run: EPU ←→ ITR
Akadiri *et al*. (2020)	12 countries/ 1995-2015	Emirmahmutoglu and Kose panel Granger	EPU ←→ ITA (France, Ireland, USA) ITA →EPU (Türkiye)
Nguyen *et al*. (2020)	82 countries/ 2002-2014	GMM	EPU ↑ ↑ TOUR (departure) EPU ↑ ↑ TOUR (expenditures) EPU↑ ↓ TOUR (per expenditures)
Wu *et al*. (2021)	BRIC countries/ 1995-2018	Wavelet, Granger	EPU → ITA
Wu and Wu (2021)	BRIC countries/ 1995-2016	Wavelets, Granger	short-run, mid-run: EPU → ITA (Brazil) Long run: ITA←→EPU (China and Russia)
Sharma and Khanna (2023)	19 countries/ 2010-2019	Panel cointegration	EPU↑ ↓ TA
Demir *et al*. (2022)	Croatia/ 2005-2019	Wavelet coherence (WC)	short-run, long-run: DEPU ↑ ↓ DA DEPU↑ ↑ DNPT GEPU↑ ↓ DNPT DEPU↑ ↓ FA GEPU ↑ ↓ FA
Kuok *et al*. (2023)	31 countries/ 2000-2019	Global vector autoregressive	EPU → TOUR
Navarro-Chavez *et al*. (2022)	Developed-emerging economies/ 2010-2018	Panel cointegration, Causality	developed economies: EPU↑ ↓ TA emerging economies: EPU↑ ↑ TA
Wu *et al*. (2022)	BRIC countries/ 1995-2018	Wavelet, Granger	EPU → ITA EPU → ITR
Zhao *et al*. (2023)	Italy, Spain, and the United States/ 1995-2021	Quantile on Quantile	EPU↑ ↓ TOU PU↑ ↓ TOU
Demir and Gozgor (2018)	15 countries/ -	Regression	EPU↑ ↓ TOURIST

Author(s)	Region/sample period	Technique	Findings
Isik *et al.* (2020)	USA/ 1996M1– 2017M9	DOLS	EPU↑ ↓ TA
Tiwari *et al.* (2019)	India/ 2003M1-2017M6	Wavelet	Short run: EPU → TA
Ongan and Gozgor (2018)	USA/ 1996Q1–2015Q1	DOLS	EPU↑ ↓ TA
Singh *et al.* (2019)	USA/ 1997M1-2017M4	Wavelet	Short run: EPU↑ ↓ TA
Sharma (2021)	India/ 2006M1- 2018M4	NARDL	EPU↑ ↓ TA
Zhang *et al.* (2022)	China/ 2000M1-2018M12	Time-varying parameter vector autoregression	EPU →TA
Hailemariam and Ivanovski (2022)	USA/ 1999M1- 2020M10	Structural vector autoregression	EPU↑ ↓ TNX
Shahzad *et al.* (2022)	USA/ January-November 2020	Novel time-varying granger	EPU ←→TA
Uzuner *et al.* (2020)	France, Germany, UK, USA/ 1985Q1–2017Q4	Emirmahmutoglu and Kose	EPU →TA
Akdag *et al* (2022)	20 selected destinations/ 2001-2017	Panel cointegration	EPU↑ ↓ OTE

Note: ↑ increases; ↓ decreases; ↔ bidirectional relationship. EPU: Economic policy uncertainty; TS: Tourism spending; TA: Tourism arrivals; ITR: International tourism receipts; ITA: International tourist arrivals; TNX: Tourism net export expenditures; DA: Domestic arrivals; FA: Foreign arrivals; DNPT: Domestic nights per tourist; DEPU: Domestic economic policy uncertainty; GEPU: Global economic policy uncertainty; TOUR: International outbound tourism demand, and OTE: Outbound tourism expenditures.

3. Dataset, methodology, and empirical results

This study employs annual data from 1997 to 2020 to investigate the relationship between EPU and tourism in selected Mediterranean Basin countries. The EPU index by Baker *et al.* (2016) is used as a measure of uncertainty, and data on international tourist arrivals (ITA) were sourced from the World Bank. Due to data availability constraints, the study is limited to Mediterranean countries—France, Spain, Italy, and Greece—over the specified period. To address missing values for France (1998–2003) and Greece (2007–2012), the Catmull-Rom spline method was applied for interpolation.

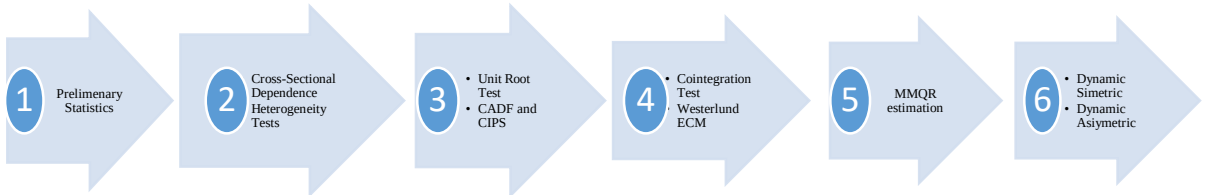


Figure 2. *Summary of the methodological steps.*

This study begins by presenting descriptive statistics. Horizontal cross-section dependence is then assessed using the CD-lm and LM-adj tests developed by Breusch-Pagan (1980) and Pesaran *et al*. (2008). To examine the stationarity levels of the variables, we apply the CADF and CIPS unit root tests proposed by Pesaran (2007). The cointegration relationship is subsequently evaluated using the Westerlund ECM Panel Cointegration Test. Following this, the Machado and Silva (2019) MM-QR model is employed to obtain more comprehensive estimates. Finally, symmetric and asymmetric dynamic Kónya panel causality tests are used to explore the dynamic link between the variables.

The descriptive statistics for the variables used in this analysis are presented in Table 2.

Table 2. *Summary statistics.*

	lnITA	**lnEPU**
Mean	92293079	121.3248
Median	77228000	106.4001
Maximum	2.18E+08	317.1186
Minimum	7406000.	37.60334
Std. Dev.	63703303	58.59145
Skewness	0.542817	1.683352
Kurtosis	2.092344	5.613292
Jarque-Bera	8.009768	72.65594
Probability	0.018226	0.000000
Observations	96	96
lnITA	1.0000	
lnEPU	0.3156	1.0000

The normality of the variables is assessed using the Jarque-Bera test. The results indicate that ITA exhibits a non-normal distribution at the 5% significance level, while EPU shows a non-normal distribution at the 1% significance level. Consequently, the quantile method, which provides more robust results for non-normally distributed series, is applied.

