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Tourism seasonality worldwide

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ABSTRACT

Tourism seasonality is generally seen as a problem for most of the main destinations in the world, particularly from the point of view of sustainability. Despite its importance, no reasonably homogeneous international measurement of seasonality is yet available on the global scale. Using the best World Tourism Organization (UNWTO) data, the paper uses the coefficient of variation, over the period 2008–2013 and for the main destinations, as a measure of tourism seasonality. In addition to the descriptive results, the paper includes a mixed effects panel data model, which allows us to investigate some reasonable main global determinants of seasonality. The results may be summarized as follows. Firstly, the world seasonality shows an inverted U pattern. Secondly, the highest (and increasing) seasonality is concentrated in the Mediterranean countries. Lastly, in terms of empirical determinants, geographical location, and the income of the major markets of origin are globally significant variables.

1. Introduction

Tourism has become a key factor for socio-economic development in many countries, contributing approximately 10% of the world's GDP in 2017. Over the last six decades, this sector has been one of the fastest growing in the world. For instance, the number of international tourist arrivals reached 1, 326 million in 2017, up from 25 million in 1950. Similarly, according to data from the World Tourism Organization (UNWTO), international tourism receipts increased from US$ 2 billion in 2008 to US$ 1340 billion in 2017. However, international tourist arrivals in some of the main tourist destinations are concentrated in relatively short periods, rather than being distributed uniformly across the year. This imbalance in tourist arrivals is typically known as seasonality (Allcock, 1994).

The seminal analysis of the seasonal dimension of tourism was carried out by Bar-On (1975). From this pioneering study, academic research has clarified the areas of concern, especially with respect to consolidated destinations. The economic aspects mainly cited are to do with the economic inefficiency caused by periods of the congested use of resources, followed by periods of low use (Williams & Shaw, 1991). Other studies consider the impact on the workforce (Yacoumis, 1980) and how these highs and lows affect motivation and productivity. The environmental (Manning & Powers, 1984) and social impacts have also been underlined with problems ranging from traffic volumes to civil security and the well-being of residents (Sastre, Hormaeche, & Villar, 2015).

One of the main contributory areas on this regard has been the identification of determinants. Specifically, these have been conceptually and traditionally segmented into two broad groups (Bar-On, 1975): in the first, they point out the relevance of variables associated with climatic conditions, which have a very significant association with the geographical location; in the second, institutional factors are highlighted, associated with the characteristic regulations of different countries applied to specific holiday periods. Beyond the traditional approach, the literature has recently proposed the relevance of other factors, such as economic ones, that might not only influence the variations in annual tourism demand, but also the degree to which they affect inter-annual distribution (Rosselló, Riera, & Sansó, 2004). In fact, the first two groups are particularly related to structural determinants, while those in the last group have more to do with short- and medium-term conditioning factors, which typically can be relevant (given the data availability).

In a widely cited survey, Koenig-Lewis and Bischoff (2005) established the priority areas for research. In particular, they identified the measurement issues and the research of determinants as one of the topics with greatest potential. In this regard, most analysis in the literature focuses on measuring and analyzing tourism seasonality as part of a case study for a specific region or country, but little research has been carried out at a global level to extract a general overview. Thus, existing studies tend to focus on North America (Hogan, 1987; McHugh & Mings, 1992; Soesilo & Mings, 1987; Stanley & Moore, 1997; Sun, Wu, & Feng, 2015; Tucker, Marshall, Longino, & Mullins, 1988) Europe

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(Bender, Schumacher, & Stein, 2005; Fernández-Morales & Cisneros-Martínez, 2018; Koc & Altinay, 2007; McEnnif, 1992; Zimmermann, 1998) or Australia (Hadwen, Arthington, Boon, Taylor, & Fellows, 2011; Kim & Moosa, 2001; Mings, 1997; Pegg, Patterson, & Gariddo, 2012) and little research exists for Africa (Amelung, Nicholls, & Viner, 2007; Burger, Dohnal, Kathrada, & Law, 2001; Steyn & Spencer, 2012), Asia (Chen, Li, Wu, & Shen, 2017; Li, Goh, Hung, & Chen, 2017; Li, Song, & Li, 2017) or South America (Amelung et al., 2007; Fernández-Morales & Cisneros-Martínez, 2015).

In this paper, we attempt to present a worldwide comparative analysis on seasonality (or, more accurately, monthly concentration). Our purpose is to obtain a homogenous international measurement of tourism seasonality. The current work obtains evidence on the global seasonality and allows a comparative analysis of the role of countries and significant regional groups, from an extensive sample of countries that have significant demand for tourism at a global level, over the period 2008–2013. This period, for instance, allows to us to explore the association between the economic crisis and the seasonality records.

In particular, the countries included in the calculations generate nearly 73% of worldwide demand in the top 50 countries. A measure, such as the coefficient of variation (Duro, 2016), is used to measure tourism seasonality and to analyze the changes in global seasonality for regional groups and countries. In addition, the study takes advantage of the nature of the data, countries, and years, to conduct an empirical investigation based on a data panel model into the aggregate relevance of different potentially relevant factors. Given the relatively short period analyzed, the data availability, and the probable high level of spatial, as opposed to temporary, heterogeneity in seasonality, income, geographical location, and time and regional controls have been included.

The rest of the article is structured as follows: First, it reviews the current state of research/studies in tourism seasonality. Second, it addresses some methodological aspects and the data. Third, it considers how tourism seasonality has changed for some of the most important destinations worldwide. Finally, the paper concludes with a summary of the main results and statements.

2. A review of literature

Various methods have been developed to quantify and compare seasonal patterns, such as financial portfolio theory (Jang, 2004) and principal components analysis (Jeffrey & Barden, 1999). Nevertheless, time-series analysis stands out as being the technique most commonly used by researchers (Donatos & Zairis, 1991; González & Moral, 1996; Kim, 1999; Kulendran, 1996; Pegg et al., 2012; Sorensen, 1999; Sutcliffe & Sinclair, 1980). The components of this type of analysis can be modeled using deterministic or stochastic methods applying the Auto Regressive Integrated Moving Average (ARIMA) models. The primary aim of time-series is to improve forecasting accuracy, rather than to analyze seasonality (Rosselló & Sansó, 2017). However, Butler (1994) defines tourism seasonality as the 'temporal imbalance in the phenomenon of visitors, expenditure of visitors, traffic on highways and other forms of transportation, employment and admissions to attractions' which should be measured by means of summary indicators. Following this definition, seasonality can also be described by means of summary indicators that synthesize the degree of dispersion of a distribution by means of a scalar. Measures proposed in the literature to synthesize the degree of dispersion of a distribution include, for example, the Seasonal Range, Seasonality Ratio, Peak Seasonal Factor, Coefficients of Seasonal Variation Amplitude Ratios, Similarity Ratios, Coefficient of Variation, and Concentration Indices (Koenig-Lewis & Bischoff, 2005). Although, some of these techniques can easily be calculated, also they have disadvantages such as not considering the changes occurring in all observations of the distribution, the possibility of being influenced by extreme values, and not considering the skewness of the distribution (e.g. the Seasonality Ratio and the Coefficient of Seasonal Variation). The Gini index (Gini, 1912) is one of the most used by researchers (Fernández-Morales, Cisneros-Martínez, & McCabe, 2016; Fernández-Morales & Mayorga-Toledano, 2008; Koenig-Lewis & Bischoff, 2005; Lundtorp, 2001; Wanhill, 1980). This is due to specific characteristics, including its stability, and insensitivity both to changes in the peak months and to outliers. Nevertheless, the Gini Index gives more weight to changes in observations located around the mean (Cowell, 1995). To address this issue, the literature available also offers other useful inequality measures, such as Theil family indices (Theil, 1967), Atkinson family indices (Atkinson, 1970), and the coefficient of variation (Duro, 2016; Rosselló & Sansó, 2017). Interestingly, a very recent study proposes a new approach for measuring seasonality based on a transportation problem (Lo Magno, Ferrante, & De Cantis, 2017), which takes into account the cyclic ordering of the months (see also Ferrante, Magno, & De Cantis, 2018).

In fact, each of these indices satisfy the basic axioms from the literature of scale-independence and population-independence, and they also obey the transfers-principle. The difference between these indicators comes from the treatment they give in relation to the changes produced in the units (for example, months) that make up the (inter-monthly) distribution of the annual activity (Duro, 2016). In our work, and consistent with the literature, seasonality is understood as the monthly concentration of demand. Thus, the concern is to reduce the monthly variability, without undertaking any analysis of location of months. As a measure of monthly concentration, we decided to use the coefficient of variation because it is fully consistent with this approach and the Butler (1994) definition. Furthermore, as opposed to the Gini index, the coefficient of variation treats the units (months) uniformly. That is, it is insensitive to where the monthly changes occur, and treats changes that occur in different months homogenously, regardless of their location in the ranking. This distributive neutrality appears quite useful for the analysis of tourism seasonality both from a methodological point of view and practically. The coefficient of variation is constructed by dividing the standard deviation by the mean where low values of the coefficient of variation indicate a stability in the seasonality pattern, and high values the opposite. Note that, if we square and halve it, the resulting measure is ordinally equivalent to Theil indices for $\beta = 2$, where β captures the sensitivity of the measurement to the place where the distribution changes.

On the other hand, diverse factors have been proposed as the main determinants of seasonality in tourism. A very popular synthetic structure specifies two broad categories: natural and institutional (Allcock, 1994; Bar-On, 1975; Butler, 1994; Commons & Page, 2001; Connell, Page, & Meyer, 2015; Higham & Hinch, 2002). The first category includes climatic variables, in relation to some of the main forms of current tourist activity, such as sun and beach tourism and/or snow tourism. The second includes institutional factors relating to the effects on flow associated with, for example, the precise programming of school and work holiday periods, national holidays, and cultural events. Introducing different climate variables into the models is also common in the literature (Becken, 2013; De Freitas, 2003). For instance, some authors have used climate index for tourism (see De Freitas, Scott, & McBoyle, 2008) or the temperature (especially the average temperature), and its square, as proxies to measure the impact of climate on tourism (c.f. Maddison, 2001; Lise & Tol, 2002; Hamilton, 2004; Bigano, Hamilton, & Tol, 2006; Bujosa & Rosselló, 2013). Authors such as Hartmann (1986) or Butler (1994) also find that seasonal differences increase with the distance from the Equator. Related to this, Lundtorp

(2001) state that problems caused by seasonality are more difficult to solve in regions with high latitude, especially peripheral regions in the Northern or Southern Hemispheres.

