Journal of Innovation & Knowledge 7 (2022) 100163

Journal of Innovation & Knowledge

https://www.journals.elsevier.com/journal-of-innovation-and-knowledge

Analysis of the role of innovation and efficiency in coastal destinations affected by tourism seasonality

Rosa María Puertas Medina[a], José María Martín Martín[b,*], José Manuel Guaita Martínez[a], Paula Serdeira Azevedo[c]

[a] Department of Economics and Social Sciences, Universitat Politècnica de València, Valencia, Spain
[b] Department of International and Spanish Economy, University of Granada, Granada, Spain
[c] CiTUR – Centro de Investigação, Desenvolvimento e Inovação em Turismo, ESGHT – Universidade do Algarve, Faro, Portugal

A R T I C L E I N F O

Article History:
Received 29 November 2021
Accepted 21 January 2022
Available online 1 February 2022

Key words:
Seasonality
Efficiency
Innovation
Coastal tourism

JEL codes:
L83 Sports
Gambling
Restaurants
Recreation
Tourism
O32 Management of Technological Innovation and R&D

A B S T R A C T

This research analyses the relationship between efficiency, innovation and seasonality of the Spanish coasts for a five-year period (2015–2019). First of all, the nexus between the level of efficiency and changes in productivity, driven by improvements in innovation and/or efficiency, is determined using Data Envelopment Analysis and the Malmquist Index. Second, this paper proposes a synthetic index to measure seasonality and assess its connection with efficiency and innovation, using a cross efficiency approach to do so. Results show how the intensity of seasonality influences efficiency. In addition, it is observed that innovation can offset possible decreases in efficiency; as such, policies that promote both aspects are needed in the more seasonal destinations.

Introduction

Tourism is currently one of the most important and fastest-growing economic sectors at an international level (Gómez-Vega et al., 2019). This activity has been positioned as one of the main pillars in the development of many regions and countries, as when it is done properly it promotes growth, creates jobs, attracts investment and boosts exports (Bampatsou, Halkos & Astara, 2020; Salinas, Guaita & Martín, 2021). Indeed, the form of implementation and the characteristics of the development model will determine the benefits generated, and even the negative impacts that may arise (Guaita-Martínez, Martín, Salinas & Mogorrón-Guerrero, 2019; Martín, Prados, de Castro & Jiménez, 2021, 2020). One of these factors that directly influences the final outcome is tourism seasonality (Martín, Salinas, Rodríguez & Jiménez, 2017). This tendency affects many economic sectors, although the tourism sector can be said to be among those that suffer the most (Cisneros & Fernandez, 2015). In the academic literature we find very diverse ways of expressing the concept of seasonality. Seeking a consensus among the proposed definitions, tourism seasonality can be described as the variations in the levels of activity that occur throughout the year in a destination, and that are expressed through changes in the flows of demand and the characteristics of the supply (Butler, 1994; López & López, 2006, Martín, 2018).

Fluctuations in tourism activity can undermine its capacity to contribute to development (Martín, Salinas & Rodríguez, 2019), and is a determining factor in business viability (Shen, Li & Song, 2009). Apart from other effects of seasonality on tourism environments, the lack of continuity in certain activities throughout the year puts numerous businesses at risk; particularly affected are destinations with a weak production structure, which are more vulnerable to variations in demand (Kastenholz & Lopes de Almeida, 2008). Conversely, business sustainability improves if the flow of activity is stable throughout the year (Martín et al., 2017). Coastal destinations suffer especially acutely from tourism

* Corresponding author.
E-mail address: martinmartin@ugr.es (J.M. Martín Martín).

https://doi.org/10.1016/j.jik.2022.100163

seasonality (Fernández, 2003), so research focused on such destinations should be a priority. In these regions, tourism has become the cornerstone of their economic development (Niavis & Kallioras, 2021) This is because coastal tourism can create major opportunities based on the huge volume of visitors it attracts (Apostolopoulos, Apostolopoulos & Gayle, 2002; Gossling, Hall & Scott, 2018), which entails strong positive externalities and multiplier effects (Martín et al., 2019). The driving force behind the attraction of this type of tourism is the "sea, sun and sand" model (Hall, 2001). While this model of development offers huge potential, it involves a number of characteristics that need to be taken into account: the seasonality and the spatial concentration of large flows of visitors (Batista e Silva et al., 2018).

