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Is the tourism-led growth hypothesis valid after the COVID-19 pandemic? The case of Spain

José Francisco Perles Ribes [1]*, Luis Moreno Izquierdo [2], Ana Clara Rucci [3] and Adrian Más Ferrando [4]

[1] Economics of Innovation and AI Research Group, Instituto de Economía Internacional, University of Alicante, Spain. Email: jose.perles@ua.es
[2] Economics of Innovation and AI Research Group, Instituto de Economía Internacional, University of Alicante, Spain. Email: luis.moreno@ua.es
[3] Tourism Research Institute, Faculty of Economics, University of La Plata, Argentina
[4] Economics of Innovation and AI Research Group, Instituto de Economía Internacional, University of Alicante, Spain

*Corresponding author

Abstract
This paper analyses the validity of the tourism-led economic growth hypothesis (TLEGH) for the case of Spain after the COVID pandemic. Advanced tests (dynamic and nonlinear) of non-causality Granger are carried out on time series of tourist arrivals and income as well as the evolution of GDP between the period 1955-2022. After performing an analysis with data up to 2019, we then examine whether the introduction of COVID modifies the conclusions obtained using data up to 2022. As a novelty, our results contradict in some cases (denying the bidirectional relationship between tourism growth and economic development), and qualify in others (pointing out that the TLEGH remains in force only in periods of economic expansion) those obtained by previous literature.

Keywords: Spain; TLEGH; COVID-19; advanced non-causality Granger test.

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1. Introduction

The tourism-led economic growth hypothesis (referred to as TLEGH, or TLEG hypothesis) suggests that tourism growth is positively related to overall economic growth, including investments, employment, residents' well-being and income, and business opportunities. This concept originates from the export-led growth hypothesis (ELGH) (Balaguer and Cantavella-Jorda, 2002), which posits that tourism contributes positively to long-term economic growth. According to this hypothesis and following Balassa's (1978) postulates, the tourism industry, as a high-value export activity, generates foreign exchange that can be used to import capital goods, stimulating the production of goods and services, thus driving economic growth. Additionally, the tourism industry can enhance efficiency by promoting competition between local firms and their international counterparts and facilitating the exploitation of economies of scale in local businesses.

The TLEG hypothesis has been extensively studied in recent decades. Its positive impact on the economy, or the "flow of benefits from tourism to the economy" (Antonakakis, 2015, p. 143), includes the creation of new job opportunities, as evidenced by Jin (2011), Pavlić *et al.* (2013), or Diakonidze (2019) in different countries, as well as generating wealth for residents directly and indirectly, including socially disadvantaged layers (Mazumder *et al.*, 2011; Jayswal and Jaiswal, 2015; Raza and Shah, 2017; Zimmerhackel *et al.*, 2019). Additionally, tourism has been found to attract foreign capital and improve the balance of payments, which is especially important for developing countries (Kalantzi *et al.*, 2017), as observed in Rasheed *et al.* (2019), or increase business opportunities (Mitra, 2019), among others.

Although tourism is generally associated with a positive impact on economic growth, it is just one of several possibilities. In fact, there are at least four hypotheses regarding the relationship between tourism and economic growth, systematically analyzed in numerous empirical studies. These hypotheses, referred to in Badulescu *et al.* (2020), include the TLEGH, a reciprocal or two-way relationship between tourism and economic growth, the neutral hypothesis which posits the absence of any effect, and the conservation hypothesis, which suggests that "people will spend more money on tourism when their economy becomes better" (We *et al.*, 2018, p. 367). In this research, we will discuss the first two possibilities regarding the positive impact between the economy and tourism.

This relationship may be influenced by the type of destination, countries' specialization, or the selected period. Given this complexity, Brida *et al.* (2016) suggest expanding the validation of TLEGH beyond innovative methodological approaches, including examining non-linearity between tourism and growth in different scenarios. Indeed, numerous factors can change the relationship between tourism and economic development, from economic crises to armed conflicts (Alp and Genk, 2015), making them non-linear. According to Perles *et al.* (2016), crises and booms can affect the carry-over capacity of tourism activity and economic growth through various transmission mechanisms based on economic competitiveness determinants, leading to an asymmetric behavior in TLEGH, as seen in their proposed model.
Following this rationale, this article aims to evaluate whether the TLEGH continues to hold true for Spain in the context of the "new normal" following the COVID-19 pandemic. By analyzing data from 1955 to 2022 and using advanced Granger causality tests, which accommodate the possible asymmetry in the relationship (one of the possible forms of nonlinearity), the study examines the relationship between tourist arrivals and income and GDP growth in Spain before and after the pandemic. The results of the study are then compared with existing literature on the TLEGH to determine whether the pandemic has had a significant impact on the relationship between tourism and economic growth in Spain.
The study is innovative in several aspects. First, to the authors' knowledge, it is the first time that the TLEGH is examined for the Spanish case using a test that allows for asymmetric behavior of the relationship. Second, likewise, it is the first study to analyze the validity of the TLEGH after the COVID-19 pandemic. Finally, using a sample spanning from 1955 to 2022, and a dynamic causality test, this is the first study to examine the TLEGH for Spain over such a long period of time.