The literature has also recently suggested the importance of certain other causes and has given them significant attention. These include the type of tourist product offered by the destination (Cuccia & Rizzo, 2011; Martín Martín, Jiménez Aguilera, & Molina Moreno, 2014), the market structure (Fernández-Morales et al., 2016), and economic variables (Rosselló et al., 2004). This last work analyzed the relationship between monthly concentration and economic determinants (income, prices, and exchange rate) in the Balearic Islands with respect to their two main markets, the British and the German. Their results showed that these variables had significant impacts on tourism seasonality. Turrión-Prats and Duro (2018) analyzed tourism seasonality from a market-side perspective for Spain and found that, in this case, inertial and economic factors are also significant explanatory determinants.

Regarding the determinants of tourism seasonality, we consider that, although researchers may have identified the causes of seasonality (Bar-On, 1975; Baum & Hagen, 1999; Butler, 1994; Butler & Mao, 1997; Frechtling, 1996), it has been on a very speculative basis (Hinch & Jackson, 2000). It thus seems that greater efforts should be made to establish a more comprehensive theoretical framework. It is also necessary to corroborate this theoretical framework with empirical research that allows one to, among other things, observe the relative strength of each factor and their relative influences.

As mentioned previously, time series have been used widely to explore empirical determinants. Nevertheless, the determinants of seasonality can be also analyzed in an empirical way by combining cross-sectional and longitudinal data, capitalizing on the econometric advantages associated with panel data. It is important to highlight that panel data permit us to measure the effects of variables with small changes within countries and greater intra-country variability, which is often the case with short and medium-term analyses. This methodology has been used for certain cases such as Spain (Turrión-Prats & Duro, 2018).

Although ‘seasonality is not necessarily bad for everyone’ (Murphy, 1983), many authors consider that it has numerous negative repercussions for the economy, employment, the environment, and society. Other researchers have paid attention to its potential benefits. For instance, on the one hand, in the off-season, ecological (Butler, 1994; Hartmann, 1986) and sociocultural (Hartmann, 1986; Mathieson & Wall, 1982) recovery happens, as well as the maintenance and reform of tourist infrastructures (Grant, Human, & Le Pelley, 1997). Hartmann (1986) argues that one of the most powerful reasons is that the ‘dead season [is] the only chance for social and ecological environment to recover totally. A dormant period for the host environment is simply a necessity to preserve its identity’. Also, in periods of greater demand, temporary workers such as students or artists can be incorporated into the labor market (Mourdoukoutas, 1988). Lundtorp, Rassing, and Wanhill (1999) found that some workers in Denmark think that ‘having a two or three month lay-off out of season is a bonus rather than a hardship’. Getz, Carlsen, and Morrison (2004) discuss this dilemma in more detail.

The negative effects of seasonal variations can affect destination choice, destination image, and tourist spending. Consequently, managers of tourism enterprises and policymakers typically have designed strategies focused on mitigating this imbalance or on removing its negative consequences (Allcock, 1994; Andriotis, 2005; Butler & Mao, 1997; Capó, Font, & Nadal, 2007; Weaver & Oppermann, 2000). The main ones involve product diversification, market segmentation, and differential pricing strategies during the off-season. The first of these consists in creating different tourism products based on different seasons of the year—for example, staging events and festivals as a way of extending the tourist season and diversifying the attractions of destinations (Brännäs & Nordström, 2006; Getz, 2008). The second strategy is implemented under the criterion of market segmentation. Given that, distinctive tourist profiles exist, it is necessary to establish alternative marketing strategies according to the season and matching appropriate tourism products and services to the time of year. The third strategy is to apply differential-pricing strategies during the off-season for example, price reductions. For some researchers, this last strategy is positive (see, for example, Manning & Powers, 1984) but other authors consider that it may damage the reputation of the destination (Baum & Hagen, 1999).

To sum up, and given the previous evidence, this work makes several contributions. As far as we know, it is the first time that a global measurement of seasonality has been presented. In this sense, we can compare the position of countries and relevant regional areas and to observe their changes and, in particular, the impact of the world economic crisis on seasonality. In addition, the present work analyses the aggregate empirical determinants of cross-country seasonality, a line of research for which there is currently little quantitative evidence. Thus, most researchers have focusing on modeling global tourism demand, but relatively little research has used econometric methods to study monthly concentration of demand.

3. Methods and data

Seasonality is measured based on international tourist arrival data, which is a standard indicator in the literature, where months are taken as the basic seasonal unit (Duro, 2016; Lundtorp, 2001; Rosselló et al., 2004; Tsitouras, 2004; Turrión-Prats & Duro, 2017; Wanhill, 1980). The data of this indicator used from the official sources of each country (see Appendix 0). The analysis includes 36 countries from the top 50 tourist destinations. Specifically, the sample represents about 73% of the total international tourist arrivals among the 50 main tourist destinations (UNWTO) and nearly 75% of the top 20 tourist countries.[1] An effort has been made to homogenize the sample as much as possible, so all the data refer to the same indicator and typically to the same population. The data is very homogeneous and when there is a difference, it seems not to be very relevant. For some countries, international travelers by day are introduced because there a breakdown between tourists and hikers is not available, but when it occurs, the latter makes a relatively small contribution. Ex-ante, this issue might be relevant for only three countries, Bulgaria, China, and Singapore, where the number of hikers is close to 20%. So, this does not seem to affect the global consistency of the results.[2]

The model used in this study is based on a combination of several determinants proposed in the literature. In addition, it is restricted by data availability (only a short time period is available) and by the empirical context analyzed (that is, countries). Specifically, the natural factors, such as destination climate, have been selected because weather conditions are identified as one of the most important causes. In addition, given that the aim of our study is focused on a relatively short period (2008–2013), the use of economic variables as the main determinants of monthly concentration in tourism may be reasonable and advisable.

[1] We had to exclude France form the calculations because surprisingly, no homogeneous monthly data was found. Given the importance of France, by removing this country the representativeness of our sample would rise to 81% in terms of the top 50 and 86% in terms of the top 20).

[2] We estimated our models including control dummies for these countries and tested the significance of this issue. In none of the cases were the results significant. We also conducted simulations using inequality decomposition analysis by groups (tourists and hikers), using the Theil Indices. and different reasonable values for monthly concentration by hikers and night-travelers (see Duro, 2016). In this case, no significant gaps were found in the global monthly concentration values for these countries and no changes in the rankings emerged. In addition, the exclusion of these countries did not alter the average overall results of the estimation. Calculation details are available on request from the authors.

In the following, we will consider our model in some detail. It includes the following variables as determinants:

Firstly, as proxy for income, we used data from Real Gross Domestic Product per capita in the countries of origin, expressed in Purchasing Power Parity. In demand models, authors have used global variables like Gross Domestic Product (GDP) due to the difficulties in obtaining real personal disposable income (Ledesma-Rodríguez, Navarro-Ibáñez, & Pérez-Rodríguez, 2001; Song & Witt, 2000).

Secondly, the price variable is expressed in relative terms i.e. the ratio (rp) of the Consumer Price Indices in the countries of destination and origin. This variable is one of most commonly applied in this type of analysis (Rosselló et al., 2004; Vanegas Sr & Croes, 2000), given that, for a product like tourism, selecting an overall price indicator is particularly difficult because of the large number of different types of costs associated with this activity and the difficulty of finding tourism price data.

A priori, the predicted impact of income and prices on monthly concentration is unknown. It is difficult to determine adequate price and income variables, because destinations benefit from the arrival of tourists from different countries. Therefore, we weight variables by the impact of each emitting country on the total demand of the destination and select those countries whose tourists make up about 70% of the total demand (using data for 2013 without significant changes when a different year is used). For the remaining 30%, since there are many countries with low relative weight, we use the global variable data.

Finally, the proximity of destination countries to the Equator in terms of degrees of latitude is used as a proxy for climate for two main reasons. First, because latitude affects the weather of a region, determining greater or lesser solar radiation, dictating the duration of the day and the height of the sun on the horizon according to the inclination of the terrestrial axis throughout the year. Hence, latitude is one the fundamental controllers of a location's climate. Regions in high latitudes (around 60 degrees from the Equator) are usually characterized by having cool summers and cold winters. At the other extreme, countries in low latitudes receive greater solar energy and therefore have climates with warm temperatures throughout the year. Secondly, the amount of solar energy received by areas in middle latitudes (from around 30 to 60 degrees) varies seasonally. All indicates that seasonality should affect high latitude regions more. It is expected that the length of the summer season is shorter in countries at higher latitudes. In contrast, in countries at lower latitudes, the duration of the summer season is longer, allowing the tourist season to be extended beyond the traditional months. Second, the choice of this variable is also due to the difficulty of selecting an adequate weather variable aggregated by country, given that weather can be very different within the same country.

Data on income and consumer price indices for the countries of origin were collected from the World Bank, and the source for latitude is the Central Intelligence Agency (CIA).

Based on the above descriptions, the models to be estimated are:

$$ln\_ts_{i,t} = \beta_0 + \beta_1 ln\_income_{i,t} + \beta_2 ln\_rp_{i,t} + \beta_3 latitude_i + \alpha_i + \varepsilon_{i,t} \qquad (1)$$

$$\begin{aligned} ln\_ts_{i,t} = {} & \beta_0 + \beta_1 ln\_income_{t,t} + \beta_2 ln\_rp_{i,t} + \beta_3 latitude_i \\ & + \beta_4 dnorthamerica + \beta_5 dnortheastasia + \beta_6 dsoutheastasia \\ & + \beta_7 dnortherneurope + \beta_8 dwesterneurope \\ & + \beta_9 dcentraleasterneurope + \beta_{10} dsouthernmedieurope + \alpha_i + \varepsilon_{i,t} \end{aligned} \qquad (2)$$

$$\begin{aligned} ln\_ts_{i,t} = {} & \beta_0 + \beta_1 ln\_income_{t,t} + \beta_2 ln\_rp_{i,t} + \beta_3 latitude_i + \beta_4 dnortheastasia \\ & + \beta_5 dsoutheastasia + \beta_6 dsouthernmedieurope + \alpha_i + \varepsilon_{i,t} \end{aligned} \qquad (3)$$

where $ts_{,t}$ is the measure of monthly inequality in the destination country *(i)* and the year *(t)*. Here the subset of regressors that are potentially correlated with α_i, are given as endogenous variables. Appendix 2 provides descriptive statistics for the variables used in this study.