In the subsequent step, the horizontal cross-section dependence of the variables is analysed. This is important because panel data tests are categorized into first-generation tests, which do not account for cross-section dependence, and second-generation tests, which do. Therefore, we employ Pesaran's cross-sectional dependence (CD) test to investigate this dependence. The CD analysis is conducted using the LM test (Breusch and Pagan, 1980), the LMadj test (Pesaran *et al*., 2008), and the CDLM test (Pesaran, 2004), given that the time dimension is greater than the cross-sectional dimension (T > N). The results indicate significant horizontal cross-section dependence among the series, as the null hypothesis of no cross-section dependence is rejected at the $p < 0.05$ significance level. The results are presented in Table 3.

Table 3. *CD test results.*

Test	**Statistic**	**Prob.**
LM (Breusch and Pagan, 1980)	100.4	0.000
LM_{adj} (Pesaran *et al*., 2008)	73.7	0.000
CD_{LM} (Pesaran, 2004)	9.974	0.000

The second-generation unit root test, which accounts for cross-section dependence and provides more reliable results, can be employed to assess the stationarity of the series when previous tests indicate the

presence of horizontal cross-section dependence. Accordingly, panel unit root tests for CADF and CIPS are conducted (Pesaran, 2007), with the results displayed in Table 4.

Table 4. *Panel unit root tests.*

Variables	CADF		CIPS	
	Z [t-bar]	**P-value**	**Z [t-bar]**	**CV (1%)**
At level (intercept and trend)				
lnITA	-0.487	0.313	-1.884	-2.33
lnEPU	0.654	0.743	-1.588	-2.33
First difference				-2.33
ΔlnITA	-1.722	0.043	-4.139	-2.33
ΔlnEPU	-2.373	0.009	-4.760	-2.33

Although the CADF test indicates a maximum lag length of 2, the optimal lag length is determined using the Schwarz information criterion. The null hypothesis is rejected at a significance level of 0.05. The unit root test results indicate that the series possesses a unit root and is non-stationary at the level. Consequently, the series exhibits stationarity after applying the first difference, denoted as I (1). This conclusion is further supported by the findings from the CIPS assessment.

3.1. Panel cointegration estimation

Our research employs the Westerlund cointegration test estimator, which is a more robust method for estimating cointegration in the data. This approach yields reliable results even in the presence of CSD and consists of four distinct group statistics: two group statistics, Gτ and Gα, which test the null hypothesis for the entire group, and two panel statistics, Pτ and Pα, which test the null hypothesis of at least one cointegration relationship among the cross-sections. The results are presented in Table 5.

Table 5. *Westerlund ECM panel cointegration test.*

Test	Value	p-value[a]	p-value[b]
Group- τ	-0.532	0.997	0.745
Group-α	-16.081	0.001***	0.000***
Panel- τ	-0.571	0.990	0.820
Panel - α	-8.343	0.032**	0.095*

The null hypothesis of no cointegration is the basis for the Westerlund (2007) test. Two lags and one lead are used in the test estimation together with constant and trend. ***, **,*, indicates respectively the 1%, 5%, 10% significance level.

[a] One-sided test based on the normal distribution has asymptotic p values. [b] the one-sided test's p-values (bootstrapped) are based on 2000 bootstrap replications.

The test findings presented in Table 5 confirm that there is a long-term relationship between the variables, indicating that the series move together. The results reject the null hypothesis that the series are not cointegrated. Under the null hypothesis, the estimation results remain robust when evaluated against bootstrapped critical values.

3.2. Moment Quantile Regression Method (MM-QR) estimation model

This study investigates the impact of independent variables on the dependent variable using the MM-QR estimation approach developed by Machado and Silva (2019). This method analyses the distribution function across multiple quantiles while accounting for the influence of fixed effects.

Quantile regression techniques for panel datasets analyse relationships by transitioning across various quantiles of the variables. Koenker and Hallock (2001) developed a method to assess coefficients derived from quantile asymmetries of the dependent variable, which are influenced by the averages of multiple explanatory variables. This approach is effective in addressing potential outliers that could skew the overall data distribution. Additionally, this technique can produce reliable outcomes even when conditional measures show minimal or restricted impacts. However, conventional quantile regressions may struggle to transition between different quantile levels across various cross-sections, potentially resulting in an inaccurate distribution of the dependent variable. To address these challenges, the present analysis employs a novel estimation technique known as the 'method of moments quantile regression' (MMQR), introduced by Machado and Silva (2019). This method effectively tackles issues of heterogeneity and endogeneity. The current study focuses on the 10th percentile, determined by Equation (1), which calculates quantile values based on the scale of a specific location.

$$Q_{y_{i,t}Ix_{i,t}} = \alpha_\tau + x'_{i,t}\beta_\tau + \varepsilon_{i,t,\tau} \quad (1)$$

In the equation, $y_{i,t}$ represents the dependent variable and $x_{i,t}$ represents the independent variable vector. It is formed as follows. τ represents the conditional quantile of interest. α_τ and β_τ are the quantile-specific intercept and coefficient parameters, respectively, and $\varepsilon_{i,t,\tau}$ is the error term (Cutcu *et al.*, 2024; Hieu and Mai, 2023).

Table 6. *MM-QR estimation results.*

Model lnITA= f(lnEPU)	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
lnEPU	-.004 (.138)	.041 (.091)	.060 (.076)	.098* (.052)	.109** (.047)	.122*** (.044)	.135*** (.044)	.156*** (.051)	.196** (.076)
Model lnEPU= f(lnITA)	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
lnITA	.548 (.485)	.470* (.264)	.322 (.639)	.263 (.888)	.204 (1.140)	.133 (1.144)	.058 (1.776)	-.014 (2.09)	-.112 (2.52)

Note: ***, **,* indicate the standard deviation value in parentheses as 1%, 5%, and 10%, respectively.

When the results in Table 6 are analysed, it is seen that the effect of lnEPU on lnITA in Model I has a positive effect in all quantiles (except quantile 0.1). However, it is not statistically significant in the first (0.1, 0.2 and 0.3) quantile groups. Afterwards, it is observed that the positive effect increases as the quantile level increases. Evidence in favour of this asymmetric relationship is provided in the dynamic asymmetric causality results and explained in detail.

Except for quantiles 0.8 and 0.9 in Model II, all quantiles show a positive relationship between lnITA and lnEPU. It is only statistically significant in the nations that fall into the 0.2 quantile group, though. After that, it is found that when the quantile level rises, the favourable effect diminishes. The dynamic asymmetric causality results provide evidence for this asymmetric relationship and provide a detailed explanation of it.

3.3. Dynamic symmetric and asymmetric bootstrap panel causality test

The direction and existence of the causal relationship can change over time due to various factors, including wars, economic and financial crises, natural disasters, and diseases (Tang, 2008). Since the foundational work of Granger, several causality tests have been developed for both individual time series and panel data, including the Kónya causality test specifically designed for panel data. In panel

data analyses, it is essential to incorporate a causality method that accounts for cross-sectional dependence among countries and the heterogeneity of slope coefficients.