The article is structured as follows. After this introduction, the second section reviews the existing literature on the topic. The third section explains the methodology. The fourth section deals with the econometric analysis. Finally, in the last section, the main conclusions are summarized.

2. Literature review

2.1. The relationship between tourism and economic growth: a geographic and temporal question

The positive relationship between tourism and economic growth, either unidirectional or bidirectional, has been widely supported by many researchers in recent decades. One of the most relevant studies in this regard is the one carried out by Brida *et al.* (2015), who, in a review of over a hundred scientific papers, found that in most cases studied, 'overall international tourism drives economic growth.' This relationship can be observed continent by continent, without exception, but with some differences, as remarked by Antonakakis *et al.* (2019). However, while the TLEGH is confirmed in developing countries, developed countries tend to have a bidirectional relationship between tourism and economic growth.

In developing regions, tourism is an undeniable element for rapid economic growth, as indicated by Samimi *et al.* (2011), with countries with higher degrees of development benefiting the most from tourism. This is evident in the work conducted by Odeleye *et al.* (2022) for 37 Asian countries in an annual data series between 1995 and 2018, where the TLEGH in Asia is also confirmed in the work of Wu *et al.* (2020) who analyzed 11 countries (i.e., Cambodia, China, Hong Kong, Indonesia, Japan, Macau, Malaysia, the Philippines, Singapore, South Korea, and Thailand) for the period 1995-2016, albeit with varying intensity over time. Other studies where TLEGH is observed include Liu and Song (2018), who found in a study for Hong Kong from 1974 to 2016, that 'not only a positive link between tourism and economic growth, but also the adverse effects of one on the other' (p. 906), in both the hypotheses of tourism-led economic growth (TLEGH) and economy-driven tourism growth (EDTGH); Kumar *et al.* (2015), who found that for the case of Malaysia, tourism has a significant long-term effect in boosting economic growth and attracting financial investment; and Wu and Wu (2020), who found that tourism development fostered economic growth in sixteen out of twenty Chinese regions during the 1995-2015 period, and advised the rest to implement tourism development policies to boost their economic growth.

Tourism development has also been seen to activate the economies of Latin America and Caribbean countries and to improve their relationship with other countries worldwide (Schlüter, 1993). Recent works, such as Fuinhas *et al.* (2020), which covers the period from 1995 to 2014, and Simundic *et al.* (2016), which analyzes panel data from 2000 until 2014, confirm the positive relationship between tourism and economic growth in Latin America, and recommend policymakers to undertake actions for the development of tourism activity in the different countries analyzed. Individually, positive effects can also be seen in Brida and Risso's (2009) study for the case of Chile, Brida and Monterubbianesi's (2010) study for the case of Colombia, Rasool *et al.*'s (2021) study for the case of Brazil (involving BRICS countries), or in Tzeremes' (2022) study for Chile, Ecuador, and Nicaragua, among many others.

But the relationship between tourism and economic growth is not constant over time. In the long term, as countries develop, tourism loses its weight as an economic driving force. This phenomenon is already evident in Europe. The tourism industry played a relevant role in European convergence from the 1960s onwards, being a key element for the development of Mediterranean countries, such as Spain, Italy, Turkey or Greece (Leontidou, 1995; Corkill, 1998; Gunduz and Hatemi-J, 2005; Cortes-Jimenez and Pulina, 2010). However, in recent decades, countries with a higher degree of specialization in the tourism sector are experiencing a significant reduction in their ability to converge with more advanced ones (Haller *et al.*, 2020).

This can be explained by the emergence of new sectors, such as the digital industry, with much higher productivity than traditional sectors, and the lack of innovation in tourism regions, as illustrated in

Moreno-Izquierdo *et al.* (2018) and Romão and Nijkamp (2019). But at the same time and in the short-run, compliance with the TLEG hypothesis has been conditioned by repeated economic shocks, as well as the resilience of each country's tourism sector. These asymmetries are observed in Hatemi-J *et al.* (2018) for the period of 1995-2014, which pointed out that the tourism industry in France, the US, and the UK copes better with negative shocks than in Italy and Japan. Iglesias Garrido (2018) also unveiled the varying sensitivities in tourist outbound flows driven by positive and negative economic cycles in Europe, which condition the impact of tourism on the economic growth of host countries. These differences can also be observed by studying each country separately. For example, Michálek and Výbošťok (2019) showed that the financial crisis affected the economic growth of countries with a higher dependence on tourism, such as Mexico and Argentina, and Dibeh *et al.* (2020) pointed out the resilience of the TLEG hypothesis even in situations of extreme political instability, such as the Lebanese war and the Syrian crisis.

All of the cases mentioned above lead to the conclusion that the study of the economic impact of the tourism sector varies greatly depending on the time and place studied, and thus requires a constant update of its effects. COVID-19 undoubtedly represents a shock that requires our full attention for two reasons: firstly, due to the adverse effects generated in the short term, and secondly, because recent research has shown changes in user preferences that, if sustained, could significantly alter the traditional tourism market (see Seraphin and Dosquet, 2020; Renaud, 2020; Khozaei *et al.*, 2022, among others).

