1. Introduction

The relationship between economic development and tourism has attracted the interest of policymakers, researchers and academics due to the debate of tourism's contributions to world GDP. According to the World Travel and Tourism Council (WTTC, 2018), in 2017, tourism accounted for nearly 10% of the world's GDP for the fifth consecutive year. Furthermore, the sector now supports the employment of nearly 313 million people, which accounts for 1 out of every 11 jobs on the planet. In Spain, from the perspective of foreign relations, since 1970, the surplus of the Tourism and Travel heading of the Balance of Payments has compensated for more than 70% of the deficit of the balance of merchandise (Álvarez *et al.*, 2007). Consequently, a growing interest in tourism has emerged in developed countries where the growing trend in international tourism flows was interrupted in late 2008 by the effects of the international financial crisis. Even though international tourist flows have regained their vigour since 2010, the intensity of growth differs between geographical areas (Gómez-Loscos and González, 2014). In Spain, following the report of Cuenta Satélite del Turismo, the share of incoming tourism with respect to the whole Spanish economy has increased in recent years, with Spain becoming the third largest tourist destination. With a relative weight of greater than 6% of GDP, tourism is remarkably important to Spain's economy, allowing for a correction of the recent external imbalances.

There are many studies that have analysed the relationship between tourism and growth, especially the bidirectional relationship (see among others Balaguer and Cantavella-Jordá, 2002; or Gunduz and Hatemi-J., 2005). The impact of tourism on a country's development is a fact widely held in the literature on tourism and is known as the tourism-led growth hypothesis (TLGH). However, few studies have addressed the opposite relationship in which GDP growth causes an increase in tourist arrivals, even though most studies have used the Granger causality technique that can prove the relationship in both directions (see recently for instance Pavlic *et al.*, 2015a; Wang *et al.*, 2012; Çağlayan *et al.*, 2012; or Tang and Abosedra, 2014).

However, in this paper, by using the arguments of Pina *et al.* (2013) or Tugcu (2014) regarding endogenizing the rate of tourist arrivals, the comparison is done among the GDPs of the origin countries of tourist arrivals in Spain. In this sense, the empirical exercise developed in this paper moves away from the studies on TLGH and utilizes traditional analyses of the tourist demand and its determinants. For this reason, our goal is to investigate the income shocks on Spain's international tourism demand in order to determine the most appropriate economic and tourist policies to maintain the flow of tourists in Spain. To this end, we investigate a sample of 9 OECD countries from 2000-2017 by using GDP and international tourist arrivals data collected from the OECD database and the Instituto Nacional de Estadística (INE). Our empirical approach consists of a set of techniques developed by Toda and Yamamoto (1995) and Hatemi-J. (2012) for Granger causality analysis using time series. For the country-by-country analysis, the methodology that is used was proposed by Emirmahmutoglu and Kose (2011) as an extension of Toda and Yamamoto (1995) for panel data.

To the best of our knowledge, this will be the first application of these econometric techniques on studying the relationship between tourism and economic growth. Our paper contributes to the previous literature in two ways. First, we explore how the income shocks in the 9 countries with major tourism flows to Spain affect inbound Spanish tourism, using control variables as the real effective exchange rate (REER). Second, we identify the existence of asymmetries in this relationship. In particular, this paper studies how the state of the economy of the origin country affects inbound tourism to Spain. We also discriminate this behaviour by country and economic situation in order to establish a particular country's tourism policies. The results reveal that a relationship exists between growth and tourism flows in several ways across the analysed countries, which shows the importance of the economic idiosyncrasy.

This paper is structured as follows. Section 2 presents the theoretical and empirical background on the relationship between growth and tourism. Section 3 describes the data and methods used in the empirical analysis. Section 4 presents the main results, and section 5 discusses implications for academics and policymakers.

2. Theoretical background

2.1 The drivers of the tourism demand on economic growth

Many variables have been examined and accepted in previous research that explains the tourism demand determinants; however, significant distinctions can be drawn between the influences of different determinants for different visit purposes (see Peng *et al.*, 2015). Some of these determinants that play a key role in the tourist inflows in Spain are the incomes, the REER, the relative price of tourism, (Padilla, 1988; Espasa *et al.*, 1990; González and Moral, 1995; González and Moral, 1996; Espasa (1996); García-Ferrer and Queralt, 1997; Garín-Muñoz, 2011; or more recently Álvarez-Díaz *et al.*, 2014), and the quality of service (Albaladejo *et al.*, 2014). In the international context, other determinants include the volume of international trade, transportation costs, size of the population within the origin country (Turner and Witt, 2001), trends in immigration patterns (Seetaram and Dwyer, 2009), destination promotional expenditures (Crouch *et al.,* 1992), changes in tourists' tastes, seasonal variations (Lim, 2004), climate change (Lise and Tol, 2002), political instability (Dhariwal, 2005; Naude and Saayman, 2005), foreign direct investment (Tang *et al.*, 2007), unemployment rates (Cho, 2001), income distribution (Morley, 1998), quality or security perceptions (Tang, 2011; Albaladejo *et al.*, 2014 or Pavlić *et al.*, 2015b) and the educational levels and age distributions of tourists (Alegre and Pou, 2004).

In addition to understanding the conditions of demand, the effects that tourism has on economic development have been also studied. For instance, tourism has the ability to create new jobs, economic benefits and income for the economic agents in the local economy. It can also stimulate investment in new infrastructure and competition by creating competition, encouraging economies of scale, and importing capital goods (Balaguer and Cantavella-Jordà, 2002). This is coupled by the multiplier effect with linked industries for human capital that can create economies of scale and allow for the diffusion of technical knowledge (see the survey of Brida *et al.*, 2016).

Although there is a very large collection of literature that has explored the relationship in both directions, attention has been mainly placed on understanding the effects of tourism demand on economic growth. The belief that international tourism can promote economic growth is known as the TLGH. It is inspired by the idea that tourism brings in foreign currencies that can be used to import capital goods and services, which favours economic growth (McKinnon, 1964). To explain the growth rate of output over long periods, a couple of complementary approaches can be used (see Balaguer and Cantavella-Jordá, 2002). Growth theory models the interactions among factor supplies, productivity growth, saving, and investment in the process of growth. Growth theory supports unidirectional causality for economic growth. Consequently, policies aimed at subsidising tourism will have positive impacts on economic growth. The other is growth accounting, which attempts to quantify the contribution of the different determinants of output growth. However, Tugcu (2014) proposes several directions concerning the relationship between GDP and tourism and recognizes the bidirectionality of the tourism and growth relationship. First, he proposes that the initial conditions determine the effect caused by tourism on growth, with it being relatively larger in economies that have worse initial conditions than in the economies with better ones. The other reason supported in his work can be attributed to the interconnections among the sectors. It is expected that more tourism development leads to faster economic growth and *vice versa*. Therefore, it is possible to summarize the TLGH under different points of view (Tugcu, 2014 summarizes the alternative approaches to TLGH). Recently, Hatemi-J. (2016) and Brida *et al.* (2016) analysed this direction proposed by the TLGH concerning this relationship and empirically supported it. First, the *feedback hypothesis* denotes a reciprocal relationship between tourism and growth. As a result, tourism conservation policies may decrease economic growth. Similarly, the chances for economic growth are reflected back on the tourism sector. The second hypothesis is denoted as the *neutrality hypothesis*, which is based on the idea that tourism has no effect on economic growth.[1] Additionally, the *conservation hypothesis* means that economic growth is the dynamic that strengthens the tourism sector. The validity of the conservation hypothesis is supported if there is unidirectional causality from economic growth to tourism. In this situation, transferring subsidies from tourism to another sector will not have a negative impact on economic growth.[2]

2.2 Empirical framework concerning the relationship between tourism demand and growth

Some of the facts that we have been presented allow us to understand the process that generates growth from tourism. The mainstream literature on this topic has considered that tourists arrive in the host country at a given exogenous rate that is a parameter

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[1] In order to distinguish the growth, feedback, neutrality and conservation hypotheses, Tugcu (2014) summarized the empirical studies that support each hypothesis.