This model has adopted the double-logarithmic form for economic variables. Note that this logarithmic transformation, which is convenient for econometric consistency, implies that international seasonality might be explained in terms of differences.

In this analysis, a panel data model is used, which has several advantages. First, its structure consists of several observations over time, which provides data that are more informative and have greater variability. Second, it limits the problem of omitted variables and reduces multicollinearity bias (Hsiao, 2003). Third, this methodology monitors the unobserved heterogeneity, removing the risk of obtaining biased results if we do not check for this heterogeneous behavior. All of this makes it possible to improve both the possible econometric specifications and the parameter estimates. In addition, panel data allow us to analyze variables for which there is information is missing in some periods. The method used in this study is an estimator of the instrumental variables proposed by Hausman and Taylor (1981).

4. Main results

The aim in this section is to complement the global analysis with regional analysis thereby testing possibly dissimilar patterns in the position and changes in the phenomenon by territory.[3] The regions are at different levels of tourism development, in different climate areas and have different market profiles that may affect the results. In this respect, an additional interesting subject for general analysis is to compare the effects of the global crisis on destinations seasonality and the subsequent pattern. In addition, quantitative models will be estimated through panel data techniques with the aim of clarifying the general determinants.

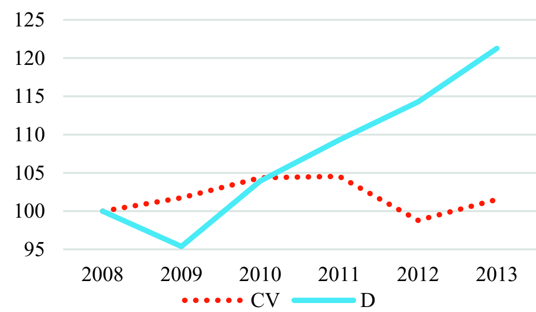
4.1. Descriptive results

Fig. 1 shows that, comparing 2008 and 2013, world monthly concentration did not change much if one uses a concentration index value of around 0.24. However, taking a closer look at the seasonal pattern, seasonality seems to have slightly increased up until 2011 (around a 5%) only to reduce afterwards, coinciding with the major recovery in world demand (an increase of 21.3% since 2008). One may interpret this positively in that, since 2010, the great growth in demand coincided with a slight reduction in monthly concentration. Thus, if this enormous growth in activity had been accompanied by an increase in seasonality, the negative impacts would have been much greater at a global level.

Given the diversity between countries and regions, as a first segmentation, we thought it interesting to provide results based on the level of the country's development, differentiating between advanced and non-advanced economies (see Fig. 2). All economies, advanced and others, have seen a growth in tourist flows, only interrupted by the crisis period. However, the impact of this growth on monthly concentration differs slightly depending on the group. Specifically, in the case of advanced economies, in which most of the world's demand is concentrated, seasonality typically increases in line with growth (except in 2012) whereas, for the remainder of the economies, the monthly imbalance in demand clearly decreases from 2010 (with a drop of 10% in the index between 2010 and 2013). Therefore, the monthly distribution seems to worsen in more consolidated countries, while in less developed or emerging countries the opposite is true. Here then, we first find a qualitative difference beyond the global numbers.

It is worth pursuing the analysis of these patterns in further detail. Therefore, Table 1 bring us an analysis that consists of assessing the

[3] The authors are willing to share their data set in Excel format with those who wish to replicate the results of this research.



Top 50

Fig. 1. Seasonality and global demand, 2008–2013.
Note: CV is the Coefficient of Variation; D is the total demand. Series are indexed according to their initial value (2008 = 100).

patterns followed by regions (Appendix 3). This table shows that, the regions with the highest levels of demand and monthly concentration were European. In Europe, the number of international tourist arrivals reached 286 million in 2008 which rose 335 million in 2013. Most of these were tourists from within Europe—a consequence of the intraregional nature of this demand. Their monthly concentration also increased from 0.36 in 2008 to 0.39 in 2013 (a noticeable growth of 8.2% in the index). The worst pattern was experienced by the Southern and Mediterranean area, which shows a growing trend in the number of tourist arrivals over the period analyzed, and also a strong and growing seasonality (from 0.48 to 0.53, the highest world value and with a very significant growth of 9.8%).

On the other hand, the Asia Pacific region, a region of increasing demand (particularly in the South-East), presents the lowest values of monthly concentration (between 0.06 and 0.07). The Asia Pacific region, despite having similar numbers of international tourist arrivals as North America, for example, displays just half of the monthly concentration. In addition, this region, in contrast to the European values, experienced a reduction in seasonality during the last period, just as in North America (since 2008) (Fig. 3).

Also, it may be interesting to consider what effect the global crisis of 2008 had, not only on tourism demand, but more especially on the monthly distribution. To allow comparison of the impacts of the economic crisis, Table 1 also includes data for 2009. In this table, we see that, during the critical initial phase of the crisis, 2008–2009, levels of demand decreased in all regions except South-East Asia where growth rates, although very limited, were positive. The regions most affected by the economic recession were the northern regions, specifically North America (22.6%), North-East Asia (with a fall of 12.1%), and Northern Europe (6.6%). Conversely, monthly concentration over this year increased in all regions with the notable exception of North America (−28.2%) and, in a lesser extent, Northern Europe (−2.2%). We tentatively conclude that the economic crisis was negatively correlated with tourism seasonality.

Given the difficulties of adding patterns and the limited space available, Table 2 shows that in 2013, among the ten tourist countries with least monthly concentration included, eight of them belong to the Asia Pacific region (Singapore, Thailand, Vietnam, Indonesia, the Philippines, Japan, Malaysia, and China). Half of these (Thailand, Vietnam, Indonesia, the Philippines, and Japan) managed to reduce their

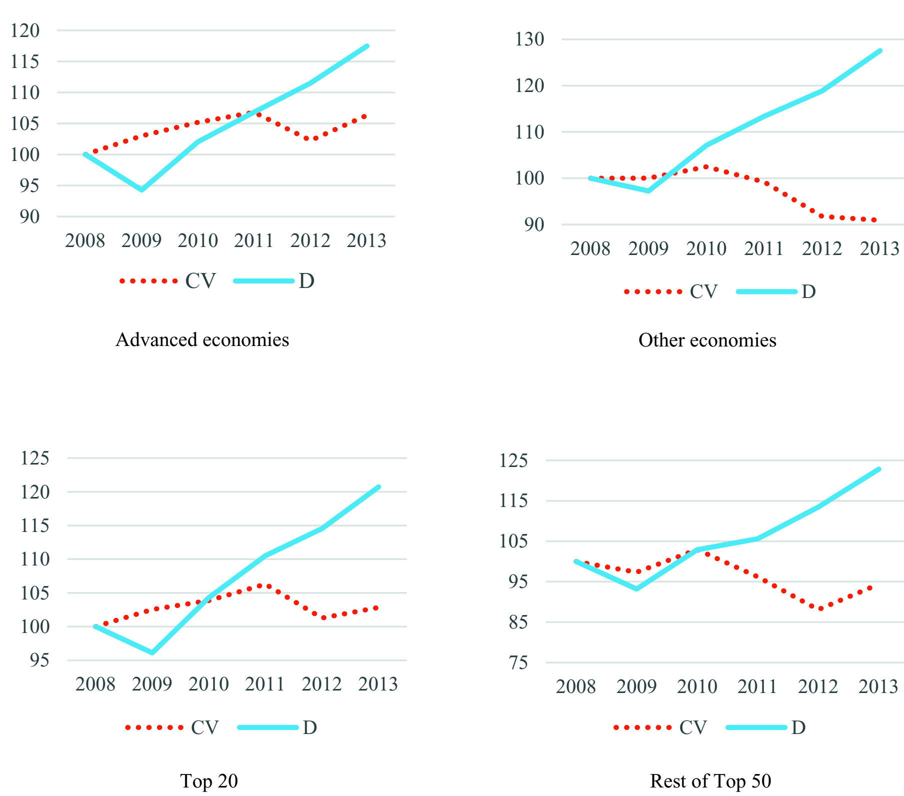


Fig. 2. Seasonality and global demand for advanced and non-advanced economies, 2008–2013.
Note: Series are indexed according to the initial value (2008 = 100). According to data from the International Monetary Fund (IMF) the following are considered as advanced economies: Austria, Belgium, Canada, Czech Republic, Finland, Germany, Greece, Italy, Japan, Netherlands, Portugal, Singapore, Spain, Switzerland, United Kingdom and United States.

Table 1
Tourism seasonality by UNWTO regions.