One of the most suitable causality tests in this context is the Kónya (2006) causality test, which employs a strategy based on estimating a set of equations using an apparently unrelated regression method alongside the Wald test, utilizing country-specific bootstrap critical values. Consequently, there is no requirement for the variables to be stationary. This test does not assume homogeneity within the panel, allowing for the performance of separate Granger causality tests for each individual panel member. Additionally, this approach eliminates the need for pre-testing, such as cointegration or unit root testing, since a unique bootstrap critical value is derived for each country. Furthermore, this method aids in identifying panel members with unilateral Granger causality, bidirectional Granger causality, or no causal relationship (Kónya, 2006).

In this assessment, the variables are constructed without any parsing, and the subsequent set of equations is estimated using seemingly unrelated regression (SUR) to conduct the symmetric bootstrap panel causality test:

$$\begin{aligned} Y_{1,t} &= \beta_{1,1} + \sum_{k=1}^{lY_1} \alpha_{1,1,k} Y_{1,t-1} + \sum_{k=1}^{lX_1} \gamma_{1,1,k} X_{1,t-1} + u_{1,1,t} \\ Y_{2,t} &= \beta_{1,2} + \sum_{k=1}^{lY_1} \alpha_{1,2,k} Y_{2,t-1} + \sum_{k=1}^{lX_1} \gamma_{1,2,k} X_{2,t-1} + u_{1,2,t} \\ Y_{N,t} &= \beta_{1,N} + \sum_{k=1}^{lY_1} \alpha_{1,N,k} Y_{N,t-1} + \sum_{k=1}^{lX_1} \gamma_{1,N,k} X_{N,t-1} + u_{1,N,t} \end{aligned} \tag{1}$$

And

$$\begin{aligned} X_{1,t} &= \beta_{2,1} + \sum_{k=1}^{lY_2} \alpha_{2,1,k} Y_{1,t-1} + \sum_{k=1}^{lX_2} \gamma_{2,1,k} X_{1,t-1} + u_{2,1,t} \\ X_{2,t} &= \beta_{2,2} + \sum_{k=1}^{lY_2} \alpha_{2,2,k} Y_{2,t-1} + \sum_{k=1}^{lX_2} \gamma_{2,2,k} X_{2,t-1} + u_{2,2,t} \\ X_{N,t} &= \beta_{2,N} + \sum_{k=1}^{lY_2} \alpha_{2,N,k} Y_{N,t-1} + \sum_{k=1}^{lX_2} \gamma_{2,N,k} X_{N,t-1} + u_{2,N,t} \end{aligned} \tag{2}$$

N, l , k, and t represent the number of individuals, optimal lag length, selected lag lengths, and time, respectively, as determined using the Akaike information criterion. No restrictions were imposed on the stochastic characteristics of the variables, as bootstrap simulations were utilized to establish the necessary critical values. Prior to estimating equations (1) and (2), the presence of simultaneous correlation between the individual equations is assessed. Since ordinary least squares estimators may yield ineffective results in the presence of simultaneous correlation due to the omission of additional information, the equations are estimated using the SUR estimator introduced by Zellner (1962).

Equations (1) and (2) in the matrix form for the *j*th element of the panel can be rewritten as follows:

$$Y_j = \beta_{1,j}\tau + Y^*_{1,j}\alpha_{1,j} + X^*_{1,j}\gamma_{1,j} + u_{1,j} \quad (3)$$

$$X_j = \beta_{2,j}\tau + Y^*_{2,j}\alpha_{2,j} + X^*_{2,j}\gamma_{2,j} + u_{2,j} \quad (4)$$

where τ indicates the Tx1 vector of ones and Y_j and X_j are the T × 1 vectors of the observed values of Y and X. $Y'_{1,j}$,. $X'_{1,j}$, . $Y'_{2,j}$, and. $X'_{2,j}$ are matrices of lagged Y and X, which have dimensions of $T \times lY_1$, $T \times lX_1$, $T \times lY_2$, and $T \times lX_2$. $\beta_{1,j}$ and $\beta_{2,j}$ denote the intercept terms and $\alpha_{1,j}$, $\gamma_{1,j}$, $\alpha_{2,j}$ and $\gamma_{2,j}$ are the $lY_1 \times 1$, $lX_1 \times 1$, $lY_2 \times 1$, and $lX_2 \times 1$ vectors of the slope coefficients. $u_{1,j}$ and $u_{2,j}$represent the Tx1 vectors of the error terms.

Eqs. (3) and (4) can be stacked as follows for all j ($j = 1,2, \dots, N$):

$$Y = \beta_1 + Y^*_1\alpha_1 + X^*_1\gamma_1 + u_1 \quad (5)$$
$$X = \beta_2 + Y^*_2\alpha_2 + X^*_2\gamma_2 + u_2 \quad (6)$$

Where,

$$Y = [Y_1\ Y_2\ \vdots\ Y_N], X = [X_1\ X_2\ \vdots\ X_N], \beta_1 = [\beta_{1,1}\iota\ \beta_{1,2}\iota\ \vdots\ \beta_{1,N}\iota], \beta_2 = [\beta_{2,1}\iota\ \beta_{2,2}\iota\ \vdots\ \beta_{2,N}\iota], u_1 = [u_{1,1}\ u_{1,2} \vdots\ u_{1,N}], u_2 = [u_{2,1}\ u_{2,2}\ \vdots\ u_{2,N}]$$

Are NT x 1 vectors

$$Y^*_1 = \begin{bmatrix} Y^*_{1,1} & 0 & \cdots & 0 & 0 & Y^*_{1,2} & \cdots & 0 & \vdots & \vdots & 0 & 0 & \cdots & Y^*_{1,N} \end{bmatrix}, X^*_1 = \begin{bmatrix} X^*_{1,1} & 0 & \cdots & 0 & 0 & X^*_{1,2} & \cdots & 0 & \vdots & \vdots & 0 & 0 & \cdots & X^*_{1,N} \end{bmatrix}, Y^*_2 = \begin{bmatrix} Y^*_{2,1} & 0 & \cdots & 0 & 0 & Y^*_{2,2} & \cdots & 0 & \vdots & \vdots & 0 & 0 & \cdots & Y^*_{2,N} \end{bmatrix},$$

$$X^*_2 = \begin{bmatrix} X^*_{2,1} & 0 & \cdots & 0 & 0 & X^*_{2,2} & \cdots & 0 & \vdots & \vdots & 0 & 0 & \cdots & X^*_{2,N} \end{bmatrix}$$

NT × lY₁, NT × lX₁, NT × lY₂, NT × lX₂, and

$$\alpha_1 = [\alpha_{1,1}\ \alpha_{1,2}\ \vdots\ \alpha_{1,N}], \gamma_1 = [\gamma_{1,1}\ \gamma_{1,2}\ \vdots\ \gamma_{1,N}], \alpha_2 = [\alpha_{2,1}\ \alpha_{2,2}\ \vdots\ \alpha_{2,N}], \gamma_2 = [\gamma_{2,1}\ \gamma_{2,2}\ \vdots\ \gamma_{2,N}]$$

are $NlY_1 \times 1, NlX_1 \times 1, NlY_2 \times 1, and\ NlX_2 \times 1$ vectors.