[2] The theoretical contextualization of the TLGH is necessary to understand the treatment given to this body of literature. However, the exercise done in this article moves away from the studies on TLGH. For this reason, this terminology will not be used in the following sections.

independent of the country's characteristics (Albaladejo *et al.,* 2014). Conversely, Pina *et al.* (2013) endogenize the rate at which tourists arrive, which is important for analysing the growth process of tourism and whether an economy is exogenous or endogenous. As a result, the number of inbound tourists increases by increases in income in the origin countries, while inbound tourism generates higher incomes. Supporting this endogenous point of view, Tugcu (2014) also argues that in the absence of economic growth, the development of the tourism sector diminishes. The economic growth itself may play a vital role in determining the direction of causality between tourism and economic growth, which is conditioned on an adequate income distribution.[3]

In this attempt to prove the causality between economic growth and tourism demand, Wang *et al.* (2012) showed that China's economic growth is the Granger cause of domestic tourism development. Moreover, Canova and Dallari (2013) presented some conclusions that allow us to understand the effects of output shocks on fluctuations in tourism flows in the Euro area. Their analysis also revealed that the link is obscured if unconditional correlations are considered and if the predictable part of the fluctuations is not filtered out of the data. In addition, they show that the reaction of tourism flows to income shocks is much stronger in recessions than in expansions. They argue that fostering tourist relationships may help to better integrate the Mediterranean economies with the EU and may have long-lasting beneficial output effects due to the virtuous investment cycle they ignite. Additionally, the total per capita expenditures of families (as a proxy of the propensity to consume) must increase with respect to their consumption of tourism products, especially knowing that tourism is a luxury good. The luxury good characteristics of international tourist flows are supported by Canova and Dallari (2013). Most studies have estimated a high-income elasticity of demand (see Crouch, 1996 or more recently Smeral, 2012), which shows that as incomes rise, tourists spend an increasing proportion of their income on international travel (Peng *et al.*, 2015). In this sense, under the influence of different economic conditions and cultural and customer habits, the income and price sensitivities of tourists from different origins are expected to vary (Peng *et al.*, 2015). More specifically, Smeral (2012) affirmed that the income elasticity of tourism imports varies depending on the phase of the business cycle, and they may change over a business cycle for a number of reasons

There are multiple determinants of tourism demand. In this sense, some authors suggest a multivariate analysis to test the determinants' relationships with tourism demand in order to avoid a possible bias related to the omission of variables (see Oh, 2005 among others). Smyth and Narayan (2015) argue that models should be multivariate to avoid omitted variable bias but also warn that bi-variate approaches may measure direct relationships. Firstly, a bivariate analysis allows one to articulate initial insights. Secondly, there is an obvious trade-off between the use of multivariate and bivariate analyses. They support that this trade-off is based on the omitted variable bias. A multivariate model

[3] The concept of causality is commonly referred to in the literature as Granger causality. The Granger non-causality test determines if one time series significantly forecasts another (Granger, 1969). A variable x does not Granger cause another variable y if the lagged values of variable x do not provide significant additional explanatory power in forecasting y after controlling for lagged values of y. In our paper, we use the causality concept referring to Granger causality.

potentially results in over-parameterising the model and the loss of degrees of freedom, which contributes to estimation error. List and Gallet (1999) previously argued that a reduced-form model allows one to measure the direct and indirect relationships between economic growth and other variables. They discarded multivariate analysis since the inclusion of additional variables would distort their primary objective and produce conflicting results. Additionally, in circumstances in which only a relatively short span of data is available and for the purposes of drawing policy implications, the focus has to be on individual countries; there is the cited trade-off and an alternative framework in which to consider Granger causality as a bivariate model (for example, in Narayan and Popp (2012) and Narayan *et al.* (2010)).

In particular, among the different demand factors that the literature holds, most empirical exercises have used the REER as a determinant of this demand (see among others Balaguer and Catavella-Jorda, 2002; Dritsakis, 2004; Lokman Gunduz & Abdulnasser Hatemi-J, 2006; or more recently Belloumi, 2010; Tang, 2013; Perles-Ribes *et al.*, 2017). For example, Balaguer and Cantavella-Jorda (2002), Katircioglu (2009b; 2011), and Tang (2013a) suggested that the REER is another important variable that influences both international tourism and economic growth. This is based on the view that changes in the real exchange rate of the currency of a country result in change in the real purchasing power obtained by tourists, which in turn can impact their chosen destination. So, in almost half of the studies, a three-variables structure is adopted including indicators on GDP, inbound tourism and exchange or price indicator, where the real exchange rate is often included as a proxy to take into account the degree of openness of a given destination country, following the seminal framework proposed by Balaguer and Cantavella-Jordá (2002). Therefore, we apply a multivariate modelling approach by incorporating the REER to study the causal relationship between tourism inbounds and economic growth.

2.3 Previous empirical findings on the TLGH

The large number of empirical studies just described were derived from research focused on a causal relationship between tourism demand and economic growth (Ivanov and Webster, 2013), including Spain (Balaguer and Cantavella-Jordá, (2002), Albaladejo *et al.* (2014) or Mérida and Golpe (2016)), Turkey (Gunduz and Hatemi-J. (2005)), Cyprus (Katircioglu (2009)), Greece (Dritsakis (2004)), South Korea (Oh (2005)), Mauritius (Durbarry (2002)), and Mexico (Mishra *et al.* (2012) or Brida *et al.* (2008)). In most cases, these studies applied the approximation of cointegration and the Granger causality test with time-series data (Balaguer and Cantavella-Jordá, 2002; Dritsakis, 2004; Durbarry, 2002; Oh, 2005; Nowak *et al.*, 2007; Carrera *et al.*, 2008 or Brida *et al.*, 2010 or recently Wu *et al.*, 2016).[4] Nevertheless, few articles analyse the cointegrated relationship between tourism and economic growth in Spain (Buisán, 1995; Buisán, 1997; Balaguer and Cantavella-Jordá, 2002; Nowak *et al.*, 2007; Cortes-Jimenez and Pulina, 2010; Merida and Golpe, 2016; and

[4] See Table 1 for a selected review of different research papers on tourism literature classified by methodology, data and growth and tourism measures used after 2009.

Perles-Ribes *et al.*, 2017). In all of these studies, the series are found to be cointegrated, confirming the TLGH.

From this empirical point of view, the particular relationship proposed in the TLGH is usually analysed by applying cointegration techniques, and any changes in its degree over time have been a recent focus of tourism studies. However, the focus on the tourism income and growth relationship diverge among them. Although many studies find a positive relationship between tourism and economic growth (Cortés-Jiménez and Pulina, 2010; Gunduz and Hatemi-J, 2005; Dritsakis 2004; Nowak *et al.*, 2007), some studies have failed to show such a link (see Sequeira and Campos, 2005; Oh, 2005; Lee and Chien, 2008; Lee and Chang, 2008; Tang and Jang, 2009; or Katircioglu, 2009). One of the most striking studies with extensive evidence that tests the causality between tourism and growth is the work of Hatemi-J *et al.* (2014). They argued that while economic growth positively affects tourism growth in four of the G7 countries observed, none of them should have a policy that is aimed at improving economic growth through tourism. They showed that both negative and positive tourism shocks have a large impact on economic performance, while GDP shocks have a large impact on tourism in each country. Their work shows that there is a causal relationship between tourism and economic growth, with GDP actively causing tourism for Canada, Germany, France, Italy and Japan. Particularly, Canada and Germany are the only two countries where a symmetrical causal relationship is found. Aslan (2014) concluded that while there is a bidirectional causal relationship between tourism development and economic growth for Portugal, unidirectional causal relationships between economic growth and tourism development are found for Spain, Italy, Tunisia, Cyprus, Croatia, Bulgaria and Greece.

Overall, there is extensive literature that has studied the determinants of tourism demand and the causal relationship between tourism demand and economic growth. The literature review in Table 1 allows us to obtain a clear vision of the empirical contributions made in the last decade concerning TLGH studies.[5] It seems common that the increasing availability of data that has greater temporal coverage allows for the use of time-series techniques. In particular, most studies that test the TLGH usually apply Granger causality techniques. The proxies used to measure the relationship between growth and tourism demand generally take into account GDP per capita, tourism receipts, foreign tourist revenues or expenditures, and other data from the World Bank database, the World Development Indicators and the Global Developments Finance. Finally, our empirical review supports the previous findings of Brida *et al.* (2016) that provided the TLGH, and the results present more diversified econometric modelling. They provided strong evidence on the TLGH. Various methodological approaches were used, such as VAR, VECM, ARDL, ARCH, GARCH, cross-sectional or panel data and the cointegrating relationship

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[5] This paper presents a selection of the literature after 2009 since Brida et al. (2016) and Brida and Pulina (2010) present exhaustive reviews of approximately 100 peer-reviewed published papers on the TLGH covering 2002-2013. In these articles, they presented comprehensive literature reviews on the temporal relationship between tourism and economic growth. Thus, this selection of articles intends to present the studies on TLGH in the last 9 years, which covers the last decade after the revision of Brida and Pulina (2010).

of the economic variables. This allows one to test the short- and long-run Granger non-causality. Table 1 reveals that the TLGH is confirmed in 80% of the analysed cases.