2.2. The TLEG hypothesis in Spain

Regarding Spain, studies available suggest a bidirectional relationship between tourism growth and economic development, which confirms the validity of the Tourism-Led Growth Hypothesis (TLEGH) in this specific case. Balaguer and Cantavella-Jordá's (2002) article was a pioneering work that employed a bivariate non-causality Granger test to examine the validity of the TLEGH. This study, which serves as a crucial starting point and reference for subsequent research on the topic, found evidence of a unidirectional relationship from tourism growth to economic development in Spain during the 1975-1997 period.

After that work, many others have emphasized the importance of tourism in promoting economic growth in Spain. For example, Nowak *et al.* (2007) validated the TLEGH in the short-term and demonstrated a bidirectional relationship between tourism growth and economic development through investment, as a second channel of transmission. In their research they used a Vector Error Correction Model (VECM) for the period of 1960-2003. The same methodology (VECM) is used in the work of Cortes-Jiménez and Pulina (2010), which updates the Balaguer and Cantavella-Jordá (2002) research. In this case, a longer period of time is chosen (from 1964 to 2000), and the analysis is enhanced by incorporating a production function that introduces capital and human resources factors. The authors found a bidirectional relationship between tourism growth and economic development in the long-term, which supports the validity of the TLEGH in the Spanish context.

Proença and Soukiazis (2008) also validated the positive relationship between tourism development and economic growth in the Mediterranean economies (Greece, Italy, Portugal and Spain). Specifically, and by using different estimation methods (OLS pooled, LSDV fixed effects, and GLS random effects) for the period 1990-2004, it is found that “every 1% increase in international tourism revenues induces an increase of roughly 0.026 p.p. in per capita income in these countries” (p. 804). Furthermore, in Balsalobre-Lorente *et al.* (2021) the TLEGH is confirmed by the bidirectional relationship between economic growth and air transport as tourism proxy, indicating that “both tourism and GDP are a key predictor of each other” (p. 511). In this research, the asymmetric autoregressive distributed methodology and a non-parametric causality test are used for the period 1970 - 2015.

The bidirectional relationship between Spain's tourism demand growth and economic growth is also shown in Perles-Ribes *et al.* (2017), even after the financial crisis, despite Spain being one of the countries hardest hit by it. Authors warn that the results are sensitive to variable selection, transformation, and model specification, indicating a lack of causality procedure robustness when applied to real-world data. This is something that can be confirmed by the research conducted by Mérida and Golpe (2014), who do not find evidence of causality between the gross domestic product and the number of nights spent in Spanish tourist accommodations in the period of 1985-2013. However, dividing the sample they observe causality from economic growth towards tourist activity until 1985, and from that moment on, a biunivocal relationship.

In view of the above, the research questions to be addressed in this article would be the following:

RQ1: Using a symmetric causality test, the bidirectional relationship between tourism growth and economic development observed in previous studies continues to be confirmed after the pandemic resulting from COVID-19?
RQ2: If not, using an asymmetric causality test for which phases (growth or crisis) is the bidirectional relationship still confirmed?
RQ3: From a dynamic point of view, which time periods contribute most relevantly to confirm the TLEGH for the Spanish case?

The following sections are devoted to answering these research questions.

3. Methodology

For our study, tourism development is proxied by the international visitors' arrivals and the international tourism income. Arrivals are provided by two different sources, Tena (2005) for the period 1955-1995, and the Spanish National Institute (www.ine.es) for the period 1996-2022. Tourism income is provided by Tena (2005) for the period 1955-1993 and the Bank of Spain thereafter. Economic growth is proxied using the Real GDP series provided by the Fundación de Estudios de Economía Aplicada (Fedea) for the period 1955-2020, and again the Spanish National Institute for the year 2022. The tourism income series is deflated using the same GDP deflator provided by FEDEA for the GDP series. Therefore, both series are expressed in real terms with base year 2016. To minimize the variance of the series and interpret the coefficients as elasticities, all the series are transformed by taking the natural logarithm.

We have employed the Granger non-causality testing to confirm the TLEG hypothesis. This methodology is, without any doubt, the most commonly used test for this kind of exercises, as it is shown in the literature review conducted by Brida *et al.* (2016). However, within this methodology, there are alternative and advanced versions that are employed in different cases. For this research, we will employ the advanced version described by Hacker and Hatemi-J (2010), Hatemi-J (2012) and Hatemi-J (2022). These adaptations of the Granger test for the tourism economy are also found in recent papers such as Hatemi-J *et al.* (2018), Iglesias *et al.* (2018) and Osinubi *et al.* (2021).