Equations (5) and (6) can be estimated using various techniques, including Bayes, Gaussian quasi-maximum likelihood, minimum distance, ordinary least squares (OLS), and generalized least squares (GLS). Following the recommendation of Kónya (2006), this assessment employs the GLS approach proposed by Aitken (1936). Since the variance-covariance matrix (∑) is not known, an initial approximation of ∑ is determined as follows:

$$\hat{\Sigma} = \frac{1}{T}\sum_{t=1}^{T} \hat{e}'_{it}\hat{e}_{it}$$

where $\hat{e}'_{it}$ is an example of the OLS residuals. The following structure is developed to obtain the GLS estimator:

$$\hat{\theta} = \left(\sum_{t=1}^{T} X_t\hat{\Sigma}^{-1}X'_t\right)^{-1}\sum_{t=1}^{T} X_t\hat{\Sigma}^{-1}Y_t$$

where $\hat{\theta}$ displays the parameter estimators. The Wald test statistic is used to determine the significance of gs in equation (1) to test the null hypothesis that there is no causation from X to Y:

$$W = (R\hat{\gamma})'[RVar(\hat{\gamma})R']^{-1}(R\hat{\gamma})$$

To investigate the existence of an asymmetric causal link, it is essential to decompose the original data into negative and positive components and then test for causality between these decomposed series. Conventional cointegration tests indicate that if the series under investigation respond jointly to a shock, as discussed by Granger and Yoon (2002), they cannot demonstrate an asymmetric causal link when reacting collectively to a single type of shock. In alignment with this perspective, Hatemi (2012) proposes an asymmetric time-series causality test, while Yilanci and Aydın (2016) develop an asymmetric panel causality test.

The negative and positive shocks of the variables are first cumulatively determined before applying the asymmetric bootstrap panel causality test using the following equation:

$$Y_t^+ = \sum_{i=1}^{T} e_1^+, Y_t^- = \sum_{i=1}^{T} e_1^-, X_t^+ = \sum_{i=1}^{T} \varepsilon_1^+, X_t^- = \sum_{i=1}^{T} \varepsilon_1^-$$

Where,

$$Y_t = Y_{t-1} + e_t = Y_0 + \sum_{i=1}^{T} e_i^+ + \sum_{i=1}^{T} e_i^-$$

And

$$X_t = X_{t-1} + \varepsilon_t = X_0 + \sum_{i=1}^{T} \varepsilon_i^+ + \sum_{i=1}^{T} \varepsilon_i^-$$

where X_0 and Y_0 are initial values. i and T indicate the country index and number of observations, respectively.

Thus, by employing positive and negative shocks in place of the original series, an asymmetric bootstrap causality test is conducted using equations (1) and (2). However, structural changes in the model or shifts in the causality relationship within subsamples can lead to violations of stability, potentially causing traditional causality tests (Kónya, 2006; Yilanci and Aydın, 2016) to yield misleading results, which may result in incomplete policy recommendations. To address this, the present study applies these established tests dynamically to account for shifts in causality across subsamples. These methods are designated here as the dynamic symmetric bootstrap panel causality test and the dynamic asymmetric bootstrap panel causality test.

Within this framework, sequential tests were conducted on subsamples using dynamic symmetric and asymmetric bootstrapping panel causality tests. The number of subsample observations (ss) can be calculated using the following formula (Phillips *et al.*, 2015):

$$ss = \left[T\left(0.01 + 1.8/\sqrt{T}\right)\right]$$

As a result, the tests were run on the following three samples:

1,2,3,..., ss.

2,3,4,..., ss+1

3,4,5,..., ss+2

As illustrated, at each successive step, a new observation is added to the sample while the first observation is removed, continuing this process until the final observation is reached. Once a full set of test statistics is obtained, bootstrapped p-values are calculated. These p-values are then plotted against the standard significance level (e.g., 0.10). The null hypothesis of no causality within a given subsample is retained if the p-values exceed the 0.10 threshold.

4. Empirical findings

When analysing the causal connection between two or more variables, it is essential to link economic theory with hypothesis testing. To explore the relationship between tourism and EPU, this study applies the initial dynamic symmetric causality technique. In the first stage, the causal relationship is assessed without accounting for shocks to the variables (symmetric causality analysis). Findings from the dynamic symmetric causality analysis indicate a causal relationship between tourism and EPU in the sampled countries, except for Spain. These results are displayed in the first column of Table 7.

In the case of France, a causal relationship is observed during the period 2019–2020, coinciding with the global COVID-19 pandemic. As the most visited country in the world, France was significantly impacted by the pandemic.

The dynamic symmetric panel causality tests indicate a causal relationship between the variables during specific periods for Greece, namely 2010, 2012–2013, and 2019–2020. The causal relationship observed in 2010 and 2012–2013 aligns with the aftermath of the 2008 global economic crisis and the onset of the EU debt crisis. These events directly impacted the economies of the USA and EU, Greece's primary tourism partners. The next period in which causality is detected, 2019–2020, corresponds to the global impact of the COVID-19 pandemic.

In Italy, a causal relationship is identified during the periods 2009–2010, 2011–2012, and 2013, likely driven by both external and internal factors. Italy's key tourism markets are primarily EU countries, including Germany, France, Austria, Switzerland, and the UK. The timing of this causality aligns with the progression of the 2008 global crisis into a debt crisis within Europe, which impacted these core markets. Additionally, domestic challenges, such as limited political resolve for reforms, economic stagnation, and political instability, may have intensified these effects. During this period, Italy faced the 2009–2013 eurozone crisis and significant political uncertainty under Prime Minister Mario Monti, as well as the 2013 general elections.

No dynamic symmetric panel causality findings were observed for Spain. According to Granger and Yoon (2002), causality tests should separately assess positive and negative shocks to variables. Therefore, this study re-evaluated the cause-and-effect relationship by isolating positive and negative shocks. Since no causal link was found for negative shocks, the related information has been omitted from the table. In the dynamic asymmetric causality analysis, positive shocks (favourable changes) in tourism have the potential to trigger increases in EPU (adverse outcomes) even further. The graphs in the second column of Table 7 illustrate the results of the dynamic asymmetric panel causality test from tourism to EPU.

The dynamic asymmetric panel causality test results indicate a causal relationship for France in 2007, 2011-2012, and 2020, periods marked by significant global and country-specific events. In 2007, the Gulf War led to an oil crisis that began to pressure the global economy. The resulting rise in oil prices likely affected France's tourism sector by increasing transportation costs and reducing GDP per capita. Given the tourism sector's importance to the French economy, such factors likely fostered economic and political uncertainty. Additionally, the lead-up to the 2008 global economic crisis, originating in the

U.S. and subsequently impacting the EU and other regions, aligns with the second observed period of causality. Lastly, the COVID-19 pandemic explains the 2020 period. As one of the sectors most severely impacted by the pandemic, tourism faced global travel restrictions and limited public access, measures that had substantial negative effects on the industry and heightened economic uncertainty in France.