This line of arguments presents an ambiguous framework since the literature is inconclusive, as either the direction of causality was unclear or the most suitable analysis technique for the samples or the time period was not studied. In addition to this set of arguments that reveal the inconclusive literature on the studied relationship, the methodological approach applied to these studies is also controversial. In this sense, according to Po and Huang (2008), since the relationship between tourism and economic growth is inherently a long-term one, a biased estimate may be the result of an insufficiently large sample size in the time series, the existence of structural changes, or short-term economic fluctuations. Therefore, time-series data could inefficiently reflect the long-run relationship between tourism and economic growth. Consequently, an alternative thread of the literature is composed of studies that analyse the relationship between tourism and economic growth by using cross-sectional or panel data. In this context, they indicate that there can be mixed results with respect to the relationship between tourism and economic growth that are sensitive to the specific country being examined. In this work, to shed more light on this relationship, we carry out a novel empirical approach in which we test the implications of economic situations on inbound Spanish tourism with respect to how the positive and negative economic shocks in each origin country affect inbound Spanish tourism.

Table 1: Selected papers on the TLGH after 2009

Study	*Publication Year*	Country or countries	Period	Measure of growth	Measure of tourism	Data	Methodology	Main result
Ozturk & Acaravci	*2009*	Turkey	1987-2007 (Quarterly)	real GDP, 1987=100),	International tourists (NT), the real tourism receipts (TR, 1987=100) and the real exchange rates (RER, 1987=100).	Central Bank of the Turkish Republic (http://www.tcmb.gov.tr)	Vector error correction model (VEC) and an autoregressive distributed lag model (ARDL).	TLGH cannot be inferred for the Turkish economy because no cointegration exists between international tourism and the real GDP. Moreover, Granger causality test and error correction model cannot be run any further in the long-term period.
Katircioglu	*2009*	Turkey	1960–2006.	real GDP (natural logarithm) where the GDP variable is at 2000 constant	Total number of international tourists visiting and accommodating in Turkey and real exchange rates.	World Bank Development Indicators (World Bank, 2006) and Turkish Institute of Statistics (TURKSTAT, 2007). US dollar prices.	Bounds test and the Johansen technique for cointegration- (ADF, PP,ARDL)	TLGH cannot be inferred for Turkey since both the bounds and the Johansen tests do not confirm long-term equilibrium relationship between international tourism and economic growth. Thus, unlike Gunduz and Hatemi-J (2005) and Ongan and Demiroz (2005), this study rejects the validity of the TLGH for Turkey.
Tang & Jang	*2009*	U.S.A.	1981-2005 (Quarter 1, 1981 to Quarter 4, 2005)	GDP	Aggregate industry sales revenue	COMPUSTAT	Cointegration and Granger causality tests.	No cointegration between economic growth and industry performance in the U.S. This suggests that mechanisms to increase the revenue of tourism related industries can potentially be successful in the long-run, even in the face of sustained economic stagnation. The results also indicate a temporal causal hierarchy among industry performance, which could be a good tool for timing and prioritizing the allocation of resources among industries to ensure better overall tourism and economic outcomes.
Savas et al.	*2010*	Turkey	1985:Q1-2008:Q3. & 1984:Q1-2008:Q3.	Real GDP (*Yt*)	Real tourist expenditures (*TOURt*) and international tourist arrivals (*NTOURt*) and real exchange rates (*RERt*).	Turkish Statistical Institute; and *Tourism Statistics (2000-2008)* of The Ministry of Culture and Tourism of Turkey- *The Central Bank of the Republic of Turkey- OECD.-The Central Bank of the Republic of Turkey*'s	ARDL	find evidence of long-run uni-directional causality running from the volume of international tourism (both the tourist expenditures and tourist arrivals) and real exchange rates to economic growth, but not vice versa. The results indicate that the Turkish case supports the tourism-led growth hypothesis.
Mishra et al.	*2012*	India	1978 - 2009	Real Gross Domestic Product	Tourism Foreign Exchange Earnings (TFEE) and Foreign Tourist Arrivals (FTA)	RBI database on Indian economy, Bureau of Immigration, and from tourism statistics published by Ministry of Tourism, Government of India.	Augmented Dickey-Fuller Unit Root Test ; Johansen's Cointegration Test; Estimates for VECM Regression; Granger Causality Test	Evidence of long-run unidirectional causality from tourism activities to economic growth of the country.
Çag layan et al.	*2012*	135 countries	1995-2008	GDP	Real tourism revenue (receipts). Real tourism revenue (LTR) is used to measure tourism development and expressed in natural logarithms.	World Bank database; World Development Indicators and Global Developments Finance.	Panel Granger causality analysis	Results indicated bidirectional causality in Europe between tourism revenue (TR) and gross domestic product (GDP). Findings showed that there is a unidirectional causality in America, Latin America & Caribbean and World from GDP to tourism revenue. While in case of East Asia, South Asia and Oceania the reverse direction of causality was found from tourism revenue to GDP. No causal relationship was found in Asia, Middle East and North Africa, Central Asia and Sub Saharan Africa.
Wang et al.	*2012*	China	1984 - 2009	GDP	China's domestic tourist arrivals	The Yearbook of China Statistics and The Yearbook of China Tourism Statistics.	Panel Granger causality analysis	China's economic growth is the Granger cause of development of domestic tourism as well.

Study	*Publication Year*	Country or countries	Period	Measure of growth	Measure of tourism	Data	Methodology	Main result
Tang	*2013*	Malaysia	1974 - 2009	GDP	Real tourism receipts	International Financial Statistics published by the International Monetary Fund, the World Development Indicators reported by World Bank and the CEIC database.	Panel Granger causality analysis	The results reveal that a long-run relationship exists between the variables. In the short run, this study finds no Granger causality between real tourism receipts and real income, whereas there is bidirectional causality in the long-run. Moreover, we also find unidirectional causality running from real exchange rates to real tourism receipts and real income in both short- and long-run.
Albaladejo et al.	*2014*	Spain	1970 - 2010	GDP	Number of tourists (Tt), ratio of luxury hotels and the total number of hotels in Spain (Qt), and foreign real GDP (Mt)	INE & Encuesta de Ocupación Hotelera	Three stages: unit root tests, cointegration analysis, and Granger causality tests.	in the long run, tourist arrivals, quality of tourism accommodations, and foreign GDP have a positive effect on Spanish GDP. In the short term, changes in economic growth appear to lead to growth in tourist arrivals. Our findings support a two-way causal relationship between real GDP growth and tourism growth in Spain.
Tugcu	*2014*	*European*: Albania, Bosnia and Herzegovina, Croatia, France, Greece, Italy, Malta, Monaco, Montenegro, Slovenia, Spain and Turkey. *Asian*: Cyprus, Israel, Lebanon and Syria. *African*: Algeria, Egypt, Libya, Morocco and Tunisia.	1998 - 2011	GDP pc growth-annual	International tourism receipts (RCPT) in current US$ and international tourism expenditures (EXP) in current US$	World Bank, World Development Indicators database and World Tourism Organization, Compendium of Tourism Statistics.	1) Panel unit root tests Cross-sectional Dependency 3) Granger causality test.	The results indicate that the direction of causality between tourism and economic growth depends on the country group and tourism indicator. Furthermore, the European countries are better able to generate growth from tourism in the Mediterranean region.
Hatemi-J et al.	*2014*	G7: Italy, Canada, Japan, France, the UK, the US and Germany.	1995-2012	GDP	Real international tourism receipts	World Bank's World Development Index	Asymmetric panel causality test suggested by Hatemi-J (2011)	The results show that exist a positive economic shocks cause positive tourism shocks for Canada, France, Italy and Japan. A bidirectional relationship is found only for Germany and there is a causal relationship between tourism activity and economic growth, with GDP actively causing tourism activity for Canada, Germany, France, Italy and Japan. In this case, Canada and Germany are the only two countries where a symmetric causal relationship is found. More importantly, the results further show that tourism activity causes GDP growth for Germany, France, Italy and US. Germany, France, and the US, however, are the only three countries where a symmetric causal relationship is found. Further, one could conclude that the TLGH is not valid for G-7 countries given that positive tourism activity shocks do not lead to positive economic output shocks for any of the countries.
Pavlic et al.	*2015a*	Croatia	1996q1–2013q2	GDP	Tourist arrivals	Croatian Bureau of Statistics	Johansen Maximum Likelihood cointegration	Short-run causality between OPEN and GDP, as well as between real effective exchange rate and GDP.
Pérez-Rodríguez et al.	*2015*	U.K., Spain and Croatia	U.K. 1980Q1-2012Q2 (n=130); Spain 1995Q1 2013Q1(n=73); Croatian 1997Q1-2013Q4 (n=68)	Gross Domestic Product (GDP) data from 2005 with constant prices (Y1t)	Tourist receipts	IMF while tourism receipt data were collected from International Passenger Survey (Office for National Statistics) for the United Kingdom, from Boletín Estadístico del Banco de España for Spain and from the Croatian National Bank for Croatia.	Copula-based GARCH approach	Results indicate that there is a significant, asymmetric and positive dependence between tourism and GDP growth rates for the three countries studied, though only for Croatia is it time-varying over time.