	2008		2009		2013		Rate of Variation (%)			
							2008–2013		2008–2009	
	CV	D	CV	D	CV	D	CV	D	CV	D
America	**0.19**	**90,574,737**	**0.14**	**70,090,123**	**0.17**	**109,978,311**	**−9.82**	**21.42**	**−28.18**	**−22.62**
North America	0.19	90,574,737	0.14	70,090,123	0.17	109,978,311	−9.82	21.42	−28.18	−22.62
Asia Pacific	**0.06**	**94,671,251**	**0.07**	**90,876,267**	**0.06**	**125,078,206**	**−8.13**	**32.12**	**11.2**	**−4.01**
North-East Asia	0.10	32,676,035	0.11	28,727,058	0.1	36,654,304	−2.86	12.17	5.31	−12.09
South-East Asia	0.06	61,995,216	0.06	62,149,209	0.07	88,423,902	15.99	42.63	1.75	0.25
Europe	**0.36**	**285,778,003**	**0.37**	**273,935,677**	**0.39**	**335,415,136**	**8.16**	**17.37**	**4.13**	**−4.14**
Northern Eur.	0.17	34,379,832	0.17	32,106,267	0.18	35,487,684	4.99	3.22	−2.19	−6.61
Western Eur.	0.21	72,726,214	0.22	70,574,988	0.23	85,643,582	6.38	17.76	2.29	−2.96
Cent./East. Eur.	0.35	21,763,882	0.37	20,867,175	0.3	31,166,847	−15.1	43.2	3.95	−4.12
South/Medit. Eur.	0.48	156,908,075	0.5	150,387,247	0.53	183,117,023	9.84	16.7	4.25	−4.16
of which EU	0.34	250,845,931	0.36	238,576,825	0.38	291,549,023	10.16	16.23	4.43	−4.89

Note: Although our sample contains countries that belong to the Caribbean, South America, South Asia, and Sub-Saharan Africa, these regions have not been included because we only used the higher demand regions and for representativeness problems too. CV is the Coefficient of Variation; D is the total demand. In the case of China, foreign visitor arrivals from Macao, Hong Kong and Taiwan are excluded due to the lack of monthly information.

Fig. 3. Global demand and seasonality by regions, 2008–2013. a) Tourism Demand. b) Monthly Concentration.

Table 2
The ten tourist countries with the most/least seasonality in 2013.

	CV	Var. CV	D			CV	Var. CV	D
Croatia	1.16	Decrease	10,948,366	1	Peru	0.07	decrease	3,163,639
Greece	0.88	Increase	17,919,582	2	Singapore	0.07	increase	15,567,923
Bulgaria	0.68	Increase	9,191,782	3	Thailand	0.09	decrease	26,546,725
Italy	0.51	Increase	50,263,236	4	South Africa	0.09	decrease	9,536,568
Canada	0.5	Decrease	16,059,342	5	Vietnam	0.09	decrease	7,581,500
Turkey	0.49	Decrease	34,910,098	6	Indonesia	0.10	decrease	8,802,129
Portugal	0.45	Increase	8,400,252	7	Philippines	0.10	decrease	4,681,307
Spain	0.39	Increase	60,675,489	8	Japan	0.10	decrease	10,363,904
Tunisia	0.37	Decrease	6,268,700	9	Malaysia	0.11	increase	25,715,460
Morocco	0.36	Decrease	10,046,264	10	China	0.11	increase	26,290,400

Note: CV Coefficient of Variation for 2013; Var. CV is the variation of CV with respect to 2008; D is the total demand for 2013. In the case of China foreign visitor arrivals from Macao, Hong Kong, and Taiwan are excluded due to the lack of monthly information.

Table 3
Country classification based on measures of monthly concentration in 2013. Top 20 destinations.

		CV	Variation	D
1	Greece	0.879	increase	17,919,582
2	Italy	0.513	increase	50,263,236
3	Canada	0.499	decrease	16,059,342
4	Turkey	0.488	decrease	34,910,098
5	Spain	0.385	increase	60,675,489
6	Austria	0.342	decrease	24,813,128
7	Netherlands	0.274	increase	12,782,892
8	Germany	0.263	increase	31,448,050
9	United Kingdom	0.178	increase	32,689,000
10	United States	0.155	decrease	69,768,455
11	Poland	0.123	decrease	14,123,200
12	Mexico	0.122	decrease	24,150,514
13	China	0.11	increase	26,290,400
14	Malaysia	0.109	increase	25,715,460
15	Thailand	0.086	decrease	26,546,725

Note: CV Coefficient of Variation for 2013; D is the total demand for 2013. In the case of China foreign visitor arrivals from Macao, Hong Kong and Taiwan are excluded due to the lack of monthly information.

concentration rates as compared to 2008. In clear contrast, the highest values belong to countries from the Mediterranean coastline and Southern Europe (Croatia, Greece, Italy, Turkey, Spain, Morocco, and Portugal), Bulgaria, Canada, and Austria. In addition, some of these countries demonstrate a rising trend in their monthly concentration figures as compared to 2008 (for example, Greece, Bulgaria, Italy, Canada, Portugal, and Spain) which increases the problem of tourist sustainability.

As a complementary analysis, Table 3 shows a ranking of monthly concentration for 15 of the top 20 countries with the greatest demand for tourism, according to data from 2013.[4] Note that their rankings do not change significantly from year to year. In addition, as can be seen in detail in the table, more than half of the main tourist destinations of the world show an increase in monthly concentration, which is a cause for concern. We see that, for example, Italy and Spain are facing an even more negative situation due to their high demand.

In addition, it seems interesting to explore the different seasonality-type profiles, which underlie the previous numbers. Butler and Mao (1997) identify three of such types (one-peak, two-peak, and non-peak seasonality) and Chen and Pearce (2012) extend them into six types of seasonality patterns applied to Asian tourism (*rolling hills, plain, single-peak mountain, multi-peak mountains, basin*, and *plateau*). We have grouped our sample of countries according to this last structuring, which seems more precise. From this, based on data from 2013, we can see that the most widespread pattern of seasonality in our country sample is the *single-peak mountain* (50% of the cases studied conform to this pattern) whereas the rest of the distributions are less common (see Appendix 4). In most of the one-peak destinations, tourists are more likely to be concentrated from March to October, with the notable exception of Malaysia where the peak month is December. We also note that, mainly because sun and sand is the most important touristic product, all the countries of the Mediterranean coast show this type of pattern. The second more common pattern is the *rolling hill* one (28% of the cases). It should be noted that the more than half of the countries that follow this pattern belong to the Southeast and Northeast Asia region. The novelty of these exotic countries may have contributed to their having this type of distribution, given that a one-peak pattern is more typical in mature destinations. The *multi-peak mountains, basin,* and *plateau* distribution types are uncommon in our selected countries, only between 6 and 8% of them conforming to these types. Among the countries examined, none presents the pattern known as the *plain*. An analysis that allow us to identify the different seasonal patterns may be useful to tourism authorities because, according to authors such as Connell et al. (2015) or Vergori (2017), introducing more seasons may reduce the problems caused by single-peak seasonality (overcrowding of tourist sites, social and economic losses, among others).

To conclude this section, in Table 4 we explore the demand-seasonality dynamics according to the four possible combinations. If the growth in demand and tourism seasonality forms part of the vector of strategic objectives of any destination, the countries situated in the first row and first column might be the most dissatisfied ones. This quadrant features the countries with a downturn or limited growth in global demand since 2010 and an increase in monthly inequality. This includes Spain, Italy, Greece, and other countries. Another of the problematic quadrants is that in which a significant growth in demand coincides with an increase in seasonality, thus amplifying the negative impact of growth, obviously dependent on the levels achieved by global demand in respect of resources and population (Martín Martín et al., 2014). This includes Vietnam, Indonesia, and Portugal (the most problematic given the weight of demand). Appearing in a more favorable quadrant, where growth in demand coincides with a reduction in monthly concentration, are Asian countries together with some in South America, and Turkey.

4.2. Modeling global empirical determinants

The estimation of the model is carried out using the Stata v.14.0

[4] We have been unable to obtain tourist arrival data for France, Russia, Ukraine, and South Korea. For example, for France we only have data on tourists staying in establishments such as hotels, holiday homes and other short-stay accommodation; campsites, recreational vehicle parks and trailer parks. Using this data, provided by Eurostat, France's average monthly concentration between 2011 and 2014 was 0.523. The same is true for South Korea. In this case, we have data on visitor arrivals provided by the Korea Tourism Organization (KTO), which does not differentiate between same-day visitors and tourists. Selecting this data as a reference, between 2008 and 2014 the average monthly concentration in this country was 0.081.

Table 4
Relationship between the growth of tourist demand and monthly concentration, 2010–2013.

	Decrease or low demand growth	High demand growth
Increase in concentration	Malaysia, South Africa, Greece, Spain, India, Netherlands, Italy, Austria, United States, Switzerland	Vietnam, Indonesia, Portugal
Reduction in concentration	Finland, China, Mexico, Germany, Morocco, Brazil, United Kingdom, Croatia, Belgium, Bulgaria, Dominican Republic, Canada, Japan, Tunisia	Thailand, Peru, Poland, Philippines, Chile, Turkey, Czech Republic, Singapore, Cambodia

Note: In order to determine whether demand growth has been high or low, we are using as a base the country averages from 2013 (20.71%).

Table 5
Empirical determinants of international seasonality. Panel 2008–2013.

	Model 1	Model 2	Model 3
ln_income	−0.797** (0.374)	−0.797** (0.378)	−0.824** (0.356)
ln_cpi	0.090 (0.080)	0.090 (0.081)	0.090 (0.080)
latitude	0.0190*** (0.005)	0.0173** (0.008)	0.0133** (0.005)
dnorthamerica		−0.126 (0.320)	
dnortheastasia		−1.082*** (0.180)	−0.901*** (0.141)
dsoutheastasia		−0.704*** (0.209)	−0.636*** (0.221)
dnortherneurope		−0.513 (0.346)	
dwesterneurope		−0.225 (0.271)	
dcentraleasterneurope		−0.334 (0.439)	
dsouthernmedieurope		0.640** (0.250)	0.848*** (0.186)
constant	6.098 (3.764)	6.318* (3.800)	6.556* (3.592)
Observations	214	214	214
Number of destinations	36	36	36
Rho	0.948	0.887	0.892
Wald Test	195.43(3)***	1923.85(10)***	1648.78(6)***
Link Test	1.179***	0.101	0.058

Note: Dependent variable: Logarithm of coefficient of variation for monthly tourism. Standard errors in parentheses. The asterisks denote that the coefficient is significant at *10%, ** 5% and *** 1%.

econometric program. The work by Hausman and Taylor (1981) is used to estimate the models. Table 5 shows the main empirical results. From the estimations, the following points of interest can be noted.