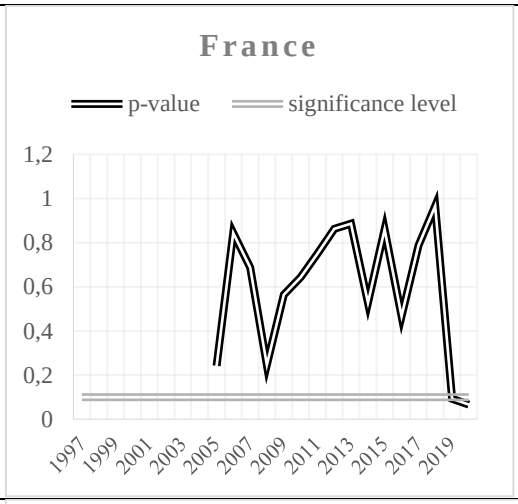
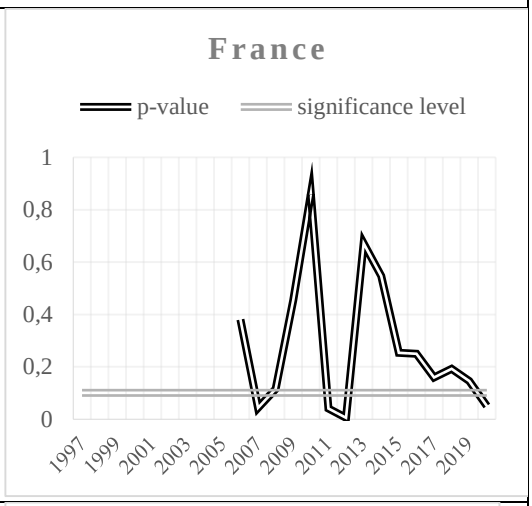
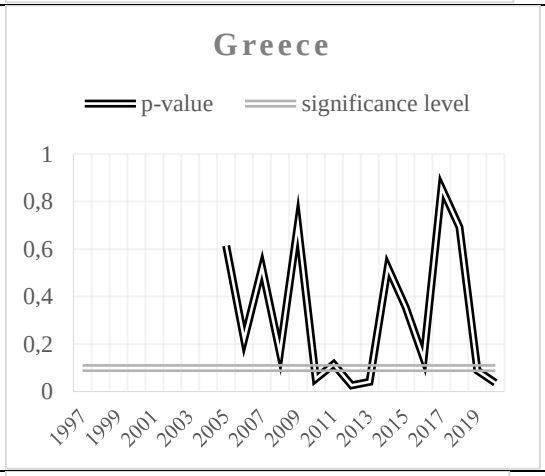
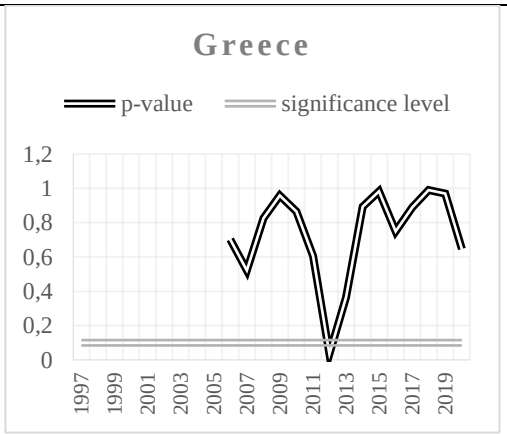
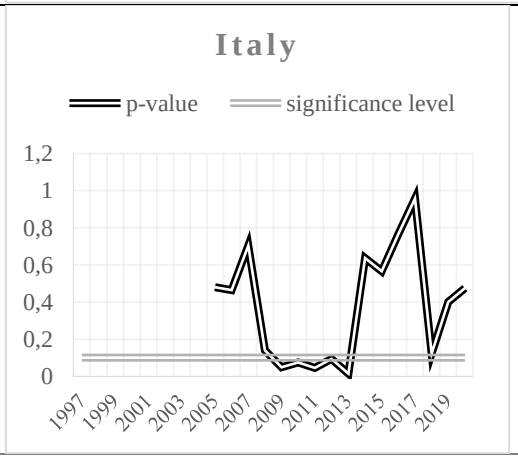
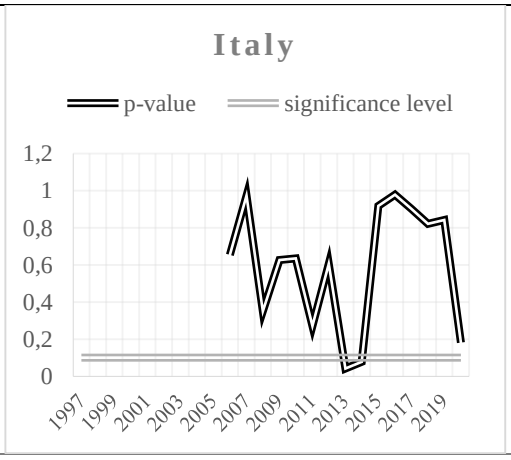
For Greece, the dynamic asymmetric causality analysis revealed a causal relationship only in 2012, in contrast to the various periods identified in the dynamic symmetric causality assessment. This causal interdependence may stem from both external and internal challenges. Externally, the economic crises affecting key tourism partners—such as England, Germany, and Italy, which collectively represent nearly half of the tourists visiting Greece—could have contributed to this relationship. Internally, Greece has faced significant macroeconomic issues, including persistent budget deficits, high public debt, and low foreign direct investment (FDI). Since 2009, the country has endured a severe economic downturn as the global recession transitioned into a debt crisis, which is believed to have adversely impacted the development of its tourism sector.

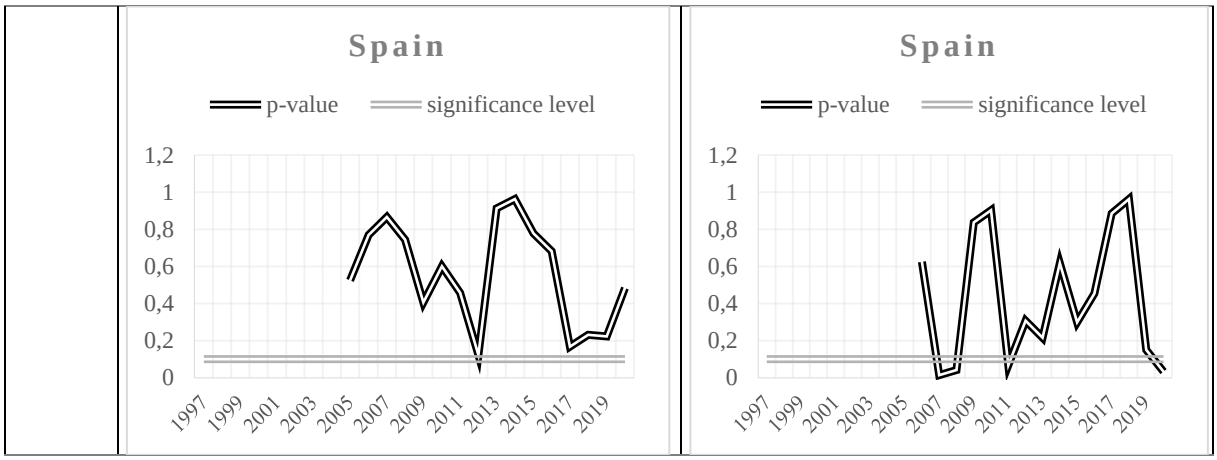
Italy's dynamic asymmetric panel causality analysis indicates a causal relationship during the 2013-2014 period, which can be attributed to both external and internal dynamics. The 2008 global crisis heightened risk premiums in the global financial system and increased borrowing costs within the Euro Area, thereby exacerbating Italy's financial vulnerability. As a result, the contraction of Italy's GDP from the second quarter of 2008 to the second quarter of 2009 was more pronounced than that experienced by the Euro Zone, driven by factors such as high public debt, a significant budget deficit, and an inefficient economy, like the situation in Greece.