Study	Publication Year	Country or countries	Period	Measure of growth	Measure of tourism	Data	Methodology	Main result
Mérida and Golpe	*2016*	Spain	1980 - 2013 (Q)	GDP	Number of nights spent in Spanish tourist accommodations	The number of nights spent is expressed in thousands of units and has been obtained from the INE4. The source of the GDP data is the OECD and REMSDB	Granger Causality Tests & Structural Test	Causality from economic growth towards tourist activity is found until 1994, when the relationship changes its direction. Results also confirm bidirectional causality from 1999 onwards, thus contributing to reconcile previous results.
Wu et al.	*2016*	Tourism receipts in the Asian and Australia (Australia, China, Hong Kong, Indonesia, Japan, South Korea, Macao SAR, Malaysia, Singapore, and Thailand).	1995 – 2013	GDPit	The real per capita international tourism receipts.	World Bank (2015)	A panel smooth transition vector error correction model (PST-VECM)	Empirical results support that the causality is bi-directional, nonlinear, time- and country-varying in both the long run and short run.
Bilen et al.	*2017*	Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Malta, Portugal, Spain, Turkey, and Tunisia	1995 - 2012	real GDP	International tourism receipts	World Bank	Im, Pesaran, Shin, Maddala-Wu, and Choi' s panel unit root tests and DH causality test.	The bidirectional causality relationship between tourism development and economic growth, which is the main finding of this study, suggests that in order to achieve high economic growth, policy-makers should focus on developing the tourism sector.
Shahzad et al.	*2017*	The top ten tourist destinations in the world (China, France, Germany, Italy, Mexico, Russia, Spain, Turkey, the United, Kingdom, and the United States)	1990Q1 - 2015Q4	GDP pc	Tourism flows: the total number of international tourist arrivals	World Tourism Organization and World Bank	The quantile-on-quantile (QQ) approachand a new index of tourism activity that combines the most commonly used tourism indicators.	A positive relation between tourism and economic growth for the ten countries considered with substantial variations across countries and across quantiles within each country.
Chiu and Yeh	*2017*	84 Countries (See footnote 4 and Table A1 in Chiu and Yeh, 2007)	1995 - 2008	Economic growth to GDP (LYi measures per capita GDP growth as a proxy for economic growth)	Growth in international tourism receipts (LTRi is the growth in international tourism receipts per capita as a proxy for tourism growth)	World Development Indicator (WDI) database of World Bank.	The threshold regression model to investigate the correlation difference between tourism development, economic growth, and other macroeconomic variables using certain threshold variables.	The empirical results show strong evidence of a nonlinear relation between tourism growth and economic growth, suggesting that it is not continuous and constant. The results do not support the view that one size fits all, and therefore countries with different conditions of tourism development experience various impacts on the tourism–growth nexus.
Paramati et al.	*2017*	*Developed*: Australia, Austria, Croatia, Cyprus, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Italy, Japan, Korea, the Netherlands, New Zealand, Norway, Poland, Portugal, Russia, Singapore, Spain, Sweden, Switzerland, UK and US. *Developing*:	1995 - 2012	EO, represent per capita economic Growth. EO indicates per capita gross domestic product (GDP) in current US dollars	International tourism receipts (ITR).	World Development Indicators (World Bank 2015) online database published by the World Bank, while CO2 emissions data are gathered from the US Energy Information Administration.	The long-run association among the variables using a panel cointegration methodology. The long-run impact of tourism on economic growth and CO2 emissions by employing the FMOLS approach. Finally, they apply a heterogeneous panel noncausality test to	Tourism has significant positive impacts on economic growth for both developed and developing economies, supporting the prevailing hypothesis of tourism-led economic growth.

Study	*Publication Year*	Country or countries	Period	Measure of growth	Measure of tourism	Data	Methodology	Main result
		Argentina, Brazil, Bulgaria, China, Dominican Republic, Egypt, India, Indonesia, Jordan, Malaysia, Mexico, Morocco, the Philippines, South Africa, Thailand, Tunisia, Turkey, and Ukraine.					identify the short-run causalities among these variables.	
Tang et al.	*2017*	Malaysia	1974 - 2013	ln GDPt is per capita real GDP	ln TOURt is per capita real tourism receipts	Economic Reports published by the Ministry of Finance Malaysia, Malaysia Economics Statistics – Time Series published by the Department of Statistics Malaysia and CEIC database.	The cointegration, Granger causality and the variance decomposition tests.	Our findings suggest that only tourism, E&E and palm oil exports significantly influence economic growth in the long-run. Likewise, our Granger causality results also suggest that only tourism, E&E and palm oil exports Granger-cause economic growth. Thus, it supports the tourism-led growth, E&E export-led growth (ELG) and palm oil ELG hypotheses in Malaysia.
Yazdi et al.	*2017*	Iran	1985–2013	ln Real GDP (RGDP) in constant 2005 US$.	Leisure travel and tourism expenditures (LTS), and business travel and tourism expenditures (BTS)	RGDP and REERs are from the World Development Indicators (WDI) online database. LTS and BTS data are obtained from the World Travel and Tourism Council (World Travel and Tourism Council (WTTC), 2014).	The ARDL approach is applicable for the variables that are I (0) or I (1) or stationary. The Granger approach based on the VECM is used.	There is a positive relationship between tourism expenditure and economic growth in the long term and short term. The result indicate that there is also positive relationship between the real effective exchange rate (REER), foreign direct investment (FDI) and economic growth. The Granger causality test shows a bidirectional causality running between tourism expenditure and economic growth.
Hatemi et al.	*2018*	G7	1995–2014	ln GDP (at constant 2005 US dollars)	real international tourism receipts (at constant 2005 US dollars) to measure the tourism performance	World Bank's World Development Indicators	Asymmetric panel causality test	Their results reveal that the tourism-led growth hypothesis holds for France, Germany, and the US, with negative tourism shocks being more important for Germany, Italy, Japan, while positive shocks are more important in UK and the US. Policy makers in Germany, Italy and Japan should be more concerned when tourism receipts decline.

3. Data and Methodology

3.1 Data

In this paper, we analyse the relationships between the per capita GDPs of Belgium, France, Germany, Italy, the Netherlands, Portugal, Switzerland, the United Kingdom (UK) and the United States (USA) with the inbound tourism to Spain. These countries represent the 9 economies from which Spain received the majority of their tourists from 2000-2017.[6] Several proxies can be used when the objective is to analyse the tourism inflows and growth (see Gunduz and Hatemi-J, 2005).[7] Although these indicators have been widely used by many authors within the field of TLGH applications, the volume of tourist arrivals presents the advantage of not being a monetary measure, which helps to avoid any causal multicollinearity issues. To prove the relationship between tourism and economic development, the empirical approaches found in the literature frequently include GDP as an indicator for economic growth. In our empirical approach, we use the tourist arrivals by country of origin obtained from the INE, while the GDP, expressed in millions of 2010 US dollars, and the REER data were obtained from the OECD. All time series are quarterly and seasonally adjusted and are available from 2000QI to 2017QIV.

3.2. Methodology

Our empirical strategy aims to determinate the possible existence of Granger causality relationships (Granger, 1969) between the GDP of the tourists' country of origin and inbound tourism. We use a set of econometric techniques in order to obtain more robust and comparable results. On the one hand, we apply the approach proposed by Emirmahmutoglu and Kose (2011) for panel analysis in order to understand the behaviours of all countries studied. On the other hand, we use the method proposed by Toda and Yamamoto (1995), which was extended by Hatemi-J (2012), to conduct an asymmetric analysis to analyse the country-specific heterogeneity. Both techniques are an extension of Toda and Yamamoto (1995) and do not require us to test for the existence of a unit root or cointegration for panel data. The variables in the system do not need to be stationary and can be used in the level form.

3.2.1. Granger causality, by country: *Toda-Yamamoto test.*

In economics, perhaps the most common technique for examining the causal effects between variables is the Granger causality method based on the estimation of VAR models and, more specifically, on tourism. The methodology proposed by Toda and Yamamoto (1995) measures causality in order to solve the problems stemming from cointegrated relationships and a non-stationary data series. For a broad study such as our proposed relationship, we propose the Toda-Yamamoto causality approach as a developed version of

[6] See Table A1 in the appendix where the percentages of tourist arrivals to Spain from the countries included in this study are described.