This methodology is based on the Toda and Yamamoto (1995) procedure, a test designed to analyze causal relationships between time series, extending the traditional Granger causality test conducting a standard Wald test on the first p lags of an augmented vector autoregression (VAR) model in the levels of the data. The VAR model is represented by the equation:

$$Y_t = \sum_{i=1}^{p} A_i Y_{t-i} + \epsilon_t$$

where Y_t is a k-dimensional vector of time series at time t, A_i is a k times k matrix of regression coefficients up to lag p, and ϵ_t is a k-dimensional vector of error terms. The Wald test statistic is then computed using the estimated coefficients and residuals from the VAR model:

$$W = T(\hat{\gamma}_p - \gamma_p)^T(\hat{V}_p/n)(\hat{\gamma}_p - \gamma_p)$$

where $\hat{\gamma}_p$ is the estimated vector of regression coefficients up to lag p of the VAR model, γ_p is the hypothesized vector of regression coefficients, $\hat{V}_p$ is the estimated covariance matrix of the residuals up to lag p of the VAR model, n is the sample size, and T is the number of observations minus $2p$. Under the null hypothesis of no causal relationship, the Wald test statistic has an asymptotic chi-square distribution with p degrees of freedom. If the coefficients are significant, then the model indicates that there is a causal relationship between the two time series.

The version of Hacker and Hatemi-J (2010) endogenously determines the optimal VAR lag length and carries out a bootstrap procedure to determine the critical values of the Wald test, thereby improving the size and power of the test. Furthermore, Hatemi-J (2012) Granger causality test is an improved version of the previous one, taking into account the possibility for asymmetric effects. Therefore, the data is transformed into both cumulative positive and negative changes to capture the potential impact of asymmetric information phenomenon. Like the symmetric version of the test, the asymmetric version also employs a bootstrap procedure to determine the critical values of the Wald test. Finally, the dynamic asymmetric test developed by Hatemi-J (2022) is used to explore the dynamic symmetric or asymmetric causality relationship between the both variables. As an example of studies that have used some of these adaptations of the Granger test in the tourism economy, we find Hatemi-J *et al.* (2018), Iglesias *et al.* (2018) or Osinubi *et al.* (2021), among others.

4. Results

Before proceeding with the analysis methodology explained above, it is interesting to observe how our variables (tourist arrivals, income, and economic growth), shown in Figure 1, have behaved.

As we can see, in all cases there is a clearly positive trend from 1955 to 2022, although with some notable differences: first, the number of arrivals and international tourism income shows a steeper slope in the 1960s, and a gradual flattening thereafter. In the case of the economic variable, growth is more linear, at least until the outbreak of the financial crisis of 2008, which is a much greater shock to Spain's development than other shocks observed in the 1980s and 1990s.

With respect to COVID, since it was a pandemic that affected the movement of people globally, the volume of arrivals and income are much more affected than economic growth. The effects on economic growth are also felt, but to a lesser extent, as local trade, exchange of goods, energy consumption, administrative tasks, or digital activities - including teleworking - remained active (within the established restrictions and the repercussions of such a crisis).

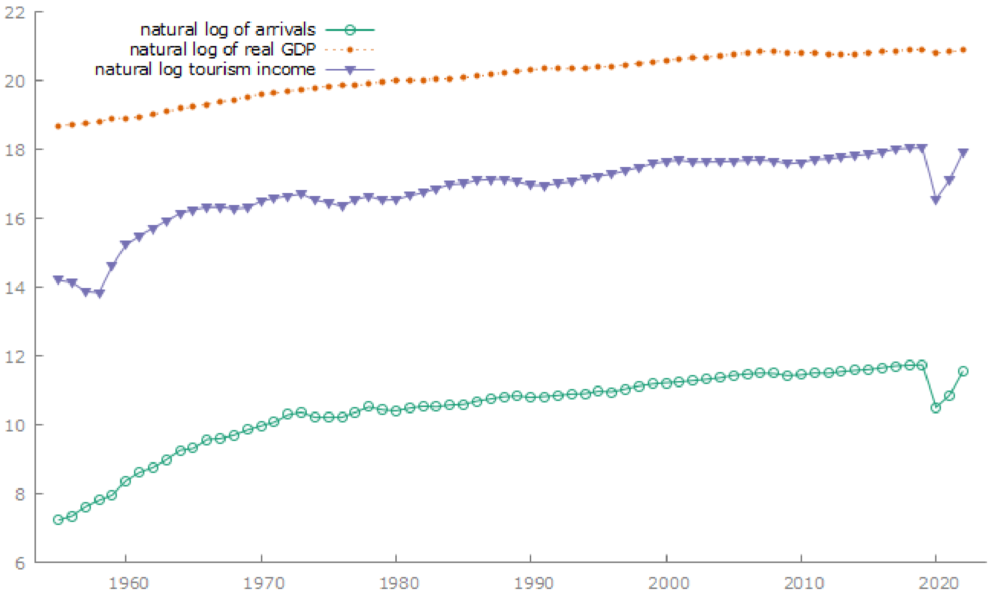

Figure 1. *Tourist arrivals, international tourism income and economic growth evolution.*

Tables 1 and 2 reflect the unit root and stationarity analysis carried out. Table 1 shows that the ADF rejects the null hypothesis of a unit root for the variables of tourist arrivals, real tourism income, and real GDP when using only a constant but does not reject it in either case when employing both a constant and a deterministic trend. In the last case, the unit root test on the first difference of the series is rejected. This last result suggests that all the variables would be stationary. However, as a precaution, both series are assumed to be I(1).