Dynamic asymmetric panel causality tests reveal a causal relationship for Spain during the periods of 2007-2008, 2011, and 2020, coinciding with significant events such as the global financial crisis, the European debt crisis, Brexit, and the COVID-19 pandemic. Despite a gradual economic recovery from the Eurozone crisis, the EU encountered numerous challenges, including the irregular migration crisis, Brexit, and the rise of far right and populist movements, all of which contributed to an unstable environment. Additionally, the onset of the COVID-19 pandemic exacerbated the uncertainty. The findings also suggest that the impact of the global recession on Spain's national economy parallels the experiences of other countries in the sample.

The effects of the Global Financial Crisis were particularly pronounced in Eurozone countries with macroeconomic vulnerabilities. In Spain, this resulted in reductions in public revenue, increased budget deficits, and financing shortfalls, as previous borrowing strategies were no longer sufficient to manage the financing gap. Furthermore, events such as the 2014 Catalan self-determination referendum, uncertainties surrounding general elections, terrorist attacks, and challenges faced by the government in managing the COVID-19 pandemic significantly hindered the tourism sector's recovery and stability.

Table 7. *Symmetric and asymmetric panel causality tests results between tourism and EPU.*

Ho: ITA↛EPU	**Results of Dynamic Symmetric Panel Causality**	**Dynamic Asymmetric Panel Causality Test Between Positive Shocks**
		
		
		



Source: *Authors' elaboration*

The causal relationship between EPU and tourism was similarly examined using dynamic symmetric causality techniques. The results indicate that there exists a causal relationship between EPU and tourism in countries of the Mediterranean Basin across various periods. These findings are detailed in the first column of Table 8.

In France, a causal relationship between EPU and tourism was identified for the years 2007 and 2018-2019. The 2007 period corresponds to the time leading up to the 2008 global financial crisis, while the later period is associated with a series of significant events, including terrorist attacks in EU countries, particularly in France, an increase in protests, and the rise of extreme right political movements. Furthermore, the Brexit process, which commenced on June 23, 2016, and concluded on January 31, 2020, created substantial uncertainty not only in the UK but also across the EU, contributing to this interdependence.

The dynamic symmetric panel causality analysis for Greece reveals a causal relationship during several key periods: 2013, 2015-2016, and 2019. These periods are significantly influenced by the EU debt crisis, the refugee crisis that escalated after 2015, and the Brexit process. Additionally, the emergence of news regarding corruption within the country can be identified as a critical factor contributing to increased uncertainty, further affecting the relationship between EPU and tourism.

In Italy, a causal relationship was identified during the periods of 2008-2009, 2014, and 2019. These findings can be attributed to the uncertainties stemming from the global economic crisis and the EU debt crisis, as well as the refugee crisis and the Brexit process, like the experiences of other sampled countries. Furthermore, Italy faced significant political challenges, including the inability to form a government following general elections, which heightened concerns regarding the country's economic stability. The emergence of the COVID-19 pandemic in 2019, particularly affecting one of Italy's most vital tourism markets, is also considered a significant factor that contributed to the increase in uncertainty during this period.

In Spain, the dynamic symmetric panel causality tests reveal a causal relationship during the periods of 2006-2007, 2011, 2013, and 2020. These findings suggest that, like other countries, the impacts of the global crisis and the EU debt crisis have been significant. Additionally, the refugee crisis, the Brexit process, and the COVID-19 epidemic are considered influential factors for Spain as well. Furthermore, political speculation regarding the future of then-Prime Minister José Luis Rodríguez Zapatero, along

with the rising independence movement in Catalonia from 2009 to 2012, contributed to the economic uncertainties observed during these periods.