[7] In this regard, Table 1 summarizes the main measures of tourism and shows that one of the key measures of tourism growth is GDP.

the Granger causality test that is based on augmented VAR models in levels and extra lags. This provides more efficient and robust results than the standard VAR model that can lead to biased results with finite samples (see Johansen and Juselius, (1990); Zapata and Rambaldi (1997), Maddala and Kim (1998); Pesaran *et al.*, (2001) and Clarke and Mirza (2006)). The main advantage of the Toda-Yamamoto test is that it can be applied irrespective of the order of integration or whether the time series are cointegrated. In our exercise, we analyse a bivariate and trivariate[8] model that includes the origin GDP and inbound Spanish tourism variables and the REER in the trivariate approach. We can describe the benchmark model for this test as follows.

$$GDP_t = \alpha_1 + \sum_{i=1}^{l+d_{max}} \beta_{1i}\, Tourism_{t-i} + \sum_{j=1}^{l+d_{max}} \gamma_{1j}\, GDP_{t-j} \sum_{k=1}^{l+d_{max}} \delta_{1k}\, REER_{t-k} + \varepsilon_{1t}, \quad (1)$$

$$Tourism_t = \alpha_2 + \sum_{i=1}^{l+d_{max}} \beta_{2i}\, Tourism_{t-i} + \sum_{j=1}^{l+d_{max}} \gamma_{2j}\, GDP_{t-j} + \sum_{k=1}^{l+d_{max}} \delta_{2k}\, REER_{t-k} + \varepsilon_{2t}, \quad (2)$$

$$REER_t = \alpha_3 + \sum_{i=1}^{l+d_{max}} \beta_{3i}\, Tourism_{t-i} + \sum_{j=1}^{l+d_{max}} \gamma_{3j}\, GDP_{t-j} + \sum_{k=1}^{l+d_{max}} \delta_{3k}\, REER_{t-k} + \varepsilon_{3t}, \quad (3)$$

where l is the optimal lag structure for the *VAR* model according to the Akaike Information Criteria (AIC). d_{max} (extra lagged explanatory variables) is the maximum order of integration for the variables considered in the model. ε_{1t} and ε_{2t} are the residual terms that are Gaussian Distributed and follow white noise processes. Hence, this test estimates a $VAR\ (l + d_{max})$ model using a modified Wald test (MWALD), which statistically is asymptotically distributed as a chi-square with *p* degrees of freedom.

For testing the Granger causality between these two variables, for the first equation, if $\sum_{j=1}^{l} \beta_{1i} \neq 0$, it implies that $Tourism_t$ Granger causes GDP_t. Analogously, for the second equation, if $\sum_{j=1}^{l} \gamma_{2j} \neq 0$, GDP_t Granger causes $Tourism_t$. Consequently, rejecting both hypotheses implies that there exists bidirectional causality in the analysed relationship.

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8 In particular, The Toda-Yamamoto procedure basically involves the estimation of a augmented VAR (k+dmax) model, where k is the optimal lag length in the original VAR system (determined by a model selection criterion such as Akaike Information Criterion (AIC)) and dmax is the maximal order of integration of the variables in the VAR, i.e, we need to estimate a VAR with k+dmax lags. Finally, a standard Wald test is applied on the first k lags. In our exercise, we have 18 years of quarterly data, which is 72 observartions. In the case of more than 3 variables, for example 4, and using an optimal lag length k=4 lags, then, we estimate a VAR(4) model, we will have 4 lags for each variable (16 parameters), plus the extra lag (dmax =1 in our case) implemented in the Toda-Yamamoto procedure for each variable (4 parameters), plus the intercept. In sum, we will have 21 parameter per equation (plus the error variance/covariance), then, we will estimating 84 parameters (21 parameters and 4 equations) on a sample size of just 72 observations.

3.2.2 Granger causality analysis for panel data: Emirmahmutoglu and Kose´s (2011) test.

To complete our econometric strategy, we will use the panel structure of our data and use the associated advantages of panel data in order to take into account the unobservable heterogeneity and the cross-sectional dependency of our data. A recently developed method for causality analysis using panel data was proposed by Emirmahmutoglu and Kose (2011) and is an extension of the Toda and Yamamoto (1995) method. This will approximate the panel data in order to provide empirical evidence about the robustness of our results. This methodology consists of the level VAR with $ly + dmax_j$ lags in heterogeneous panels as follows.

$$GDP_{1,t} = \propto_{1,1} + \sum_{i=1}^{ly_1+dmax_j} \beta_{1,1,i}\, Tourism_{1,t-i} + \sum_{i=1}^{lx_1+dmax_j} \gamma_{1,1,i}\, GDP_{1,t-i} + \sum_{i=1}^{lz_1+dmax_j} \delta_{1,1,i}\, REER_{1,t-i} + \varepsilon_{1,1,t}$$

$$= \propto_{1,2} + \sum_{i=1}^{ly_1+dmax_j} \beta_{1,2,i}\, Tourism_{2,t-i} + \sum_{i=1}^{lx_1+dmax_j} \gamma_{1,2,i}\, GDP_{2,t-i} + \sum_{i=1}^{lz_1+dmax_j} \delta_{1,2,i}\, REER_{1,t-i} + \varepsilon_{1,2,t} \qquad (4)$$

⋮

$$GDP_{N,t} = \propto_{1,N} + \sum_{i=1}^{ly_1+dmax_j} \beta_{1,N,i}\, Tourism_{N,t-i} + \sum_{i=1}^{lx_1+dmax_j} \gamma_{1,N,i}\, GDP_{N,t-i} + \sum_{i=1}^{lz_1+dmax_j} \delta_{1,N,i}\, REER_{N,t-i} + \varepsilon_{1,N,t}$$

;

$$Tourism_{1,t} = \propto_{2,1} + \sum_{i=1}^{ly_1+dmax_j} \beta_{2,1,i}\, Tourism_{1,t-i} + \sum_{i=1}^{lx_1+dmax_j} \gamma_{2,1,i}\, GDP_{1,t-i} + \sum_{i=1}^{lz_1+dmax_j} \delta_{2,1,i}\, REER_{1,t-i} + \varepsilon_{2,1,t}$$

$$= \propto_{2,2} + \sum_{i=1}^{ly_1+dmax_j} \beta_{2,2,i}\, Tourism_{2,t-i} + \sum_{i=1}^{lx_1+dmax_j} \gamma_{2,2,i}\, GDP_{2,t-i} + \sum_{i=1}^{lz_1+dmax_j} \delta_{2,2,i}\, REER_{2,t-i} + \varepsilon_{2,2,t} \qquad (5)$$

⋮

$$Tourism_{N,t} = \propto_{2,N} + \sum_{i=1}^{ly_1+dmax_j} \beta_{2,N,i}\, Tourism_{N,t-i} + \sum_{i=1}^{lx_1+dmax_j} \gamma_{2,N,i}\, GDP_{N,t-i} + \sum_{i=1}^{lx_1+dmax_j} \delta_{2,N,i}\, REER_{N,t-i} + \varepsilon_{2,N,t}$$

and

$$REER_{1,t} = \propto_{3,1} + \sum_{i=1}^{ly_1+dmax_j} \beta_{3,1,i}\, Tourism_{1,t-i} + \sum_{i=1}^{lx_1+dmax_j} \gamma_{3,1,i}\, GDP_{1,t-i} + \sum_{i=1}^{lz_1+dmax_j} \delta_{3,1,i}\, REER_{1,t-i} + \varepsilon_{3,1,t}$$

$$= \propto_{3,2} + \sum_{i=1}^{ly_1+dmax_j} \beta_{3,2,i}\, Tourism_{2,t-i} + \sum_{i=1}^{lx_1+dmax_j} \gamma_{3,2,i}\, GDP_{2,t-i} + \sum_{i=1}^{lz_1+dmax_j} \delta_{3,2,i}\, REER_{2,t-i} + \varepsilon_{3,2,t} \quad (6)$$

$\vdots$

$$REER_{N,t} = \propto_{3,N} + \sum_{i=1}^{ly_1+dmax_j} \beta_{3,N,i}\, Tourism_{N,t-i} + \sum_{i=1}^{lx_1+dmax_j} \gamma_{3,N,i}\, GDP_{N,t-i} + \sum_{i=1}^{lz_1+dmax_j} \delta_{3,N,i}\, REER_{N,t-i} + \varepsilon_{3,N,t}$$

where $x_{1,t} = 1, \dots, N$ refers to the real *GDP*, $y_{1,t} = 1, \dots, N$ denote the tourism flows and $Z_{1,t} = 1, \dots, N$ denote the *REER*, *N* represents the number of countries *(j=1…N)*, t is the time period *(t=1…T)* and *l* is the lag length. The maximal order of integration in the system for each *i* is denoted as $dmax_j$.

To check for Granger causality in these equations, alternative causal relationships are likely to be found for country j. There is a one-way Granger causality from *x* (tourism) to *y* (real GDP) if not all $\beta_{1,j,i}$ are zero. Conversely, we can prove the opposite one-way Granger causality if not all $\gamma_{2,j,i}$ are zero. Finally, a two-way Granger causality can be demonstrated between tourism and GDP if neither $\gamma_{2,j,i}$ nor $\beta_{1,j,i}$ is zero. Emirmahmutoglu and Kose (2011) apply the Fisher (1932) statistic in heterogeneous panels to test the Granger non-causality hypothesis. Fisher´s statistic combines different significance levels (p-values) of identical but independent tests. When the test statistics are continuous, the p-values P_i (i=1,..., N) are independent, uniform (0,1) variables.

$$\lambda = -2\sum_{i=1}^{n} \ln(p_i), i = 1 \dots N, \quad (5)$$

where P_i denotes the p-value of the Wald statistic of the *i*-th individual cross-section, which follows a chi-square distribution with 2N degrees of freedom. The test is valid only if N is fixed as T → ∞. However, the limit distribution of the Fisher test statistic is no longer valid in the presence of cross-correlations among the cross-sectional units. As a way to address such inferential difficulties in panels with cross-correlations, Emirmahmutoglu and Kose (2011) apply the bootstrap method in their Granger causality test for cross-sectional dependent panels.