First and foremost, the joint significance test of the model, the rho, is very high, as is the Wald test, which verifies the global significance of the variables included. Three models have been attached: one, the basic model, with just the central variables, which are income, prices, and latitude; a second, in which regional dummies have been incorporated, with the aim of capturing the homogeneous territorial differences that are unexplained by the previous variables; and a third, in which only significant regional dummies are included. The Link (Pregibon, 1979) tests provide us with an idea of the validity of the specifications. Of the three models, the Model 2 and Model 3 pass the Link test, but Model 1 does not, which indicates that the basic model needs dummies. Going beyond the values produced by the synthetic specification test, the results for the parameters are similar in all cases. In addition, previously we applied the panel unit root test provided by Fisher-type (Choi, 2001) tests based on augmented Dickey-Fuller tests and based on the results, we determine that can be strongly reject the null hypothesis that all the panels contain unit roots.

Second, regarding income, the results show that an increase of 1% in the income of the main markets of origin would suggest a decrease of 0.8% for the monthly concentration of the destination country. Therefore, it seems that an increase in the incomes of international tourists would not only be positive in terms of global annual demand, but also in terms of its monthly distribution. This result is positive on a global level, given that it makes the growth in global demand more sustainable. In any case, a parameter value of 0.8% is not especially high. In fact, and being very cautious in the light of comparability issues, Turrión-Prats & Duro (2018, 2017), although using different data and methodologies, find a coefficient higher or closer to 1 in Spain and the Catalonia region. Conversely, the crisis not only depressed global demand in algebraic terms (Crouch, 1994a, 1994b), but also concentrated it into the peak months (that is, lower decreases during those months). Note that this information can be used to anticipate results, according to the prior economic growth of the markets, and therefore might activate anticipatory measures such as promotion strategies.

Third, with respect to relative prices, for all models the coefficient is not significant. Therefore, the variations of the prices do not seem affect to the monthly concentration.

Fourth, the geographical localization, approached based on latitude, has a significant impact, higher latitudes generally being associated with increments in seasonal concentration. A non-linear relationship was tested but was not found to be significant. Note, therefore, that this effect adds a certain level of rigidity to seasonality. It would be interesting to test the effect of climate change (see Wall, 1998), an issue which, in order to approach it rigorously, would need a much longer series than those available. In this regard, note that not only the effects of change on demand would have to be assessed but also the impact on the seasonal distribution of demand. In temperate highly seasonal areas of Europe, for example, climate change could lead to a reduction in inter-annual climatic disparities and, therefore, in seasonality. Note that this variable, indirectly, would partly take into account the tourist product role.

Finally, in the second model we introduced regional dummies. In this case, we can observe that the only significant dummy variables are for Asian regions and the zones of Southern and Mediterranean Europe. In particular, the Asian regions would seem generally to exhibit lower differential concentration and the Mediterranean countries, conversely, clearly higher values.

5. Conclusions

This study measures and analyses the temporal concentration of tourist demand on a worldwide level for the period 2008–2013. To the best of our knowledge, it is the first study that analyses non-climatic determinants of tourism seasonality on a worldwide scale. In this paper, the number of international tourists is used as an indicator of demand, which seems a reasonable variable in terms of pressure on territorial resources and which, in fact, has been commonly used in these types of studies. In addition, this research uses a monthly concentration measure, that is, the coefficient of variation. The empirical period used, given the availability of data, is 2008–2013. As a second stage, we have modeled the empirical determinants of international monthly inequality using demand variables (income and prices), the geographical location, and time and regional controls with a panel data specification. In these circumstances, our main results may be summarized as follows:

First, comparing 2008 with 2013, the change in worldwide seasonality is relatively small. Thus, the major increase in international tourist demand, particularly noticeable since 2009 following the crisis in that year, would not have increased this imbalance in a significant way. Nevertheless, if we analyze all the periods, some patterns emerge. Thus, seasonality grew slightly until 2011 before subsequently falling off. However, this global result hides a variability in terms of country groupings. For the most advanced countries, those that typically lead the rankings for world tourist demand, monthly concentration followed an upward pattern, even over the later years. In contrast, for the remainder of the countries, this pattern was a declining one.

Second, if we were to perform the analysis by regional group, according to the well-known UNWTO regions, the divergent path traced by Europe, especially Southern and Mediterranean Europe, is clear. Not only its level of seasonality double that of the rest of the world, but it also grew significantly from 2008. The growth in international demand of 17% from 2008, would have coincided with an increase in monthly concentration of 10%, which can generate many concerns about the socio-economic consequences of this expansion in this area.

Third, if we perform the analysis by country, it confirms the high level of monthly concentration in countries like Greece, Italy, Canada, Turkey or Spain, with the Greek, Italian and Spanish cases standing out due to their high levels of global demand. Countries with lesser imbalance include those in the Asian continent, most of them even reducing seasonality over the period analyzed. This is especially true for South-East Asia, perhaps because it is are visited not only for tourism, but also for business reasons. It would be interesting to distinguish business tourism from leisure tourism in terms of these calculations, but this cannot be done with the available data. In addition, the new routes opened by national air companies at lower prices might have influenced the flows of European tourists to these more exotic destinations. Given that pronounced seasonality is an indication of a mature market (Butler, 1994), it is possible that the novelty of these destinations contributes to lower monthly concentrations. In the long run, when these new tourist destinations become mature, they should focus alternatives to the usual tourism model, which are capable of capturing new segments and seasonally adjusting demand.

Fourth, the modeling of explanatory factors, using panel data methodology, illustrates that the specifications work reasonably well. The evidence suggests that income in emitting markets would have had a significant and positive (reduction) effect on seasonality. Rosselló et al. (2004) also found this for the Balearic Islands. The coefficient is not particularly high (0.8), but it indicates that economic expansions not only increase global demand (due to the income channel but also, fortunately, reduce seasonal concentration. This relationship, on a global level, thus reduces the potentially destabilizing effects of growing demand. Conversely, the crisis flags problems that can then be used as anticipatory indicators and as pointers for advance action.

Fifth, a country's location affects its seasonality and seasonal variation; the higher the latitude, the greater the seasonality, and the greater the growth. Note that these results show a certain degree of determinism in the changes in a country's imbalance.

Therefore, the world is not uniform in terms of seasonality. The problem is found to be heavily centered on the European Mediterranean area and modeling it by taking, an average level by country appears to be adequate. Income in emitting countries, their geographical location and regional dummies give a reasonable explanation of average international seasonality and how it changes. Thus, we feel that these results are not only relevant in the purely academic field, but also useful as a guideline for public tourism policies. In any case, the study has brought to light some areas that need further research and some important information for the future. One of the main limitations of this work was the lack of available data. We note that considerable effort would be needed to provide homogeneous international data on monthly tourism demand that are comparable, and that cover the majority of the top 50 countries. Such efforts could be undertaken by the UNWTO, which has already been working on annual demand and its characteristics. In addition, having homogenous global statistics between countries would make it easier for researchers to include explanatory variables that may be relevant to their models, such as the prices of competing destinations. Further research may improve with the availability of longer time series, since it would be interesting to compare the variations in the relevance of previous parameters especially that of climate change. Given that the country tourist product is heterogeneous, another limitation of the work might be the use of country level. Nevertheless, there are generic rules that could be extrapolated and localized to the circumstances of other regions (see Rose, 1993).

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Appendix 1. The data used with respect to the measure of monthly concentration are from the following sources

Countries	Source
Austria	Statistics Austria
Belgium	Eurostat
Brazil	Ministerio de Turismo
Bulgaria	National Statistical Institute
Cambodia	Ministry of tourism
Canada	Government of Canada Statistics
Chile	Servicio Nacional de Turismo
China	Planning Division Tourism Bureau - Ministry of Transportation and Communication
Croatia	Croatian Bureau of Statistics
Czech Republic	Eurostat
Dominican Republic	Banco Central de la República Dominicana
Finland	Eurostat
Germany	Eurostat
Greece	Border Survey of the Bank of Greece
India	Ministry of Tourism
Indonesia	Ministry of Culture and Tourism. Statistics Indonesia
Italy	Eurostat
Japan	Japan National Tourist Organization (JNTO)
Malaysia	Tourism Malaysia Corporate website
Mexico	Secretaría de Turismo de México (SECTUR)
Morocco	Observatory du Tourism Morocco

Netherlands	Central Bureau of Statistics Netherlands
Peru	Ministerio de Comercio Exterior y Turismo
Philippines	Department of Tourism
Poland	Central Statistical Office of Poland
Portugal	Eurostat
Singapore	Singapore Government-Singapore Tourism Board
South Africa	Statistics South Africa
Spain	Instituto de Estudios Turísticos (IET)
Switzerland	Eurostat
Thailand	Ministry of Tourism and Sports
Tunisia	National Institute of Statistics- Tunisia
Turkey	Ministry of Culture and Tourism
United Kingdom	Office for National Statistics
United States	The National Travel and Tourism Office (NTTO)
Vietnam	General Statistics Office of Vietnam

Appendix 2. Descriptive statistics for the variables are as follows

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
cv	216	0.29	0.23	0.06	1.22
pib_real	214	27,456.78	7582.40	10,112.21	49,363.60
ipc	216	1.00	0.08	0.26	1.31
latitud	216	28.31	24.39	−35.68	61.92
dnorthamerica	= 0 if it is not a North America country and 1 if it is a North America country.				
dnortheastasia	= 0 if it is not a North-East Asia country and 1 if it is a North-East Asia country.				
dsoutheastasia	= 0 if it is not a South-East Asia country and 1 if it is a South-East Asia country.				
dnortherneurope	= 0 if it is not a Northern Europe country and 1 if it is a Northern Europe country.				
dwesterneurope	= 0 if it is not a Western Europe country and 1 if it is a Western Europe country.				
dcentraleasterneurope	= 0 if it is not a Central/Eastern Europe country and 1 if it is a Central/Eastern Europe country.				
dsouthernmedieurope	= 0 if it is not a Southern/Medit. Europe country and 1 if it is a Southern/Medit. Europe country.				