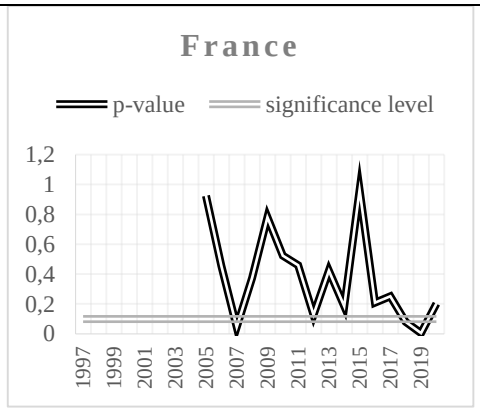
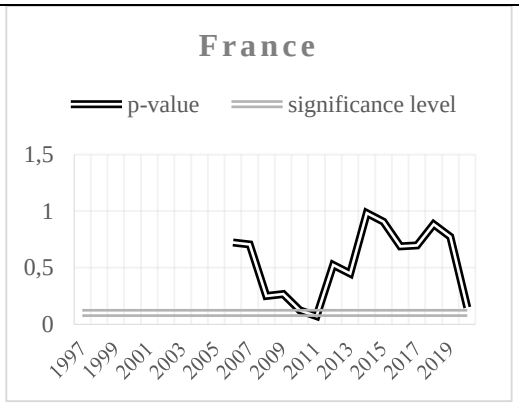
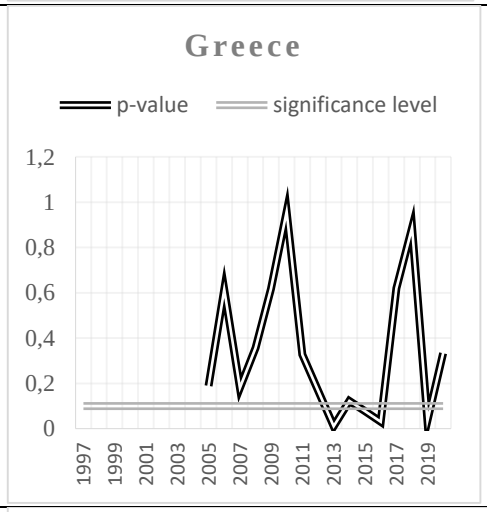
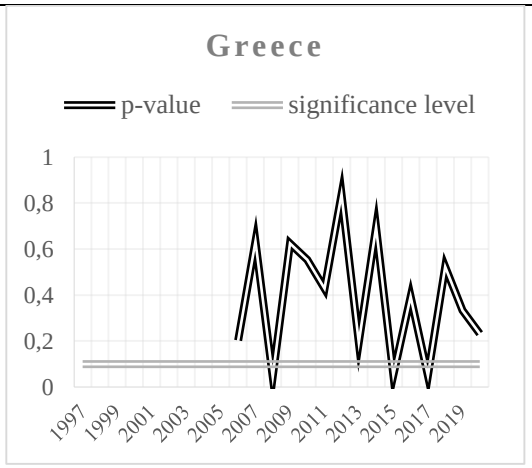
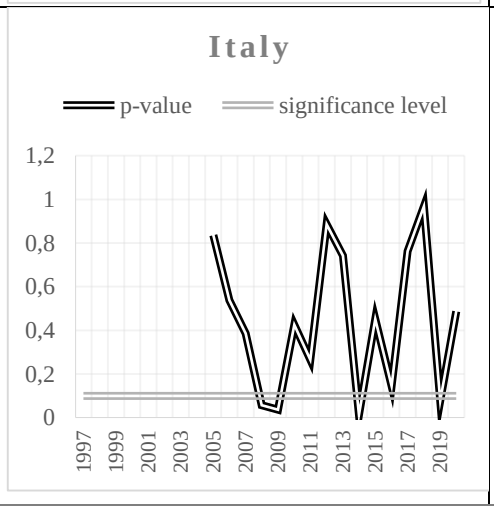
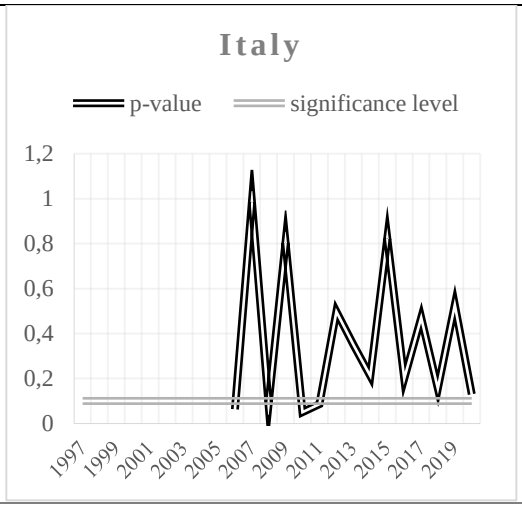
The series are then disassembled to reanalyse the causal inference by separating positive and negative shocks. It is important to note that, since no causal relationship is found for negative shocks, these results are not reported. In the dynamic asymmetric causality analysis, positive shocks to EPU can further trigger positive shocks to tourism. The graphs in the second column of Table 8 illustrate the findings of the dynamic asymmetric panel causality from EPU to tourism, highlighting the interconnectedness of these variables under specific conditions.

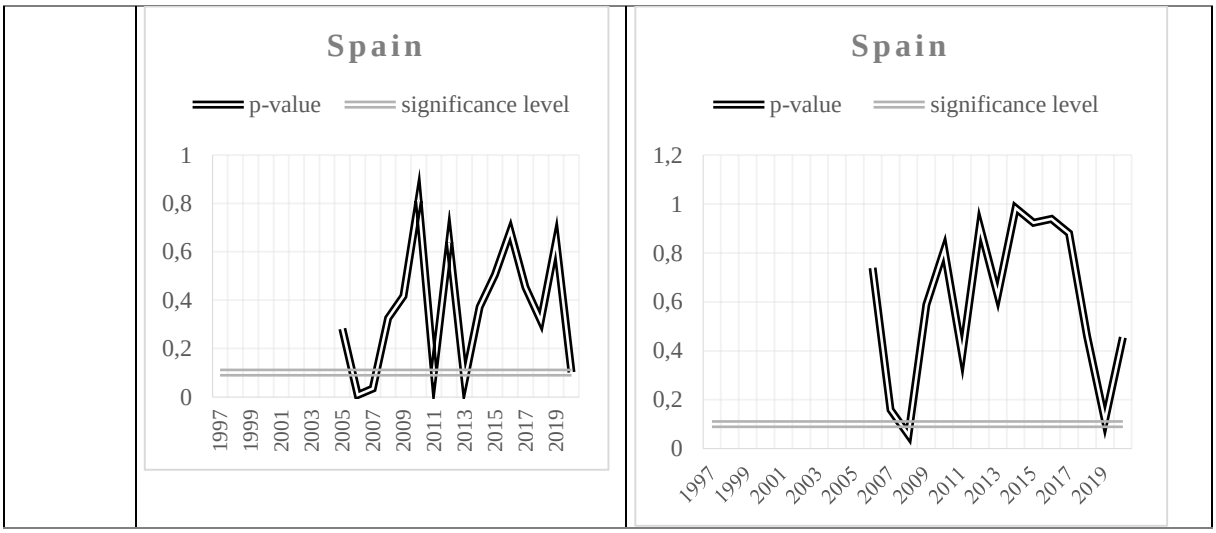
The dynamic asymmetric panel causality findings for France indicate that a causal relationship was prevalent in 2011, which can be attributed to the European debt crisis. During this period, the rising borrowing costs for Greece, along with the securities issued by Greece and other PIIGS countries, significantly impacted the balance sheets of major financial institutions in Germany and France, the central countries of the EU and the Eurozone. Consequently, this situation heightened the overall risk within the EU banking sector, which was already grappling with high leverage and low capital adequacy ratios. This increased risk likely influenced the dynamics between EPU and tourism during that time.
In Greece, the dynamic asymmetric panel causality analysis revealed causal relationships in the years 2008, 2015, and 2017. These periods of causality can be linked to several significant events. The global financial crisis and the subsequent EU debt crisis played a crucial role in shaping the economic landscape. Additionally, the refugee crisis significantly impacted the country's socio-political context, leading to heightened tensions and uncertainties. During these periods, Greece faced economic disruptions related to negotiations with the IMF and EU regarding debt repayment, alongside political instability stemming from emerging corruption issues. These factors collectively contributed to the identified causal relationships in the analysis.

Italy's dynamic asymmetric panel causality analysis revealed causal relationships in the years 2006, 2008, and 2010-2011. These periods were marked by significant political and economic challenges. Politically, issues related to corruption undermined stability, while economically, Italy grappled with the impacts of the global financial crisis and the European debt crisis. Additionally, low FDI and the inability to execute planned investments compounded these problems. Notably, the sharp increase in government bond interest rates, particularly from 2010 onwards, escalated borrowing costs for banks, fostering an atmosphere of insecurity and uncertainty within the Italian economy. These intertwined factors contributed to the observed causal relationships during the specified periods.