3.2.3. Looking for asymmetric causality relationships.

According to the empirical evidence, in many cases, causality is rejected since nonlinear relationships are not considered. To do so, a nonlinear test developed by Hatemi-J (2012) on the initial ideas of Granger and Yoon (2002) is applied in our exercise. This allows us determine whether cumulative positive and negative shocks can have different impacts on the causal relationship between GDP and tourism flows. Following this strategy, we start by specifying our two variables by means of a random-walk model.

$$GDP_t = GDP_{t-1} + \varepsilon_{1t} = GDP_0 + \sum_{i=1}^{t} \varepsilon_{1i} \tag{6}$$

and

$$Tourism_t = Tourism_{t-1} + \varepsilon_{2t} = Tourism_0 + \sum_{i=1}^{t} \varepsilon_{2i}, \tag{7}$$

where $t = 1, 2, \dots T$, the constants GDP_0 and $Tourism_0$ are the initial constant values, and the variables ε_{1i} and ε_{2i} are white-noise disturbance terms. The maximum and minimum initial constant values of both the positive and negative shocks are identified as $\varepsilon_{1i}^{+} = \max\ (\varepsilon_{1i}, 0)$ and $\varepsilon_{2i}^{+} = \max\ (\varepsilon_{2i}, 0)$ and $\varepsilon_{1i}^{-} = \min\ (\varepsilon_{1i}, 0)$ and $\varepsilon_{2i}^{-} = \min\ (\varepsilon_{2i}, 0)$, respectively. By grouping these terms as $\varepsilon_{1i} = \varepsilon_{1i}^{+} + \varepsilon_{1i}^{-}$ and $\varepsilon_{2i} = \varepsilon_{2i}^{+} + \varepsilon_{2i}^{-}$, we can write out that

$$GDP_t = GDP_{t-1} + \varepsilon_{1t} = GDP_0 + \sum_{i=1}^{t} \varepsilon_{1i}^{+} + \sum_{i=1}^{t} \varepsilon_{1i}^{-} \text{ and} \tag{8}$$

$$Tourism_t = Tourism_{t-1} + \varepsilon_{2t} = Tourism_0 + \sum_{i=1}^{t} \varepsilon_{2i}^{+} + \sum_{i=1}^{t} \varepsilon_{2i}^{-}. \tag{9}$$

Therefore, positive and negative shocks can be written as follows.

$$GDP_t^{+} = \sum_{i=1}^{t} \varepsilon_{1i}^{+};\ GDP_t^{-} = \sum_{i=1}^{t} \varepsilon_{1i}^{-};Tourism_t^{+} = \sum_{i=1}^{t} \varepsilon_{2i}^{+};Tourism_t^{-} = \sum_{i=1}^{t} \varepsilon_{2i}^{-}. \tag{10}$$

Assuming that $y_t^{+} = (GDP_t^{+}, Tourism_t^{+}), y_t^{-} = (GDP_t^{-}, Tourism_t^{-})$, $y_t^{\pm} = (GDP_t^{+}, Tourism_{1t}^{-})$, and $y_t^{\mp} = (GDP_t^{-}, Tourism_1^{+})$, the causal relationship between the variables can be tested using a vector autoregressive model, VAR of order p , for lag order $r = (1, \dots, p)$. To run a Wald test, the VAR (*p*) model can be written in a compact form (e.g., for the first combination, y_t^{+}),

$Y = DZ + \delta$, where

$Y \coloneqq (y_1^{+}, \dots, y_T^{+})\ (n\ x\ T)\ matrix,$

$D \coloneqq (v, A_1 \dots, A_p)$ $(n\,x\,(1 + np))$ $matrix$,

$$Z_t \coloneqq \begin{pmatrix} 1 \\ y_t^+ \\ y^+_{t-1} \\ \vdots \\ y_{t-p+1}^+ \end{pmatrix} ((1 + np)\,x\,1)\ matrix\text{, for} \square = 1, \dots, T, \quad (11)$$

$Z \coloneqq (Z_0 \dots, Z_{T-1})$ $((1 + np)\,x\,T)$ $matrix$, and

$\delta \coloneqq (u_1^+, \dots, u_T^+)$ $(n\,x\,T)$ $matrix$

The Wald statistic is $(C\beta)'\,[C((Z'Z)^{-1} \otimes S_U)C']^{-1}\,(C\beta)$, where $\beta = vec(D)$, being *vec(·)* the column-stacking operator; ⊗ is the Kronecker product; *C* is a $p\,x\,n(1 + np)$ indicator matrix with elements for restricted parameters and zeros for the rest of the parameters; and $S_U = \frac{\hat{\delta}'_U \hat{\delta}_U}{T-q}$, where *q* is the numbers of parameters in each equation of the VAR model. Under the assumption of normality, the Wald statistic follows an asymptotic χ^2 distribution with the same degrees of freedom of the number of restrictions to be tested (in our case, equal to *p*). The null hypothesis of non-Granger causality, H_0: $C\beta = 0$, is rejected at the α level of significance (1%, 5% or 10%) according to the bootstrap critical values generated by GAUSS software.

4. Results

According to the described econometric strategy, in this section, we present the estimation results to investigate the Granger causality relationships country by country and by allowing for asymmetries between *GDP* and *Tourism* and the reverse. In the first step, we use the methodology for a panel approach suggested by Emirmahmutoglu and Kose that is an extension of the Toda-Yamamoto test. Second, we use the method of Hatemi-J that is also an extension of Toda and Yamamoto (1995) to conduct a country-by-country study that also allows for asymmetries. The results of these approaches are reported and distinguished by the direction of the causality depending on the hypotheses to be tested. The estimation results are presented in Tables 2-6, while Table 7 shows a summary of the main results[9]. The estimation results are presented in Tables 2-6, while Table 7 shows a summary of the main results, the left side corresponding to the results of the bivariate model, and on the right corresponding to the results of the trivariate analysis, i.e. where the REER is included as a control variable. From now on, the comments of these results are indifferent to both cases given that the results are similar under both approaches.

The first approach panel shown in Table 2 reveals that there is causality from origin GDP to inbound Spanish tourism, while the inverse relationship does not show any causation. Table 2 contains the country-by-country analysis where the results support

[9] The first step in our empirical analysis is applying the unit root tests. The results of these tests are presented in Table A2 in the appendix and indicate the integration order of each variable. The results reveal that each series shows a unit root. Hence, it is important to include an unrestricted extra lag in the VAR model according to Toda and Yamamoto (1995) and Hatemi-J. (2012).

causal relationships from GDP to inbound tourism in 4 of the 9 countries analysed. These effects are rather strong in the Netherlands, Switzerland and the UK and weaker for Germany (also in Italy and Portugal in the trivariate case). Considering the effects of tourism on GDP, Table 2 also shows that there are no global effects, except for France, in which the results could be interpreted as an indicator of growth for this country.

However, our econometric strategy is applied to find heterogeneous behaviours in the observed countries, which is the main contribution of our work. In this line, when the analysis considers the asymmetries, the results change. In Table 3, the results of the positive effects show that a positive GDP shock in the origin country Granger causes a positive shock to inbound Spanish tourism and *vice versa*. In this regard, only in the UK is it shown that inbound tourism is affected by its own positive GDP shocks. Conversely, most tourist arrivals to Spain from Portugal and the US could be indicators of economic growth in the origin countries. Table 4 shows the negative effects of these relationships. These results show that in Germany, Switzerland, the Netherlands, Italy (only in the trivariate case) and the UK, a falling GDP would cause a decrease in tourist arrivals from these countries to Spain. Otherwise, Belgium, France, Portugal and Switzerland also emerge as countries where a decrease in tourist arrivals could be an indicator of a declining GDP in these countries.

In addition to contrasting these differences in relationships when distinguishing between global, positive and negative effects, Tables 5 and 6 show the mixed effects. These tables report information on the perceptions of and decisions made by tourists based on the state of the economy. Thus, when there are positive GDP shocks, a decrease in tourists from these countries would be a symptom of the residual perception of the tourists and the destination. Conversely, these results demonstrate that tourists perceive tourism in Spain as a luxury good in the cases of Italy, the Netherlands, Switzerland, Germany and the UK.