On the other hand, the KPSS test also indicates that all the considered series would be integrated of order one (I(1)), rejecting the null hypothesis of stationarity when a constant or a constant and a deterministic trend are included in the estimations in levels. But it is rejected when a constant and a deterministic trend are included, and the estimation is performed in first differences. This reinforces the impression that the true behavior of the series is of integrated order one (I(1)).

Table 1. *ADF unit root testing 1955-2022*

Variable	ADF specification	Lag length (based on BIC) max 10	t-statistic (p-value)	Conclusion
larrivals	constant+trend	0	-2.88 (0.167)	I(0)/I(1)
larrivals	constant	2	-5.04 (<0.0001)	
lRealGDP	constant+trend	0	-0.62 (0.9778)	
lRealGDP	constant	0	-4.85 (<0.0001)	
lRealIncome	constant+trend	0	-2.79 (0.198)	
lRealIncome	constant	2	-4.06 (0.001)	
dlarrivals	constant+trend	1	-8.05 (<0.0001)	
dlRealGDP	constant+trend	0	-6.27 (<0.0001)	
dlRealIncome	constant+trend	1	-7.20 (<0.0001)	

**Notes: l_variable (levels) dl_variable (first difference)*

Table 2. *KPSS stationarity testing 1955-2022*

Variable	KPSS specification	Bandwidth (Newey-West using Bartlett kernel)	t-statistic (critical values 5% level)	Conclusion
larrivals	constant+trend	3	0.33 (<0.01)	
larrivals	constant	3	1.49 (<0.01)	
dlarrivals	constant+trend	3	0.10 (>0.10)	
dlarrivals	constant	3	0.60 (0.029)	
lRealGDP	constant	3	1.70 (<0.01)	
lRealGDP	constant+trend	3	0.38 (<0.01)	
dlRealGDP	constant	3	0.92 (<0.01)	I(1)
dlRealGDP	constant+trend	3	0.04 (>0.10)	
lRealIncome	constant	3	1.43(<0.01)	
lRealIncome	constant+trend	3	0.24(<0.01)	
dlRealIncome	constant	3	0.22(>0.10)	
dlRealIncome	constant+trend	3	0.05(>0.10)	

**Notes: lvariable (levels) dlvariable (first difference)*

4.1. Static analysis

4.1.1. Non-causality test Pre-COVID estimation

Table 3 reflects the Hacker and Hatemi-J (2010) Granger non-causality testing for the period 1955-2019. The top of the table shows the analysis carried out for tourist arrivals, while the lower part of the table reflects the analysis for tourism income.

Regarding the VAR on arrivals and real GDP, the optimal lag length has been endogenously determined as 1, and the suggested extra lag is also 1, which aligns with the unit root testing carried out. The results of the test indicate that the null hypothesis of non-Granger causality is rejected for the case that tourism (measured as *arrivals*) cause real GDP growth, but the reverse is not true. Thus, it suggests the validity of the TLGH.

On the other hand, regarding the relationship between tourist income and real GDP, most lag length criteria propose an impractical 20 lags for estimations when dealing with annual data. Only one criterion, the AICC, suggests a more realistic value of 2 lags. However, analyzing the VAR with 2 lags, the null hypothesis is not dismissed in either direction at a 5 percent significance level, indicating that the validity of the TLGH during the considered period is not confirmed under this criterion. Yet, using the critical value at a 10 percent significance level would reject the null hypothesis for the scenario where income causes GDP, implying the TLGH would be confirmed for the income variable at this significance level.

Table 4 reflects the result of the Hatemi-J (2012) asymmetric Granger non-causality testing. The optimal VAR lag length has been endogenously determined as 1 for the negative case and 2 for the positive one and the suggested extra lag is also 1. The results of the test indicate that the non-Granger causality null hypothesis is rejected for the case that tourism (both arrivals or real tourism income) causes real GDP growth only for the positive shocks. But in any other case the test is not rejected at 5% significance level. Therefore, TLGH is suggested for Spain in the case of positive shocks.

Table 3. *Symmetric Granger non-causality testing Hacker and Hatemi-J (2010)*

VAR	Optimal VAR lag length	Extra lag	Granger non-causality test
l_arrivals l_RealGDP	2 lags based on Hatemi-J Criterion (HJC)	1	larrivals➔lRealGDP W=3.841 (c.v 5% 4.048) lRealGDP➔larrivals W=0.000 (c.v. 5% 4.019)
l_RealIncome l_RealGDP	2 lags based on AICC*	1	lRealIncome➔lRealGDP W=6.352 (c.v 5% 6.964 c.v 10% 5.347) lRealGDP➔lRealIncome W=0.788 (c.v. 5% 6.898)

**Notes: Bootstrap critical values based on 1000 replications. *20 lags based on Hatemi-J Criterion (HJC) which also leads to not rejection of null hypothesis.*