The dynamic asymmetric panel causality analysis indicated a causal relationship in Spain during the year 2008. This period was significantly impacted by the global financial crisis and its spillover effects on the peripheral economies of the Eurozone. In response to the crisis, Spain implemented crucial measures aimed at reducing public expenditures to stabilize the economy. However, the country continued to grapple with underlying issues, including external deficits, elevated levels of private and public debt, and high unemployment rates, all of which contributed to a climate of economic uncertainty. These factors together explain the causal relationship observed during this period.

Table 8. *Symmetric and asymmetric panel causality tests results between EPU and tourism.*

Ho: EPU↛IT A	Results of Dynamic Symmetric Panel Causality	Dynamic Asymmetric Panel Causality Test Between Positive Shocks
		
		
		



Source: *Authors' elaboration*

Table 9 presents the findings of both symmetric and asymmetric causality analyses examining the relationship between tourism and EPU across the countries included in this study for the specified periods.

Table 9. *Results of dynamic symmetric and asymmetric panel causality test.*

Direction of Causality	France	Spain	Italy	Greece
Dynamic Symmetric Panel Causality Test				
ITA ➡ EPU	2019-2020	-	2009-2010-2011-2012-2013	2010 2012-2013 2019-2020
EPU ➡ ITA	2007-2018-2019	2006-2007-2011-2013-2020	2008-2009-2014-2019	2013-2015-2016-2019
Dynamic Asymmetric Panel Causality Test				
ITA ➡ EPU	2007-2011-2012-2020	2007-2008-2011-2020	2013-2014	2012
EPU ➡ ITA	2011	2008	2006-2008-2010-2011	2008-2015-2017

5. Discussion

The current study establishes a robust reciprocal causal connection between EPU and tourism. Research findings align with the results of Wu and Wu (2019), Akadiri *et al.* (2020), Shahzad *et al.* (2022), and Wu and Wu (2021). This study investigates the causal relationship within a dynamic framework and employs more contemporary methodologies compared to previous research on the influence of domestic and international economic and political factors on tourism. It is also important to consider asymmetric shocks, which include both negative and positive components, due to the significant dynamic results observed in the series. Substantial asymmetric shocks are identified in both EPU and tourism variables. These findings increase the importance of the study.

6. Conclusion

This study analyses the interrelationship between EPU and tourism in the Mediterranean Basin countries. Two models are constructed for this purpose. First, the stationarity levels of the variables and horizontal cross-section dependence are assessed. The results indicate that second-generation unit root

tests should be employed, and that horizontal cross-section dependence exists. Subsequently, an estimation of the cointegration relationship reveals a long-term connection between the variables. The long-run coefficients are evaluated using the innovative Machado and Silva (2019) MM-QR technique, which provides more comprehensive results. Finally, symmetric and asymmetric dynamic panel causality tests are employed to investigate the dynamic relationship between the variables.

The results of the MM-QR estimation indicate that the impact of EPU on ITA in Model I is positive across all quantiles, except for the 0.1 quantile. However, this impact is not statistically significant in the first three quantile groupings (0.1, 0.2, and 0.3). As the quantile level increases, the positive effect of EPU on ITA becomes more pronounced.

In Model II, the effect of ITA on EPU is positive across all quantiles, except for the 0.8 and 0.9 quantiles. This effect is statistically significant only in the 0.2 quantile group. Subsequently, it is observed that the positive effect diminishes as the quantile level increases.

Upon analysing the causal relationship between tourism and the European Monetary Union (EMU) using the results of symmetric and asymmetric causality, it is noted that the significant events, except for Spain, occurred after the global crisis and intensified during the development phases of the EU debt crisis. Additionally, the onset of the Brexit process and the global pandemic coincided with periods when the causality became more pronounced.

When assessing the causal relationship from EPU to tourism, a causal link is identified across various periods in all countries included in the analysis. Generally, this relationship was first established in 2006, with causality periods intensifying during the global financial crisis and the EU debt crisis. Subsequently, the refugee crisis stemming from the Syrian war that began in 2011, the terrorist attacks by DEASH in EU countries, and the Brexit process in the UK also contributed to this relationship. The uncertainty generated by these regional issues was further exacerbated by the COVID-19 pandemic, which evolved into a global crisis.

According to the asymmetric causality analysis, no significant causal relationship is found with negative shocks. In contrast, a causal relationship is established during many periods for the sampled countries in the context of positive shocks, except for Greece. When examining these periods, France and Spain demonstrate an earlier causal relationship compared to other countries, primarily attributed to the global financial crisis and the uncertainty generated by the EU debt crisis. Subsequently, the negative impacts of the COVID-19 pandemic on the tourism sector become prominent. In Italy and Greece, the periods characterized by the adverse effects of economic and political uncertainties, largely stemming from their internal dynamics, are relatively more pronounced in the tourism sector.

Compelling findings emerge from the examination of the asymmetric causality relationship between the positive component of EPU and tourism. Greece is associated with one period of causality, while Italy exhibits two distinct periods. In the asymmetric causality analysis from EPU to tourism, France and Spain demonstrate a causal relationship in a single period; however, Greece and Italy experience causal relationships across multiple periods. This indicates that EPU has a more significant impact in Greece and Italy, negatively affecting the tourism sector.

Given that tourism is a country's window to the world, some suggestions can be made by policymakers. These findings confirm that the relationship between tourism and EPU is highly sensitive. Therefore, policymakers must fine-tune adjustments when evaluating the relationship between these two critical factors. Negative developments in tourism feed negative processes in EPU, and negative processes in

EPU feed negative processes in tourism. In this sense, it can be stated that the relationship between EPU and tourism shouldn't be evaluated only as the tourism sector and the economic and political uncertainties in the country. Because the tourism sector is interdependent with many industries and is seen as one of the main locomotives of an economy, unfavourable processes in the tourism sector may cause negative impacts that may spread to the entire economy. At the same time, a potentially bad image of a country can initiate isolation from the world.

Economic stimulus packages that support tourism during crisis periods should be designed with a multi-sectoral approach. Additionally, increasing the sustainability of tourism requires raising awareness among local communities and businesses, which helps distribute economic benefits more widely and reduce regional inequalities. Diplomatic and commercial strategies should be developed to strengthen international collaborations and reframe the country's tourism image on the global stage, thus minimizing the risk of potential isolation. An effective monitoring and evaluation mechanism should be established using data analytics and early warning systems to respond quickly to sudden changes in the tourism sector. These measures can help maintain the economic stability of the tourism sector, minimize the negative impacts of EPU, and support the overall economic health of the country. In this study, EPU index data for the period 1997-2020 is available only for France, Spain, Italy, and Greece, while data for other Mediterranean Basin countries could not be obtained. Future research could achieve more generalizable results if data for all countries in the Mediterranean Basin becomes available. Additionally, a similar study could be conducted focusing on Arab countries that are grappling with economic and political crises while making progress in tourism. Another potential study could examine a single-country example, such as the United States or China.

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