Table 2. Total effects

	Bivariate		Trivariate	
	$GDP\,f \nRightarrow Tour$	$Tour \nRightarrow GDPf$	$GDP\,f \nRightarrow Tour$	$Tour \nRightarrow GDPf$
Countries	Test statistic	Test statistic	Test statistic	Test statistic
Belgium	0.440	4.465	0.821	5.197*
France	0.011	6.385**	0.104	6.291*
Germany	5.951**	0.152	8.226**	0.156
Italy	3.095	3.433	5.909*	0.123
Netherlands	10.352***	1.051	9.777***	1.150
Portugal	6.594	4.689	8.501**	4.970
Switzerland	16.804***	3.627	17.622***	1.756
U.K.	16.855***	0.831	17.284***	0.520
USA	1.484	4.104	2.127	4.156

PANEL STATISTICS

$GDP\,f \nRightarrow Tour$				$Tour \nRightarrow GDPf$			
	Bootstrap critical values				Bootstrap critical values		
Fisher test value	1%	5%	10%	Fisher test value	1%	5%	10%
57.921***	38.845	31.562	28.050	22.265	35.875	29.339	26.681

Note: Lag orders are selected by minimizing the Akaike Information Criteria.
***,**,* denotes significance at 1%, 5% and 10% respectively. The bootstrap distribution of Fisher test statistics is derived from 10000 replications. Bootstrap critical values are obtained at the 1, 5 and 10% levels based on these empirical distributions.

B. Asymmetric Granger causality test.

Table 3. Positive effects

	Bivariate								Trivariate							
	$GDP\ f+\nRightarrow Tour+$				$Tour+\nRightarrow GDP\ f+$				$GDP\ f+\nRightarrow Tour+$				$Tour+\nRightarrow GDP\ f+$			
	Test statistic	Bootstrap critical values			Test statistic	Bootstrap critical values			Test statistic	Bootstrap critical values			Test statistic	Bootstrap critical values		
Countries		1%	5%	10%		1%	5%	10%		1%	5%	10%		1%	5%	10%
Belgium	0.798	10.480	6.742	5.137	1.035	9.554	6.689	4.979	0.138	10.658	6.885	5.105	1.834	10.212	6.502	4.890
France	0.553	9.331	6.347	5.004	1.004	9.172	6.193	4.810	0.196	7.394	4.424	3.048	1.426	7.930	3.847	2.807
Germany	2.760	10.727	6.541	5.046	0.504	11.859	7.457	5.607	0.133	7.852	3.767	2.844	0.044	6.759	4.180	2.930
Italy	0.549	6.783	3.798	2.620	0.327	8.833	3.958	2.688	1.662	6.817	4.101	3.021	0.287	7.450	4.248	3.154
Netherlands	0.614	10.469	6.064	4.851	2.742	11.080	6.549	4.909	0.780	7.822	4.017	2.817	0.279	6.168	3.970	2.696
Portugal	1.010	9.365	4.217	2.893	4.704**	7.573	4.108	2.931	1.185	7.629	3.997	2.872	4.385**	7.073	3.946	2.823
Switzerland	0.505	10.783	6.814	5.073	0.029	11.655	6.815	5.338	0.267	6.452	3.724	2.531	0.385	6.630	4.214	2.609
U.K.	6.086**	6.656	4.144	2.899	0.214	7.748	4.122	2.884	6.395**	7.670	3.897	2.679	0.001	7.857	3.831	2.810
USA	0.023	7.721	4.636	3.125	3.524*	6.734	3.982	2.682	0.077	7.270	4.109	2.719	2.523	6.835	4.028	2.973

Note: Lag orders are selected by minimizing the Akaike Information Criteria.
***,**;* denotes significance at 1%, 5% and 10% respectively.

Table 4. Negative effects

	Bivariate								Trivariate							
	$GDP\ f-\nRightarrow Tour-$				$Tour-\nRightarrow GDP\ f-$				$GDP\ f-\nRightarrow Tour-$				$Tour-\nRightarrow GDP\ f-$			
	Test statistic	Bootstrap critical values			Test statistic	Bootstrap critical values			Test statistic	Bootstrap critical values			Test statistic	Bootstrap critical values		
Countries		1%	5%	10%		1%	5%	10%		1%	5%	10%		1%	5%	10%
Belgium	1.168	10.655	6.766	5.079	6.021*	11.439	6.174	4.558	0.745	10.848	7.482	5.669	6.713**	11.928	6.683	5.120
France	0.526	12.306	7.096	5.364	17.698***	15.821	7.611	5.262	0.688	11.524	7.438	5.575	16.902***	13.993	6.318	4.706
Germany	5.171*	10.866	7.090	4.871	2.924	13.323	8.061	4.844	6.639**	12.294	6.506	4.718	3.603	13.944	6.889	4.936
Italy	4.759	10.937	7.433	5.398	0.425	10.669	6.493	5.045	7.360**	10.942	6.498	5.054	0.805	11.002	6.830	5.106
Netherlands	8.984**	13.722	6.572	4.874	2.283	11.929	7.219	5.251	9.641**	13.339	6.865	5.122	1.982	11.483	6.722	4.839
Portugal	2.478	9.029	5.914	4.537	5.430*	11.956	6.830	4.738	1.960	10.775	6.961	5.050	6.607**	9.222	6.192	4.721
Switzerland	23.667***	9.887	6.539	4.962	7.358**	14.013	7.221	5.056	21.475***	8.882	6.214	4.688	8.363**	10.205	6.705	4.775
U.K.	13.675***	11.722	6.583	5.030	2.884	10.226	6.018	4.393	11.574***	9.355	6.438	5.004	1.256	9.627	6.517	4.833
USA	2.046	13.277	7.681	5.206	1.430	10.534	6.597	4.663	2.601	10.039	6.529	4.838	3.072	11.868	6.217	4.755

Note: Lag orders are selected by minimizing the Akaike Information Criteria.
***,**;* denotes significance at 1%, 5% and 10% respectively.

Table 5. Mixed effects: asymmetry from positive to negative

	Bivariate								Trivariate							
	$GDP\ f+\nRightarrow Tour-$				$Tour+\nRightarrow GDP\ f-$				$GDP\ f+\nRightarrow Tour-$				$Tour+\nRightarrow GDP\ f-$			
	Test statistic	Bootstrap critical values			Test statistic	Bootstrap critical values			Test statistic	Bootstrap critical values			Test statistic	Bootstrap critical values		
Countries		1%	5%	10%		1%	5%	10%		1%	5%	10%		1%	5%	10%
Belgium	0.295	9.853	6.604	4.663	0.872	14.445	7.602	5.117	0.244	9.824	6.552	5.087	0.432	11.433	7.024	5.177
France	4.552	14.934	10.351	8.563	0.531	15.188	7.712	4.991	3.901	14.298	10.284	8.575	0.431	15.098	6.876	4.424
Germany	0.970	16.668	10.684	8.686	0.272	18.222	7.171	4.637	0.875	15.009	10.352	8.433	0.412	14.930	7.145	5.041
Italy	1.169	7.985	4.220	2.888	0.417	9.629	6.264	4.622	0.776	6.467	3.696	2.439	0.944	9.523	6.018	4.656
Netherlands	2.022	10.413	6.948	4.859	1.141	11.086	6.672	5.166	2.488	10.258	6.547	4.954	0.898	11.103	6.486	4.891
Portugal	0.421	7.774	4.289	3.077	3.567	10.192	6.427	5.093	0.334	7.523	4.144	2.808	2.151	10.117	6.326	4.875
Switzerland	5.830	13.037	8.786	6.934	0.557	11.205	6.473	4.872	3.666	11.530	6.791	5.152	0.827	10.618	6.738	5.170
U.K.	4.105	14.244	10.106	8.404	0.704	13.859	8.782	6.337	3.006	9.698	6.063	4.570	0.948	12.134	7.822	6.586
USA	0.462	7.435	4.095	2.763	0.266	9.699	6.014	4.685	0.527	8.044	4.148	2.884	0.330	10.361	6.419	4.740

Note: Lag orders are selected by minimizing the Akaike Information Criteria.
***,**;* denotes significance at 1%, 5% and 10% respectively.