Table 4. *Asymmetric Granger non-causality testing Hatemi-J (2012)*

VAR	Optimal VAR lag length	Extra lag	Granger non-causality test
l_arrivals l_RealGDP	1 lags based on Hatemi-J Criterion (HJC) for the negative case 2 lags for the positive case	1	$larrivals^{+}$➔$lRealGDP^{+}$ W=9.982 (c.v 5% 5.982) $larrivals^{-}$➔ $lRealGDP^{-}$ W=0.022 (c.v 5% 4.412) $lRealGDP^{+}$➔$larrivals^{+}$ W=6.374 (c.v. 5% 6.496) $lRealGDP^{-}$➔ $larrivals^{-}$ W=0.128 (c.v. 5% 5.145)
l_RealIncome l_RealGDP	1 lags based on Hatemi-J Criterion (HJC) for the negative case 2 lags for the positive case	1	$lRealIncome^{+}$➔$lRealGDP^{+}$ W=7.825 (c.v 5% 6.381) $lRealIncome^{-}$➔ $lRealGDP^{-}$ W=0.764 (c.v 5% 4.983) $lRealGDP^{+}$➔$lRealIncome^{+}$ W=1.748 (c.v. 5% 6.039) $lRealGDP^{-}$➔ $lRealIncome^{-}$ W=0.599 (c.v. 5% 4.066)

**Notes: Bootstrap critical values based on 1000 replications.*

4.1.2. Non-causality test Post-COVID estimation

Table 5 and 6 reflects the results of the Hacker and Hatemi-J (2010) and the Hatemi-J (2012) Granger non-causality testing for the period 1955-2022. Table 5 shows that including the data for the period 2020-2022 mask the relationship between the variables because the non-Granger causality test is not rejected in any case. Thus, TLGH would not be confirmed in the post-COVID period using the symmetric test.

Table 6 reflects the result of the Hatemi-J (2012) asymmetric Granger non-causality testing. The optimal VAR lag length has been endogenously determined as 1 for the negative case and 2 for the positive ones, and the suggested extra lag is also 1. The results of the test indicate that the non-Granger causality null hypothesis is rejected only for the case that tourism (arrivals) causes real GDP growth in the case of positive shocks. Thus, conversely to the case of the pre-COVID estimation where TLGH was confirmed for both the arrivals and income variables, in the post-COVID, TLGH would be confirmed only using the arrivals variable.

Table 5. *Symmetric Granger non-causality testing Hacker and Hatemi-J (2010)*

VAR	Optimal VAR lag length	Extra lag	Granger non-causality test
l_arrivals l_RealGDP	2 lags based on Hatemi-J Criterion (HJC)	1	larrivals➔lRealGDP W=0.618 (c.v 5% 3.940) lRealGDP➔larrivals W=0.014 (c.v. 5% 4.073)
l_RealIncome l_RealGDP	2 lags based on AICC*	1	lRealIncome➔lRealGDP W=0.627 (c.v 5% 6.392) lRealGDP➔lRealIncome W=0.705 (c.v. 5% 6.360)

**Notes: Bootstrap critical values based on 1000 replications. *20 lags based on Hatemi-J Criterion (HJC) which also leads to not rejection of null hypothesis.*

Table 6. *Asymmetric Granger non-causality testing Hatemi-J (2012)*

VAR	Optimal VAR lag length	Extra lag	Granger non-causality test
l_arrivals l_RealGDP	1 lags based on Hatemi-J Criterion (HJC) for the negative case and positive case 2 lags for the positive case and lRealGDP as dependent variable	1	larrivals$^+$➔lRealGDP$^+$ W=12.393 (c.v 5% 6.999) larrivals$^-$➔ lRealGDP$^-$ W=0.515 (c.v 5% 4.410) lRealGDP$^+$➔larrivals$^+$ W=0.829 (c.v. 5% 6.995) lRealGDP$^-$➔ larrivals$^-$ W=0.284 (c.v. 5% 5.360)
l_RealIncome l_RealGDP	1 lags based on Hatemi-J Criterion (HJC) for the negative case 2 lags for the positive case	1	lRealIncome$^+$➔lRealGDP$^+$ W=2.695 (c.v 5% 7.025) lRealIncome$^-$➔ lRealGDP$^-$ W=0.453 (c.v 5% 4.356) lRealGDP$^+$➔lRealIncome$^+$ W=0.549 (c.v. 5% 6.660) lRealGDP$^-$➔ lRealIncome$^-$ W=0.346 (c.v. 5% 4.788)

**Notes: Bootstrap critical values based on 1000 replications.*

In summary, the TLGH in Spain, from a long-term perspective and a static viewpoint would be suggested in the pre-COVID period for the symmetric test and the asymmetric test for the case of positive shocks. However, the relationship would be cloudier in the post-COVID period where only remains for the case of the asymmetric case and positive shocks.

4.1.3. Dynamic analysis

Figure 2 (which summarizes the detailed results provided in Table 7 of the annex) illustrates the results of the dynamic Granger non-causality test conducted from tourist arrivals to economic growth. The test employs a symmetric approach and a recursive method starting from an initial test covering the period 1955-1970.

According to the results, the TLGH is suggested for the tests that conclude in the years 2006, 2007, 2009, 2010, 2011, 2018, and 2019. However, for the test examining the causality direction from economic growth to tourism development (Figure 3), the null hypothesis is not rejected for any period. It's worth noting that this analysis cannot be replicated for the real income variable due to singularities of the analyzed matrices.