This study focuses on the analysis of tourism seasonality in coastal destinations, specifically the main Spanish coastal destinations. Several authors worthy of mention have argued for the need to expand the research on seasonality in such areas (Niavis & Kallioras, 2021). Furthermore, the academic literature indicates that there are still considerable gaps in the quantitative research on seasonality, so more studies are needed to contribute to an effective treatment of the problem (Koenig-Lewis & Bischoff, 2005). As Higham and Hinch (2002) point out, the phenomenon of tourism seasonality, despite representing one of the most prominent characteristics of tourism, is one of the least understood. Within the tourism sector, accommodation activities may be the most vulnerable to fluctuations in demand, given that they have to deal with a greater magnitude of fixed capital to be matched with both labor and demand (Pérez-Granja & Inchausti-Sintes, 2021). Seasonality, in the case of hotels, tends to damage operational and financial performance, and to reduce competitive advantage and efficiency (Zhang & Xie, 2021). An excessive level of seasonality can increase the risk of hotel closure (Falk & Hagsten, 2018; Vivel-Búa, Lado-Sestayo & Otero-González, 2019). Hence, the proposed analysis refers to the hotel industry in coastal areas.

Specifically, this paper explores whether there is any connection between efficiency, innovation and seasonality in accommodation services on the different Spanish coasts. In this respect, two research questions (RQ) are proposed. RQ1: Do advances in innovation translate into higher levels of efficiency? And RQ2: Is there any relationship between the level of seasonality, efficiency and innovation? The role of innovation is no minor issue when it comes to analysing tourism seasonality. Several authors have directly pointed to innovation —in its various form— as the key tool for reducing seasonality (Martín, Jimenez & Molina, 2014; Senbeto & Hon, 2021). The proposed analysis, which seeks to answer the two research questions, is based on monthly data from the main Spanish coastal areas for a five-year period (2015−2019). This setting has been chosen due to the strength and diversity of the tourism product: in 2019, this country attracted 87.9 million tourists (National Statistics Institute, 2020). The 8000 km of Spanish coastline and the aforementioned flow of tourists make this country a leader in international tourism, ranking as one of the most competitive countries in this sector (Salinas, Serdeira, Martín & Rodríguez, 2020). As such, the setting for the research is one of leadership and a high level of competitiveness.

The empirical analysis has been carried out using data envelopment analysis (DEA), the Malmquist Index (MI) and cross efficiency (CE). All of these are suited to the specific features of the proposed research, helping to ensure that the results reflect the reality on the ground. In addition, the construction of a synthetic index (SI) required the prior calculation of the Gini indices (GI) of each and every one of the variables used to determine efficiency levels. These techniques are widely accepted in the field of tourism research (Karakitsiou, Kourgiantakis, Mavrommati & Migdalas, 2020; Sharma, Jaisinghani, Joshi, Goyal & Aggarwal, 2021; Zha, Zhu, He, Tan & Yang, 2020) due to their great flexibility and capacity for yielding robust results.

The rest of the article is structured as follows. The problem under analysis is set out in section 2, outlining the possible implications of innovation in tourism seasonality. The methods and variables used are presented in section 3. The results of the research are analysed in section 4. Lastly, the conclusions, the contribution of the study and the limitations are summarized in section 5.

Implications of innovation in tourism seasonality

There are various ways in which tourism seasonality affects the destinations in question. The main implications of this problem are detailed below. To that end, four categories of effects have been defined: environmental, social, labor and economic. From an environmental point of view, the negative effects stemming from seasonality are associated with the peaks in tourist arrivals. In these peak periods, greater pressure is exerted on the environment, a large amount of waste is generated and the natural renewal of resources is hindered (Butler, 1994; Grant, Human & Le Pelley, 1997). From a social perspective, the implications of seasonality are associated with both the peaks and troughs. In peak periods, local communities can be disturbed in a number of different ways, while in low season the local environments can suffer the loss of overly intensive activity, leaving sad, desolate places (Kuvan & Akan, 2005; Waitt, 2003). The labor implications of tourism seasonality are a result of the lack of stability of the tourist activity throughout the year. This seasonal dynamic impedes job stability, the ability to attract good professionals and improvements to service quality, therefore contributing to the precariousness of the jobs offered (Baum, 1999; Mill & Morrison, 1998). Workers must look for other jobs to compensate for lost income or save money in peak times (Murphy, 1985). Lastly, the economic implications of seasonality are also associated with fluctuations in activity. The existence of trough periods implies an inefficient use of resources (Georgantzas, 2003; Getz & Nilsson, 2004; Roselló, Riera & Sausó, 2004), reducing return on investment and leading to loss of profits (Cuccia & Rizzo, 2011). The pressure on companies to generate income increases, which can affect prices (Niavis & Kallioras, 2021). This means that more seasonal destinations are less able to reduce unemployment and attract investment (Candela & Castellani, 2009). Meanwhile, in peak times excessive tourist flows can adversely affect the service, generating a negative image of establishments (Flognfeldt, 2001; Koc & Altinay, 2007).