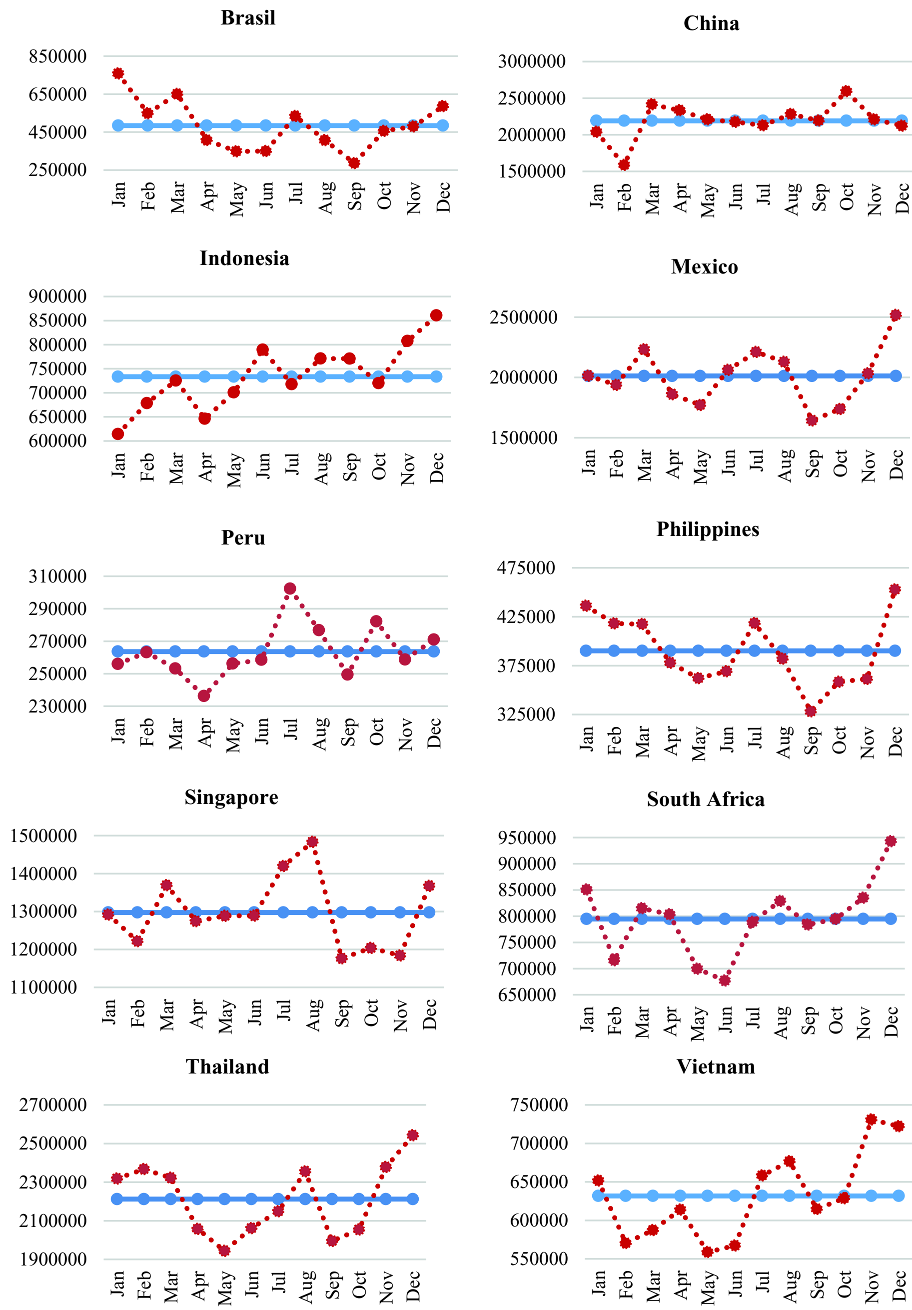
Appendix 3. countries included in the analysis have been grouped by regions based on the classification of the World Tourism Organization

Countries included in the analysis grouped by regions based on the UNWTO

Africa	Americas	Asian and the Pacific	Europe
North Africa	*North America*	*North-East Asia*	*Northern Europe*
Morocco	Canada	China	Finland
Tunisia	Mexico	Japan	United Kingdom
	United States	*South-East Asia*	*Western Europe*
Sub-Saharan Africa			
South Africa	*Caribbean*	Cambodia	Austria
	Dominican Republic	Indonesia	Belgium
		Malaysia	Germany
	South America	Philippines	Netherlands
	Brazil	Singapore	Switzerland
	Chile	Thailand	
	Peru	Vietnam	
		South Asia	*Central /Eastern Europe*
		India	Bulgaria
			Czech Republic
			Poland
			Southern/Medit. Europe
			Croatia
			Greece
			Italy
			Portugal
			Spain
			Turkey

Appendix 4. The countries have been classified according to the six seasonality patterns proposed by Chen and Pearce (2012)

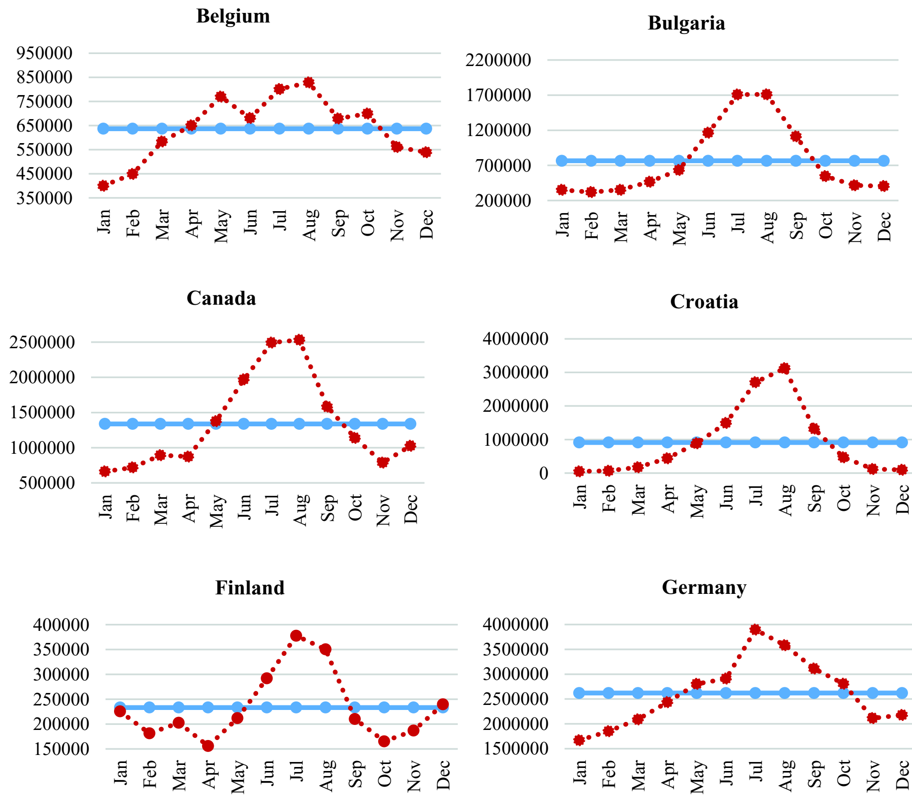
Type 1: rolling hills

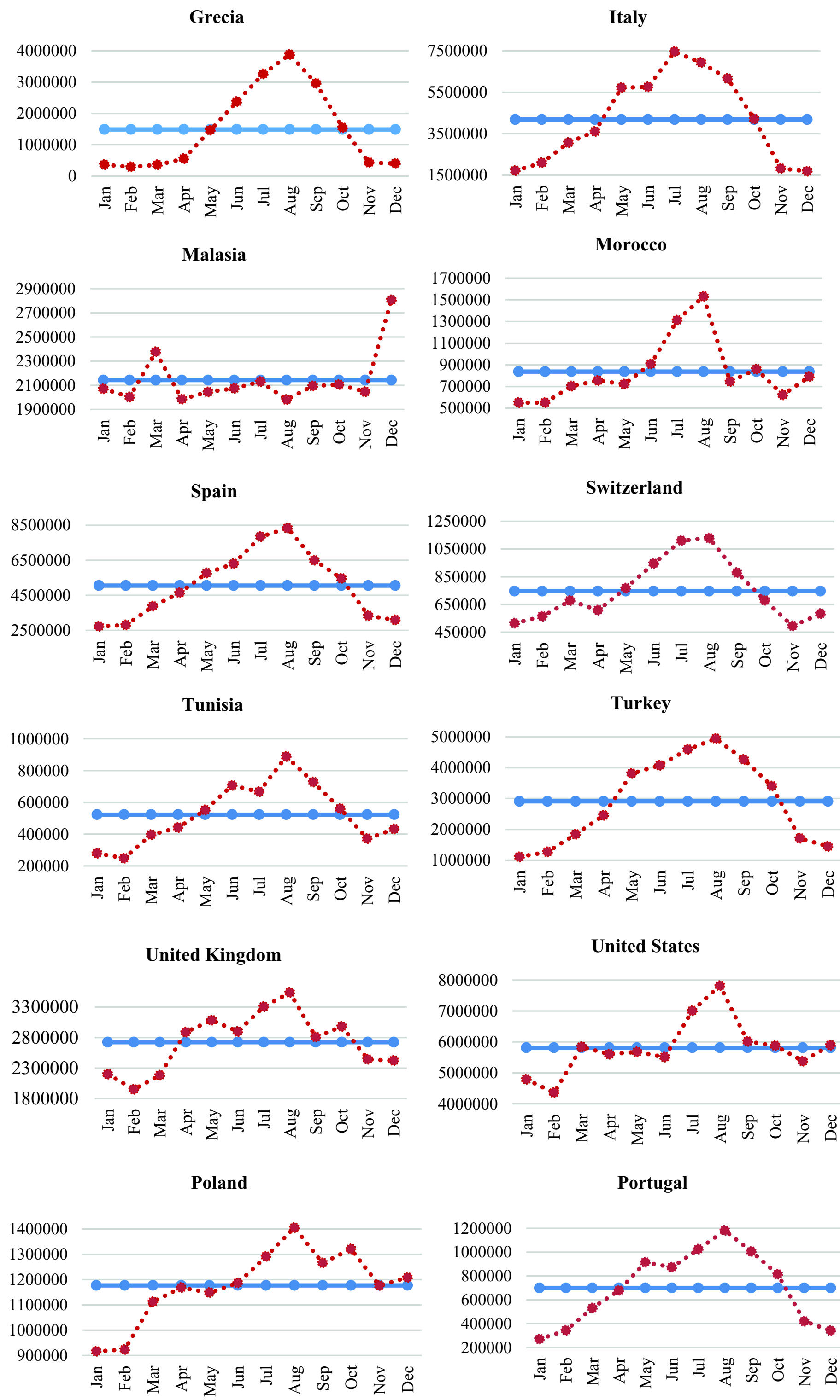


Type 2: plain

In any of the countries examined, comply this pattern.