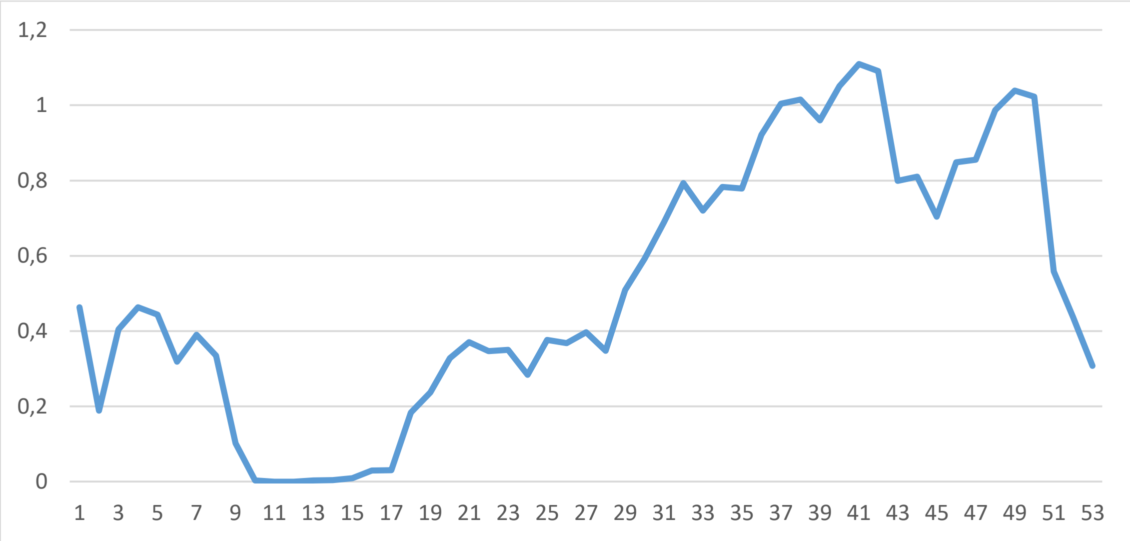

Figure 2. *Dynamic Granger non-causality test from arrivals to economic growth. Time-Varying Causality Test Results (10%). Symmetric case for Recursive Approach. TVpCV. Source: Author.*
**Note: value of TVpCV > 1 it implies that the null hypothesis of no causality is rejected at the given significant level.*

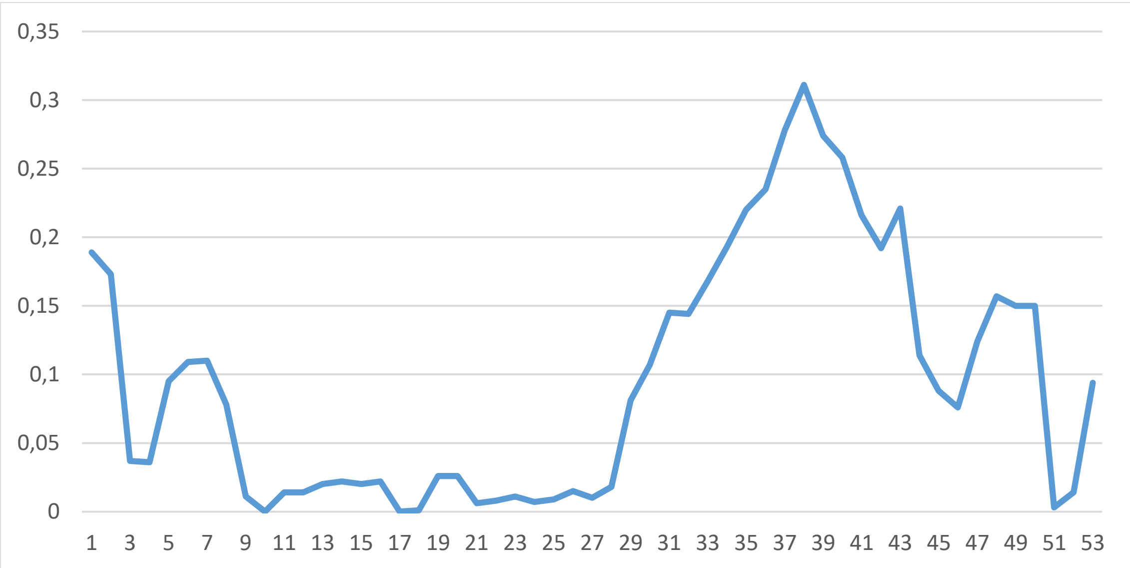

Figure 3. *Dynamic Granger non-causality test from economic growth to tourism development. Time-Varying Causality Test Results (10%). Symmetric case for Recursive Approach. TVpCV. Source: Author.*
**Note: value of TVpCV > 1 it implies that the null hypothesis of no causality is rejected at the given significant level.*

5. Conclusion

The objective of this paper was to reevaluate the correlation between tourism growth and economic development in Spain, particularly in light of the COVID-19 pandemic. Previous studies such as Nowak *et al.* (2007), Cortes-Jiménez and Pulina (2010), or Perles-Ribes *et al.* (2017) have established a bilateral relationship between Spanish tourism growth and its national economic development, thereby confirming the TLEGH. However, employing an innovative methodology that considers potential asymmetries in the relationship and its dynamic evolution over the analyzed period, this study challenges these findings.