The causes of tourism seasonality can be explained from a general perspective or with reference to the particular circumstances of each destination (Martín et al., 2014). There is a diverse range of general causes that affect all destinations, and several classifications of these causes can be found in the literature. In summary, the main ones are associated with factors such as weather; events; time-planning factors, including business or school holidays, and accounting periods; force of habit; social pressure; and travel restrictions (Butler, 1994; Hylleberg, 1992). Regarding the destination-specific factors, there are the climatic conditions of each area; the natural and artificial resources of the destination; the orientation of the products offered; and the connection to major markets through means of transport (Higham & Hinch, 2002). The destinations that enjoy greater stability are those that are most diversified in terms of source markets and tourist segments, are less dependent on the climate, and offer a wider range of products, (Fernández, 2003; Martín et al., 2014). While some destinations have moved towards greater specialization in order to capture a significant market share (Lobo, Flores, Quiroz & Cruz, 2018), this can be a dangerous direction to take if it is not accompanied by measures to diversify segments and markets.

Tourism companies' strategies for dealing with seasonality can be classified into three categories. They consist of proactively striving to attract new seasonally complementary segments, adapting to market fluctuations by trying to guarantee demand, or doing nothing and accepting the situation (Senbeto & Hon, 2021). Proactive strategies include the actions of some companies and public entities that apply novel marketing strategies, define new products targeted at untapped segments, create new tourism resources, extend the average stay, increase activities in the destination and adjust prices to demand (Banki, Ismail & Muhammad, 2016; Getz & Nilsson, 2004; Jolliffe & Farnsworth, 2003; Oklevik et al., 2019). Among these alternatives, the most proactive ones clearly entail greater potential for improvement. Therefore, innovation and the organizational culture of the company are two critical aspects (Senbeto & Hon, 2021).

As noted, tourism seasonality is one of the key factors that determines the sustainability—in a broad sense—of a tourist destination (UN, 2004). In fact, fluctuations in demand are one of the biggest challenges that companies in the sector have to face (Martín, Rodríguez, Zermeño & Salinas, 2018). The hotel industry's response to fluctuations in demand is centered not only on optimizing occupancy and capacity levels (Boffa & Succurro, 2012), but also on the management of inputs (Park, Yaduma, Lockwood & Williams, 2016). In these cases, as indicated above, the degree of innovation is decisive when it comes to containing the problem. Despite the importance of the aforementioned changes—innovations—from a supply-side perspective, much more of the research on tourism seasonality adopts a demand-side approach (Pulina, Detotto & Paba, 2010). Indeed, Wanhill (2007) states that studies focused exclusively on supply account for only 9% of the total. A specific example of such a study would be the analysis of the efficiency of the activities in the tourism sector, which remain largely understudied, in part as a consequence of the intangible nature of tourism (Grönroos & Ojasalo, 2004). Only a few studies have analysed hotel efficiency (Pulina et al., 2010), albeit without considering the effect of seasonality. Such studies would be very useful for gaining a better understanding of the effects of seasonality and ways to contain it, as well as providing guidance on the most effective strategies to combat its negative effects (Koening & Bischoff, 2003).

Methods and materials

The empirical analysis was carried out on a sample composed of monthly information from the Spanish coasts corresponding to the period 2015–2019. The year 2020 has not been included to prevent the effects of the COVID-19 pandemic from distorting the results. The coasts of the Balearic Islands have been removed from the sample due to the lack of complete statistical information and the fact that they turned out to be an outlier in the total set of observations. The research questions have been answered by applying DEA, sequential MI, and CE.