Type 3: single-peak mountain




Grecia
4000000
3000000
2000000
1000000
0
Italy
7500000
5500000
3500000
1500000
Malasia
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Morocco
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Spain
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2500000
Switzerland
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Turkey
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4000000
3000000
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United Kingdom
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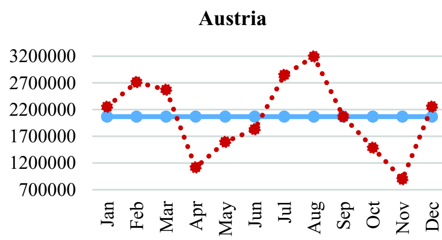
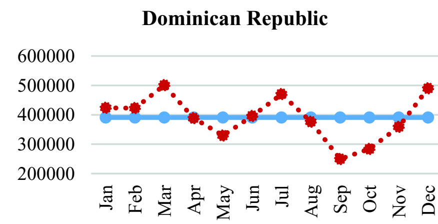
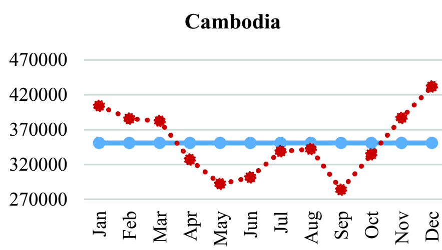
1800000
United States
8000000
7000000
6000000
5000000
4000000
Poland
1400000
1300000
1200000
1100000
1000000
900000
Portugal
1200000
1000000
800000
600000
400000
200000
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

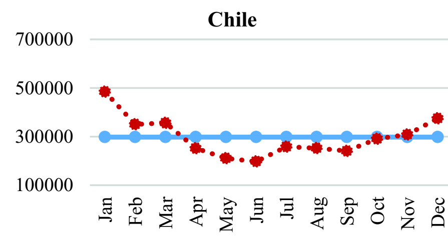
Type 4: multi-peak mountains

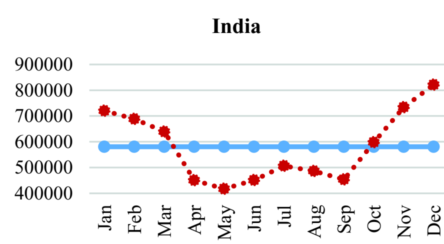




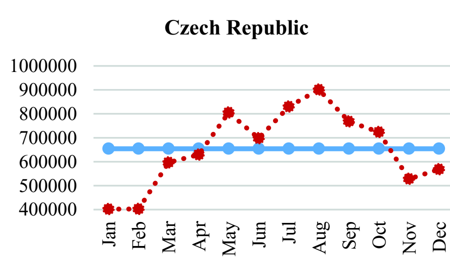
Type 5: basin

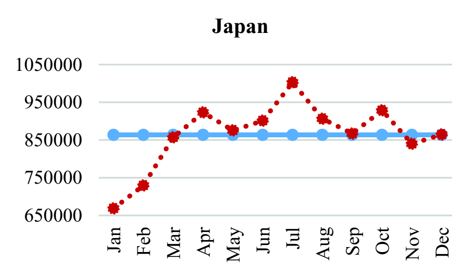


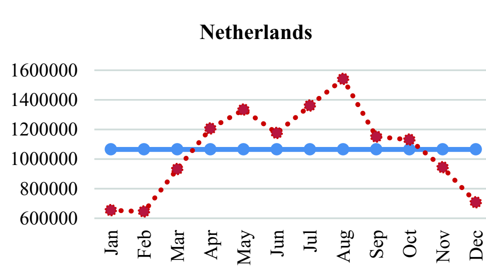




Type 6: plateau







Note: The Figures show monthly tourist arrivals and average monthly tourist arrivals in 2013.

References

Allcock, J. (1994). Seasonality. In S. F. Witt, & L. Motuinho (Eds.). *Tourism marketing and management handbook* (pp. 86–92). New York: Prentice Hall.

Amelung, B., Nicholls, S., & Viner, D. (2007). Implications of global climate change for tourism flows and seasonality. *Journal of Travel Research, 45*(3), 285–296.

Andriotis, K. (2005). Seasonality in Crete: Problem or a way of life? *Tourism Economics, 11*(2), 207–224.

Atkinson, A. (1970). On the measurement of inequality. *Journal of Economic Theory, 3*, 244–263.

Bar-On, R. V. (1975). *Seasonality in tourism: A guide to the analysis of seasonality and trends for policy making.* London: Economist Intelligence Unit.

Baum, T., & Hagen, L. (1999). Responses to seasonality: The experiences of peripheral destinations. *International Journal of Tourism Research, 1*(5), 299.

Becken, S. (2013). Measuring the effect of weather on tourism: A destination-and activity-based analysis. *Journal of Travel Research, 52*(2), 156–167.

Bender, O., Schumacher, K. P., & Stein, D. (2005). Measuring seasonality in Central Europe's tourism–how and for what? *CORP & Geo Multimedia, 5*, 303–309.

Bigano, A., Hamilton, J. M., & Tol, R. S. (2006). The impact of climate on holiday destination choice. *Climatic Change, 76*(3–4), 389–406.

Brännäs, K., & Nordström, J. (2006). Tourist accommodation effects of festivals. *Tourism Economics, 12*(2), 291–302.

Bujosa, A., & Rosselló, J. (2013). Climate change and summer mass tourism: The case of Spanish domestic tourism. *Climatic Change, 117*(1–2), 363–375.

Burger, C. J. S. C., Dohnal, M., Kathrada, M., & Law, R. (2001). A practitioners guide to time-series methods for tourism demand forecasting—A case study of Durban, South Africa. *Tourism Management, 22*(4), 403–409.

Butler, R. W. (1994). Seasonality in tourism: Issues and problems. In A. V. Seaton (Ed.). *Tourism, The State of the Art* (pp. 332–340). Chichester: Wiley.

Butler, R. W., & Mao, B. (1997). Seasonality in tourism: Problems and measurement. *Quality management in urban tourism* (pp. 9–24). .

Capó, J., Font, A. R., & Nadal, J. R. (2007). Dutch disease in tourism economies: Evidence from the Balearics and the Canary Islands. *Journal of Sustainable Tourism, 15*(6), 615–627.

Chen, J. L., Li, G., Wu, D. C., & Shen, S. (2017). Forecasting seasonal tourism demand using a multiseries structural time series method. *Journal of Travel Research*. https://doi.org/10.1177/0047287517737191 (forthcoming).

Chen, T., & Pearce, P. L. (2012). Research note: Seasonality patterns in Asian tourism. *Tourism Economics, 18*(5), 1105–1115.

Choi, I. (2001). Unit root tests for panel data. *Journal of International Money and Finance, 20*, 249–272.

Commons, J., & Page, S. (2001). Managing seasonality in peripheral tourism eegions: The case of northland, New Zealand. In T. Baum, & S. Lundtrop (Eds.). *Seasonality in tourism* (pp. 153–172). Oxford: Pergamon, Elsevier.

Connell, J., Page, S. J., & Meyer, D. (2015). Visitor attractions and events: Responding to seasonality. *Tourism Management, 46*, 283–298.

Cowell, F. (1995). *Measuring inequality* (2nd ed.). New York: Prentice Hall.

Crouch, G. I. (1994a). The study of international tourism demand: A review of findings. *Journal of Travel Research, 33*(1), 12–23.

Crouch, G. I. (1994b). The study of international tourism demand: A survey of practice. *Journal of Travel Research, 32*(4), 41–55.

Cuccia, T., & Rizzo, I. (2011). Tourism seasonality in cultural destinations. Empirical evidence from Sicily. *Tourism Management, 32*, 589–595.

De Freitas, C. R. (2003). Tourism climatology: Evaluating environmental information for decision making and business planning in the recreation and tourism sector. *International Journal of Biometeorology, 48*(1), 45–54.

De Freitas, C. R., Scott, D., & McBoyle, G. (2008). A second generation climate index for tourism (CIT): Specification and verification. *International Journal of Biometeorology, 52*(5), 399–407.

Donatos, G., & Zairis, P. (1991). Seasonality of foreign tourism in the Greek island of Crete. *Annals of Tourism Research, 18*(3), 515–519.

Duro, J. A. (2016). Seasonality of tourism in the main Spanish provinces: Measurements and decomposition exercises. *Tourism Management, 52*, 52–63.

Fernández-Morales, A., & Cisneros-Martínez, J. D. (2015). Seasonal inequalities in visitor distribution in Argentina's tourism regions. *E-review of Tourism Research, 12*(1/2), 115–126.

Fernández-Morales, A., & Cisneros-Martínez, J. D. (2018). Seasonal concentration decomposition of cruise tourism demand in southern Europe. *Journal of Travel Research.*. https://doi.org/10.1177/0047287518802094 (Forthcoming).

Fernández-Morales, A., & Mayorga-Toledano, M. C. (2008). Seasonal concentration of the hotel demand in Costa del Sol: A decomposition by nationalities. *Tourism Management, 29*(5), 940–949.

Fernández-Morales, A., Cisneros-Martínez, J. D., & McCabe, S. (2016). Seasonal concentration of tourism demand: Decomposition analysis and marketing implications. *Tourism Management, 56*, 172–190.

Ferrante, M., Magno, G. L. L., & De Cantis, S. (2018). Measuring tourism seasonality across European countries. *Tourism Management, 68*, 220–235.

Frechtling, D. C. (1996). *Practical tourism forecasting.* Oxford: Butterworth-Heinemann.

Getz, D. (2008). Event tourism: Definition, evolution, and research. *Tourism Management, 29*(3), 403–428.