Specifically, in the symmetrical version of the test conducted, only a unilateral relationship from tourism growth to economic development is indicated up to the period preceding the onset of COVID-19, consistent with the seminal work of Balaguer and Cantavella-Jordá (2002). However, the emergence of COVID-19 obscures this previous result, with no discernible causal relationship in either direction (similar to findings observed in Mérida and Golpe, 2014, where differences in results are also noted depending on the sample size).

The dynamic version of the test, focusing on the arrivals variable, suggests that the observed relationship, in the case of positive shocks, is rooted in the behavior of the relationship between 2006 and 2011, prior to the global financial crisis of 2008. Subsequently, during the years of significant tourism expansion in Spain before COVID-19 (2018-2019), the relationship remains notable. This is affirmed when applying the Hatemi-J (2012) test, which investigates potential asymmetries in the relationship. Pre-COVID-19 data indicate that the TLEGH is valid only during periods of tourism and economic expansion, reiterating a unidirectional relationship from tourism growth to economic development. Remarkably, this result persists even after incorporating the effects of the COVID pandemic, suggesting a robust relationship.

In summary, the analysis conducted contradicts previous literature in some instances (disputing the bidirectional relationship between tourism growth and economic development), while qualifying others (notably, indicating that the TLEGH remains applicable only during periods of economic expansion). Thus, this study represents progress compared to existing literature, considering the study's focus, background, and the variables included in the analysis.

However, it's essential to acknowledge the limitations of this article. The TLEGH has been examined from a macroeconomic (national) standpoint, overlooking potential differential effects that warrant further exploration. For instance, previous studies have identified signs of gender inequality in wealth distribution (Thrane, 2008; Bakas *et al*., 2018), as well as the impoverishment of some social groups in tourist destinations (Sheng and Tsui, 2009; Kinyondo and Pelizzo, 2015). These effects were not investigated in this study and should be addressed in future research.

Additionally, this article solely explores the relationship between tourism growth and economic development, without considering the potential effects of other variables such as foreign investment, education, price levels, and exchange rates on this relationship. Future research should delve into the impacts of these variables on the connection between tourism and economic development.

Nonetheless, this study opens up new avenues for future research, based on the asymmetric and dynamic nature of the relationship between tourism and economic growth. It makes a significant contribution to existing literature on this subject, and further investigations could offer valuable insights into the sustainable development of the tourism industry and the economic growth of Spain.

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Appendix

Table 7. *Dynamic Granger non-causality test from arrivals to economic growth. Time-Varying Causality Test Results (10%). Symmetric case for Recursive Approach.*

SSPTest	Test Value	10% Bootrap CV	TVpCV
1	1.585	3.421	0.463
2	2.223	11.766	0.189
3	1.472	3.637	0.405
4	1.570	3.388	0.463
5	1.521	3.426	0.444
6	1.096	3.432	0.319
7	1.119	2.870	0.390
8	1.072	3.197	0.335
9	0.372	3.645	0.102
10	0.008	3.065	0.003
11	0.001	3.144	0.000
12	0.001	3.512	0.000
13	0.010	3.043	0.003
14	0.013	3.313	0.004
15	0.032	3.479	0.009
16	0.095	3.232	0.030
17	0.094	2.992	0.031
18	0.581	3.163	0.184
19	0.734	3.103	0.237
20	0.965	2.944	0.328
21	1.003	2.704	0.371
22	0.996	2.868	0.347
23	0.972	2.778	0.350
24	0.934	3.295	0.284
25	1.027	2.727	0.377
26	1.040	2.823	0.368
27	1.170	2.946	0.397
28	0.962	2.767	0.348
29	1.391	2.733	0.509
30	1.802	3.037	0.593
31	1.972	2.860	0.689
32	2.015	2.542	0.793
33	2.062	2.866	0.720
34	2.111	2.697	0.783

SSPTest	Test Value	10% Bootrap CV	TVpCV
35	2.198	2.821	0.779
36	2.405	2.607	0.922
37	**2.683**	**2.673**	**1.004**
38	**2.713**	**2.674**	**1.015**
39	2.779	2.895	0.960
40	**3.031**	**2.883**	**1.051**
41	**3.057**	**2.754**	**1.110**
42	**3.057**	**2.802**	**1.091**
43	2.203	2.756	0.799
44	2.258	2.789	0.810
45	2.185	3.101	0.704
46	2.533	2.985	0.849
47	2.583	3.021	0.855
48	2.699	2.735	0.987
49	**2.820**	**2.714**	**1.039**
50	**2.904**	**2.837**	**1.023**
51	1.477	2.643	0.559
52	0.998	2.278	0.438
53	0.794	2.574	0.308

**Notes: SSP: Sub-Sample Period CV: Critical Value TVpCV: Test Value per Critical Value TVpCV = (Test Value) / (Bootstrap Critical Value at the given significant level) if the value of TVpCV > 1 it implies that the null hypothesis of no causality is rejected at the given significant level.*

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