Methods

DEA is a non-parametric linear programming method that, based on a set of inputs and outputs associated with the decision making units (DMUs), constructs an efficient production frontier with the observations that achieve an optimal combination of the variables. From this initial approach, it is possible to either maximize the outputs with the available resources (output orientation) or to minimize the inputs, given the outputs of each DMU (input orientation). As originally defined by Charnes, Cooper and Rhodes (1978)), DEA only accounted for proportional increases of inputs and outputs, that is, it worked under the assumption of constant returns to scale (CRS). In order to address this rigidity and to be able to recreate more realistic situations, Banker, Charnes and Cooper (1984)) reformulated the model with variable returns to scale (VRS), endowing it with greater flexibility to adapt to the specific features of each situation. Eq. (1) shows the specification of the linear programming problem.

$$\text{Min } h_0 = \sum_{i=1}^{m} v_i x_{i0} + w_0 \tag{1}$$

s.t.

$$\sum_{r=1}^{s} u_r y_{r0} = 1$$

$$\sum_{r=1}^{s} u_r y_{rj} + \sum_{i=1}^{m} v_i x_{ij} + w_0 \qquad j = 1, \ldots n$$

$$u_r, v_i \geq 0 \qquad r = 1, \ \ldots, \ s \qquad i = 1, \ \ldots, \ m$$

where:

h_0: level of efficiency
x_{ij}: quantities of input i consumed by the j-th unit
y_{rj}: observed quantities of output r produced by the j-th unit
u_r: input weightings
v_i: output weightings
w_0 : returns to scale

The level of efficiency h takes values equal to or greater than 1. Since 1 is the maximum level, the amount over 1 represents how much the outputs should be increased by to be completely efficient. In addition, the efficiency score is calculated through the inverse of h; its value ranges between 0 and 1, with a value of 1 reached only by efficient DMUs.

DEA has been a popular method in the scientific community due to its characteristic features: the efficient frontier is constructed with multiple inputs and outputs; it is not necessary to establish a functional form for the relationship between the variables, or to assign them weights; it can deal with differences in the units of measure; and it extracts individual optimizations with different patterns of behavior, for example, in terms of technology (Cooper, Seiford & Zhu, 2011; Ruggiero, 2007). In this research, given the characteristics of the sample and the proposed objective, a VRS output-oriented model has been used, both to construct the SI and to calculate the level of efficiency of each coast. In addition, an intertemporal dimension has been incorporated to prevent isolated events occurring in one year from distorting the results (Cruz-Cazáres, 2013; Bresciani, Puertas, Ferraris & Santoro, 2021).

The robustness of DEA when it comes to measuring the efficiency of a set of observations is supported by a broad literature on the subject. DEA and various versions thereof have been successfully implemented in a wide range of areas, such as transport (Tian, Tang, Che & Wu, 2020), construction (Zhou, Liu, Lv, Chen & Shen, 2019), logistics (Deng, Xu, Fang, Gong & Li, 2020), energy (Mohsin, Hanif, Taghizadeh-Hesary, Abbas & Iqbal, 2021), water (Liu, Yang & Yang, 2020), health (Puertas, Marti & Guaita-Martinez, 2020), the public sector (Msann & Saad, 2020) and even the hotel industry (Yu & Chen, 2020).

The change in productivity in the analysed period has been calculated using the sequential MI. This method can be attributed to the original study by Caves, Christensen and Diewert (1982)), developed on the basis of the Malmquist (1953) and Törnqvist (1936) indices, which did not account for the possibility of inefficient behavior. In subsequent developments by Färe, Grosskopf, Lindgren and Roos (1989) and Färe et al. (1994), the changes in productivity are broken down into changes in technical efficiency (EC) and changes in technology (TC). In this study, the former determines the change in the level of efficiency as a result of the management of resources, while the latter refers to technical progress made due to technical innovations and improvements (equation 2)

$$MI(x^{t+1}, y^{t+1}, x^t, y^t) = \underbrace{\frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)}}_{EC} * \underbrace{\left[\left(\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})}\right)\left(\frac{D_0^t(x^t, y^t)}{D_0^{t+1}(x^t, y^t)}\right)\right]^{1/2}}_{TC} \quad (2)$$