Getz, D., Carlsen, J., & Morrison, A. (2004). *The family business in tourism and hospitality.* Wallingford, UK: CABI Publishing.

Gini, C. (1912). *Variabilità e mutabilità. Memorie di metodologìa statistica. Vol. 1*Roma: Librerìa Eredid Virgilio Veschi variabilità e concentrazione.

González, P., & Moral, P. (1996). Analysis of tourism trends in Spain. *Annals of Tourism Research, 23*(4), 739–754.

Grant, M., Human, B., & Le Pelley, B. (1997). *Seasonality 'in insights—Tourism intelligence papers. British tourist authority.* London: English Tourist BoardA5–A9.

Hadwen, W. L., Arthington, A. H., Boon, P. I., Taylor, B., & Fellows, C. S. (2011). Do climatic or institutional factors drive seasonal patterns of tourism visitation to protected areas across diverse climate zones in eastern Australia? *Tourism Geographies, 13*(2), 187–208.

Hamilton, J. (2004). Climate and the destination choice of German tourists. *Fondazione ENI Enrico Mattei*.

Hartmann, R. (1986). Tourism, seasonality and social change. *Leisure Studies, 5*(1), 25–33.

Hausman, J. A., & Taylor, W. E. (1981). Panel data and unobservable individual effects. *Econometrica. Journal of the Econometric Society, 49*(6), 1377–1398.

Higham, J., & Hinch, T. (2002). Tourism, sport and seasons: The challenges and potential of overcoming seasonality in the sport and tourism sectors. *Tourism Management, 23*(2), 175–185.

Hinch, T. D., & Jackson, E. L. (2000). Leisure constraints research: Its value as a framework for understanding tourism seasonability. *Current Issues in Tourism, 3*(2), 87–106.

Hogan, T. D. (1987). Determinants of the seasonal migration of the elderly to sunbelt states. *Research on Aging, 9*(1), 115–133.

Hsiao, C. (2003). *Analysis of panel data. Vol. 34*. Cambridge: Cambridge university press.

Jang, S. S. (2004). Mitigating tourism seasonality: A quantitative approach. *Annals of Tourism Research, 31*(4), 819–836.

Jeffrey, D., & Barden, R. R. (1999). An analysis of the nature, causes and marketing implications of seasonality in the occupancy performance of English hotels. *Tourism Economics, 5*(1), 69–91.

Kim, J. H. (1999). Forecasting monthly tourist departures from Australia. *Tourism Economics, 5*(3), 277–291.

Kim, J. H., & Moosa, I. (2001). Seasonal behaviour of monthly international tourist flows: Specification and implications for forecasting models. *Tourism Economics, 7*(4), 381–396.

Koc, E., & Altinay, G. (2007). An analysis of seasonality in monthly per person tourist spending in Turkish inbound tourism from a market segmentation perspective. *Tourism Management, 28*(1), 227–237.

Koenig-Lewis, N., & Bischoff, E. (2005). Seasonality research: The state of the art. *Journal of Tourism Research, 7*(4–5), 201–219.

Kulendran, N. (1996). Modelling quarterly tourist flows to Australia using cointegration analysis. *Tourism Economics, 2*(3), 203–222.

Ledesma-Rodríguez, F. J., Navarro-Ibáñez, M., & Pérez-Rodríguez, J. V. (2001). Panel data and tourism: A case study of Tenerife. *Tourism Economics, 7*(1), 75–88.

Li, H., Goh, C., Hung, K., & Chen, J. L. (2017). Relative climate index and its effect on seasonal tourism demand. *Journal of Travel Research, 57*(2), 178–192.

Li, H., Song, H., & Li, L. (2017). A dynamic panel data analysis of climate and tourism demand Additional evidence. *Journal of Travel Research, 56*(2), 158–171.

Lise, W., & Tol, R. S. (2002). Impact of climate on tourist demand. *Climatic Change, 55*(4), 429–449.

Lo Magno, G. L., Ferrante, M., & De Cantis, S. (2017). A new index for measuring seasonality: A transportation cost approach. *Mathematical Social Sciences, 88*, 55–65.

Lundtorp, S. (2001). Measuring tourism seasonality. In T. Baum, & S. Lundtorp (Eds.). *Seasonality in tourism* (pp. 23–50). Oxford, UK: Pergamon.

Lundtorp, Rassing, & Wanhill (1999). The off-season is 'no season': The case of the Danish island of Bornholm. *Tourism Economics, 5*(1), 49–68.

Maddison, D. (2001). In search of warmer climates? The impact of climate change on flows of British tourists. In D. Maddison (Ed.). *The amenity value of the global climate* (pp. 53–76). London: Earthscan.

Manning, R. E., & Powers, L. A. (1984). Peak and off-peak use: Redistributing the outdoor recreation/tourism load. *Journal of Travel Research, 23*(2), 25–31.

Martín Martín, J., Jiménez Aguilera, J., & Molina Moreno, V. (2014). Impacts of seasonality on environmental sustainability in the tourism sector based on destination type: An application to Spain's Andalusia region. *Tourism Economics, 20*(1), 123–142.

Mathieson, A., & Wall, G. (1982). *Tourism, economic, physical and social impacts.* New York: Longman Scientific & Technical.

McEnnif, J. (1992). Seasonality of tourism demand in the European Community. *Travel & Tourism Analyst, 3*, 67–88.

McHugh, K. E., & Mings, R. C. (1992). Canadian snowbirds in Arizona. *Journal of Applied Recreation Research, 17*(3), 255–277.

Mings, R. C. (1997). Tracking 'snowbirds' in Australia: Winter sun seekers in far north Queensland. *Australian Geographical Studies, 35*(2), 168–182.

Mourdoukoutas, P. (1988). Seasonal employment, seasonal unemployment and unemployment compensation: The case of the tourist industry of the Greek islands. *American Journal of Economics and Sociology, 47*(3), 315–329.

Murphy, P. E. (1983). *Tourism: A community approach (RLE tourism)*. London, UK: Methuen.

Pegg, S., Patterson, I., & Gariddo, P. V. (2012). The impact of seasonality on tourism and hospitality operations in the alpine region of New South Wales, Australia. *International Journal of Hospitality Management, 31*(3), 659–666.

Pregibon, D. (1979). *Data analytic methods for generalized linear models* (PhD diss.) University of Toronto.

Rose, R. (1993). *Lesson-drawing in public policy.* Chatham NJ: Chatham House.

Rosselló, J., & Sansó, A. (2017). Yearly, monthly and weekly seasonality of tourism demand: A decomposition analysis. *Tourism Management, 60*, 379–389.

Rosselló, J., Riera, A., & Sansó, A. (2004). The economic determinants of seasonal patterns. *Annals of Tourism Research, 31*(3), 697–711.

Sastre, M. A. G., Hormaeche, M. A., & Villar, M. T. (2015). Are regional political decisions the key element in reducing seasonal variation in tourism? The case of the Balearic Islands. *Tourism Economics, 21*(6), 1207–1219.

Soesilo, J. A., & Mings, R. C. (1987). Assessing the seasonality of tourism. *Visions in Leisure*

and Business, 6(2), 25–38.
Song, H., & Witt, S. F. (2000). *Tourism demand modelling and forecasting.* Oxford: Pergamon.
Sorensen, N. K. (1999). Modelling the seasonality of hotel nights in Denmark by county and nationality. *Tourism Economics, 5*(1), 9–23.
Stanley, D., & Moore, S. (1997). Counting the leaves: The dimensions of seasonality in Canadian tourism. In K. Mackay, & K. Boyd (Eds.), Tourism for all Seasons: Using Research to Meet the Challenge of Seasonality (pp. 13–18). Winnipeg, Manitoba: University of Manitoba.
Steyn, J. N., & Spencer, J. P. (2012). Climate change and tourism: Implications for South Africa. African Journal for Physical *Health Education, Recreation and Dance, 18*(1), 1–19.
Sun, X., Wu, X., & Feng, X. (2015). Cruise tourism seasonality: An empirical study on the north American market. *Tourism Tribune, 30*(5), 117–126.
Sutcliffe, C. M., & Sinclair, M. T. (1980). The measurement of seasonality within the tourist industry: An application to tourist arrivals in Spain. *Applied Economics, 12*(4), 429–441.
Theil, H. (1967). *Economics and information theory.* Amsterdam: North Holland.
Tsitouras, A. (2004). Adjusted Gini coefficient and months equivalent degree of tourism seasonality: A research note. *Tourism Economics, 10*(1), 95–100.
Tucker, R. D., Marshall, V. W., Longino, C. F., & Mullins, L. C. (1988). Older Anglophone Canadian snowbirds in Florida: A descriptive profile. *Canadian Journal on Aging/La Revue canadienne du vieillissement, 7*(3), 218–232.
Turrión-Prats, J., & Duro, J. A. (2017). Tourist seasonality in Catalonia the relevance of demand factors. *Tourism Economics, 23*(4), 846–853.
Turrión-Prats, J., & Duro, J. A. (2018). Tourist seasonality and the role of markets. *Journal of Destination Marketing & Management, 8*, 21–23.
Vanegas Sr, M., & Croes, R. R. (2000). Evaluation of demand: US tourists to Aruba. *Annals of Tourism Research, 27*(4), 946–963.
Vergori, A. S. (2017). Patterns of seasonality and tourism demand forecasting. *Tourism Economics, 23*(5), 1011–1027.
Wall, G. (1998). Implications of global climate change for tourism and recreation in wetland areas. *Climatic Change, 40*(2), 371–389.
Wanhill, S. (1980). Tackling seasonality: A technical note. *International Journal of Tourism Management, 1*(4), 84–98.
Weaver, D., & Oppermann, M. (2000). *Tourism Management.* Brisbane: Wiley.
Williams, A. M., & Shaw, G. (1991). *Tourism and economic development- Western European experiences.* Chichester, UK: Wiley.
Yacoumis, J. (1980). Tackling seasonality: The case of Sri Lanka. *International Journal of Tourism Management, 1*(2), 84–98.
Zimmermann, F. (1998). Austria: Contrasting tourist seasons and contrasting regions. In G. Shaw, & A. Williams (Eds.). *Tourism and economic development: European experiences* (pp. 175–197). New York: Chichester.

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