Table 6. Mixed effects: asymmetry from negative and positive

	Bivariate								Trivariate							
	$GDP-\nRightarrow Tour+$				$Tour-\nRightarrow GDP+$				$GDP-\nRightarrow Tour+$				$Tour-\nRightarrow GDP+$			
	Test statistic	Bootstrap critical values			Test statistic	Bootstrap critical values			Test statistic	Bootstrap critical values			Test statistic	Bootstrap critical values		
Countries		1%	5%	10%		1%	5%	10%		1%	5%	10%		1%	5%	10%
Belgium	0.500	13.378	7.792	5.296	2.296	9.965	6.588	5.107	0.169	11.514	6.737	4.880	2.386	10.820	6.290	4.993

France	0.870	15.953	8.462	5.483	2.463	15.632	11.251	8.816	1.340	12.957	7.719	5.275	3.356	15.128	9.489	7.877
Germany	0.242	17.373	8.031	4.994	7.945	16.632	11.304	8.888	0.011	13.205	6.693	5.205	8.580	16.920	11.713	8.987
Italy	1.317	11.356	6.947	5.377	1.031	7.113	3.593	2.382	1.233	10.754	6.166	4.617	1.878	7.519	4.075	2.810
Netherlands	3.037	10.438	6.477	4.846	0.007	9.815	6.234	4.653	2.430	10.628	6.553	5.177	0.063	9.519	6.212	4.798
Portugal	1.948	9.769	6.142	4.843	1.313	7.388	4.095	2.808	1.018	10.556	6.599	5.067	1.032	7.312	4.113	3.019
Switzerland	0.754	9.516	6.403	4.952	1.216	13.326	8.464	6.977	0.323	12.056	6.642	4.661	1.892	8.953	6.032	5.008
U.K.	5.327	13.835	9.452	6.969	7.269	15.420	10.838	8.611	5.376	12.482	9.113	6.862	0.261	11.199	6.857	5.226
USA	1.844	11.378	6.397	4.923	3.227*	6.927	4.171	2.886	2.582	10.752	6.972	5.064	2.852*	6.106	4.199	2.829

***Note*:** Lag orders are selected by minimizing the Akaike Information Criteria.
***,**;* denotes significance at 1%, 5% and 10% respectively.

To summarize our results, Table 7 is presented, which recognizes two behaviours. First, the causalities of the overall effects are also found when asymmetries are allowed. In addition, these results show that the causalities differ depending on the cycle in which the relationship is observed, demonstrating that an analysis that only contemplates the overall effects could be biased.

Table 7. Summary of Results

		GDP		
		Global	***Positive***	***Negative***
Tourism	***Global***	UK, Switzerland, Italy, Netherlands and Germany		
	Positive		UK	
	Negative			UK, Switzerland, Italy, Netherlands, Germany and Italy

5. Conclusions

Great interest has arisen in the last decade in understanding what causes the relationship between economic growth and tourist flows in order to design the most appropriate economic and tourist policies. Granger causality, as a means of understanding the income shocks in the 9 countries from which Spain receives its majority of tourists from 2000-2017, has been analysed using a novel approach. Depending on the direction of the causality, several hypotheses are defined by Tugcu (2014). Most empirical studies support that tourism contributes to growth as per the TLGH. However, little interest emerges for the opposite direction, which is based on the conservation hypothesis. Our approach presents two important advantages. First, we can test the influence of economic status on inbound tourism using the origin GDP. Second, the use of asymmetries allows for the application of a more flexible study of Granger causality. The method applied for analysis causality is a set of alternative tests that permit the detection of Granger causality by considering both the longitudinal data (following the approaches by Toda and Yamamoto (1995) and Hatemi-J (2012)) and the panel data (following the approach by Emirmahmutoglu and Kose (2011), which is an extension of Toda and Yamamoto (1995)). Our paper has contributed to previous empirical studies by analysing the asymmetric behaviour of the relationship.

We support that Granger causality appears from GDP to tourism in five of the nine countries analysed. In addition, the set of results provided in this article show robustness between the bivariate and Trivariate analysis, where the REER has been incorporated into the model as a control variable. First, a group of countries with a large influx of tourists to Spain includes Germany, the Netherlands, Switzerland, Italy and the UK, which represented 68% of total inbound tourists in 2016. These countries are sensitive to the relationship between the number of tourists travelling to Spain and the state of their economy. Conversely, different behaviours in the tourism flows emerge when asymmetries are allowed, and as a result, this relationship varies. When there are positive cycles, greater tourist arrivals only come from the UK. When there are negative cycles, the tourists inbound from the UK, Switzerland, the Netherlands, Germany and Italy decline. Regarding the rest of the countries that exhibit exogenous behaviour to the economic situation, it would be interesting to reverse this situation so that a greater influx of tourists is received when their incomes increase. It should be tested whether the tourists inbound from all countries present patterns such as that of the UK.

The analysis of this paper is relevant for the design and implementation of tourism promotion programmes specific to countries of origin due the heterogeneity among these countries at the time that the economic situation and the asymmetries must be taken into account by policymakers and practitioners. A growing interest has emerged to establish appropriate decisions regarding tourism resources due to their impact on economic development, and the results proposed in this paper should be considered. The first policy should note that in the UK, a positive GDP shock increases tourist arrivals. Second, policies in the UK, Switzerland, the Netherlands, Germany and Italy must be aimed at preventing a decrease in the arrival of tourists from these countries during crisis times. Therefore, Spanish authorities should consider this phenomenon in order to avoid this scenario. Finally, the remaining countries show no sensitivity in the observed relationship. Hence, ad hoc policies to change this pattern and establish appropriate cycles may be implemented. Therefore, a clear segmentation policy within Spanish tourism would help to offer the services demanded by tourists, since their behaviours are very different and must be able to concurrently satisfy luxury and mass tourism.

In a similar manner proposed in this paper, future research could address the study of the causal link between the tourist arrivals from these nine countries and Spanish GDP and also within other geographical contexts. Furthermore, following the recent paper of Perles-Ribes *et al.* (2017), other future research may investigate the stability of the proposed relationship in this paper using other recent economic shocks such as the Arab spring, the economic crisis or Brexit on Spanish tourist demand by implementing methodologies such as a bootstrap Granger non-causality tests with rolling-window subsample estimations.

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APPENDIX

Table A1. Tourism inbounds quotes of origin countries in 2016

	Country	Percentage
1	Belgium	4.14%
2	France	20.38%
3	Germany	20.08%
4	Italy	7.17%
5	Netherlands	6.03%
6	Portugal	3.56%
7	Switzerland	3.10%
8	U.K.	31.95%
9	USA	3.59%

Table A2. Ng-Perron and ADF unit root tests for series

Variable	I(1) vs. I(0)						
	ADF		Ng-Perron				
Tourism	Test statistic	Lags	$\bar{M}Z_{\alpha}^{GLS}$	$\bar{M}Z_{t}^{GLS}$	$\bar{M}SB^{GLS}$	$\bar{M}PT^{GLS}$	Lags
1 Belgium	-0.366	10	-5.454	-1.475	0.270	16.221	8
2 France	-2.477	1	-10.008	-2.180	0.218	9.365	3
3 Germany	-0.827	2	-3.139	-1.080	0.344	25.249	1
4 Italy	-2.407	1	-8.542	-2.065	0.241	10.674	1
5 Netherlands	-0.989	8	-8.775	-2.027	0.231	10.634	1
6 Portugal	-2.270	0	-5.507	-1.659	0.301	16.546	0
7 Switzerland	-1.596	2	-5.676	-1.541	0.271	15.768	2
8 U.K.	-1.917	0	-3.380	-1.277	0.378	26.506	0
9 USA	-0.590	2	-1.799	-0.608	0.338	29.242	2
GDP per capita							
1 Belgium	-1.659	3	-5.045	-1.573	0.312	17.991	3
2 France	-2.593	1	-11.383	-2.428	0.205	7.724	1
3 Germany	-3.337*	1	-21.107**	-3.243**	0.154**	4.351**	1
4 Italy	-2.498	2	-9.863	-2.207	0.224	9.299	1
5 Netherlands	-1.891	1	-7.971	-1.979	0.248	11.482	1
6 Portugal	-1.609	1	-6.901	-1.744	0.253	13.333	1
7 Switzerland	-1.789	2	-8.413	-1.973	0.242	11.325	2
8 U.K.	-2.247	3	-5.252	-1.620	0.309	17.351	3
9 USA	-1.616	1	-5.890	-1.698	0.288	15.446	1
Real Effective Exchange Rate							
1 Belgium	-1.745	0	-3.152	-1.246	0.395	28.690	4
2 France	-1.532	0	-7.061	-1.865	0.264	12.926	8
3 Germany	-1.735	0	-5.178	-1.608	0.311	17.596	4
4 Italy	-1.725	2	-3.750	-1.327	0.354	23.683	4
5 Netherlands	-2.098	0	-4.326	-1.458	0.337	20.953	4
6 Portugal	-2.297	0	-2.118	-0.993	0.469	41.030	4
7 Switzerland	-1.770	0	-6.267	-1.748	0.279	14.534	0
8 U.K.	-2325	1	-11,237	-2.369	0.211	8.113	1
9 USA	-0.259	8	-5.032	-1.487	0.296	17.646	2

Notes: The critical values for the Ng-Perron test are tabulated in Ng & Perron (2001). The MAIC information criteria is used to select the autoregressive truncation lag, k, as proposed in Perron and Ng (1996)
***, ** and * denote significance at 1%, 5% and 10% level respectively