where D represents the distance functions with respect to t and $t + 1$. EC and TC take values greater than, equal to, or less than 1. If EC>1, the amount over 1 constitutes the efficiency improvements achieved in the analysed period, while TC>1 indicates the introduction of technological progress. Multiplying the two ratios gives the value of the MI; if MI>1 there has been an improvement in the productivity of the corresponding DMU, due to growth in EC and/or TC. In this study, we use the sequential MI proposed by Tulkens and Eeckaut (1995) to avoid the technological regress that would be unlikely to occur in modern production systems (TC<1). Sequential technology means that the efficient frontier of year *t* is constructed from the variables of that year plus those of previous years, such that technological knowledge accumulates over time. Similarly to DEA, the MI has been widely adopted; for example, in environmental assessments (Puertas & Marti, 2021), the evaluation of mining companies (Oliveira, Zanella & Camanho, 2020) and in the analysis of innovation (Firsova & Chernyshova, 2020), among others.

Finally, the seasonality SI has been constructed using a version of DEA, namely CE, which allows us to obtain a complete ranking of all the DMUs in the sample. This method was originally proposed by Sexton, Silkman and Hogan (1986)), and later validated by Doyle and Green (1994). The CE matrix determines how efficient one unit is relative to the others, that is, it evaluates the performance of each DMU using the other observations' optimal weights for the inputs and outputs. The elements of the matrix are calculated using the following expression:

$$E_{kj} = \frac{\sum_{r=1}^{s} u_{rk} y_{rj}}{\sum_{i=1}^{m} v_{ik} x_{ij}} \; j = 1, \ldots, n; \; k = 1, \ldots, n \quad (3)$$

where u_{rk} and v_{ik} are the optimal multipliers of each DMU, with the original efficiency scores remaining on the diagonal. The CE value for DMU_j is obtained by averaging the efficiency score (*E*) corresponding to DMU_j calculated with the optimal weights of the other DMUs. CE has proved very useful for constructing SI, enabling the assessment of quality of life (Martín & Mendoza, 2013), the environmental situation (Marti & Puertas, 2020), the anthropogenic vulnerability of regions (Fernández-Macho, González & Virto, 2020) and the spatio-temporal efficiency of coastal performance (Niavis, 2020), for example. This method has been used here to construct the seasonality SI, with the inputs and outputs having been transformed into GI by means of the following expression:

$$GI = 1 + \left(\frac{1}{n}\right) - \left(\frac{2}{(n^2 \cdot x')}\right) \cdot (x_1 + 2x_2 + 3x_3 + \ldots + nx_n) \quad (4)$$

where n is the number of observations, x' the mean of the observations and $x_1, x_2, \ldots, x_n$ the observations ordered in descending value. The GI ranges between 0 and 1, with 1 denoting the maximum level of seasonal concentration. This measure takes into account the asymmetry of the distribution, it is less influenced by extreme values, and the transfer of tourist demand from a month with higher occupancy to another with lower occupancy reduces the coefficient (Aguiló & Sastre, 1984; Wanhill, 1980; Yacoumis, 1980). It is because of these advantages that the GI has been used extensively in the analysis of tourism seasonality, in research aimed at providing information for the development of "de-seasonalization" strategies and policies (Guaita-Martínez, Martín & Ostos, 2020; Martín et al., 2019). To construct the SI, the GI used as inputs have to be transformed into "aspects to be improved”, by subtracting the value corresponding to each observation from the maximum value ($1\text{-}GI_i$).

Materials

The sample used to carry out the research has been constructed from monthly tourist information on the 27 coastal destinations in Spain. The period of analysis covers five years. The data has been obtained from official series that are issued by the National Institute of Statistics of Spain, therefore, ensuring the high quality of such data. We have not found gaps, the series are homogeneous and required no adjustments to estimate the model. In other areas of research, such as innovation, eco-efficiency and even in the hotel sector, inputs and outputs are more consensual in the literature. However, when analyzing the tourism sector at the regional level, variables are highly conditioned by the objective set. Nurmatov, Fernandez and Coto Millán (2020)), consider that the identification of inputs and outputs in tourism remains an open question. This study adopts a performance-focused approach to the accommodation supply, which leads to seasonality being analyzed from the point of view of supply. Studies that take this point of view are scarcer in the academic literature. Table 1 presents the variables and their main statistics.

The results reveal wide dispersion in the sample, due not only to the size of the coasts but also to the degree of existing seasonality. Almost all of them have their highest levels of demand concentrated in the summer months, when there is a considerable rise in employment as a result, as well as in occupancy rates and average stays. As shown in Table 2, the average stay in the Canary Islands is longer than in the other Spanish coastal areas. Regarding occupancy rates, the Canary Islands once again stand out compared to the rest, although the Costa Blanca in the Valencian Community (67.97%), the Costa del Sol in Andalusia (62.44%) and the Guipuzcoa Coast in the Basque Country (62.01%) all come close.

Finally, analysing mean productivity by region (referred to as an Autonomous Community in Spanish administrative nomenclature), Table 3 shows that the coasts of Galicia have the highest mean productivity at 9.22 places per employee, with the Canary Islands at the opposite extreme (5.18). By destination, the highest value is registered by the Costa Da Morte with 10.76, with notable values also recorded by the Costa Daurada in Catalonia (10.11) and the Costa de Almería in Andalusia (9.85). As reflected in the subsequent analysis of efficiency, the most relevant element is not the number of places available but the occupancy rates and average stay.

Table 1
Descriptive statistics of the variables (2015–2019).

	Employment	N° places	Occupancy rate	Average stay domestic tourists	Average stay international tourists
Mean	4670.87	30,005.92	55.28	3.01	4.65
SD	4977.53	27,108.13	20.65	1.12	2.47
Max	19,790	93,372	95.68	7.17	9.88
Min	72	987	5.01	1.13	1.04
Role	input	Input	output	output	output
Unit	number	Number	%	days	Days
N°obs.	1620	1620	1620	1620	1620

Table 2
Descriptive statistics of the variables (2015–2019) – destinations-.

	Employment	N° places	Occupancy rate	Average stay domestic tourists	Average stay international tourists
Andalucía: Costa de Almería	2778.22	27,355.08	44.83	3.17	4.92
Andalucía: Costa de La Luz de Huelva	2244.73	17,310.72	47.06	3.75	5.73
Andalucía: Costa de La Luz de Cádiz	4517.10	31,143.62	49.95	2.46	3.76
Andalucía: Costa del Sol	11,531.02	76,366.18	62.44	2.72	4.42
Andalucía: Costa Tropical	718.82	6298.68	49.95	3.02	5.53
Asturias (Principado de): Costa Verde	1357.72	11,595.50	36.74	2.01	2.04
Canarias: Isla de Fuerteventura	8047.85	47,649.35	73.07	4.71	8.58
Canarias: Isla de Gran Canaria	11,911.73	63,006.82	76.94	3.68	8.02
Canarias: Isla de La Gomera	409.68	1756.12	64.51	2.29	6.58
Canarias: Isla de La Palma	634.85	4382.17	62.51	3.45	7.73
Canarias: Isla de Lanzarote	6422.08	36,614.42	77.13	5.01	8.03
Canarias: Isla de Tenerife	17,546.15	86,398.97	76.80	4.22	7.75
Canarias: Sur de Gran Canaria	10,890.05	56,481.57	79.03	4.76	8.42
Canarias: Sur de Tenerife	14,103.87	66,420.43	78.72	4.59	7.87
Cataluña: Costa Barcelona	5137.53	44,240.73	56.78	2.06	3.12
Cataluña: Costa Brava	6011.52	51,302.75	50.28	2.29	3.37
Cataluña: Costa Daurada	3863.22	39,051.12	50.70	2.30	3.87
Comunitat Valenciana: Costa Blanca	8695.50	64,910.10	67.97	3.66	5.02
Comunitat Valenciana: Costa de Castellón	1764.33	15,527.35	50.28	3.04	3.00
Comunitat Valenciana: Costa Valencia	1106.38	8882.87	51.34	3.09	2.48
Galicia: Costa A Mariña Lucense	270.27	2773.58	26.65	1.90	1.97
Galicia: Costa Da Morte	214.35	2302.10	25.76	1.99	1.47
Galicia: Rías Altas	977.37	10,059.20	38.68	1.95	2.26
Galicia: Rías Baixas	2478.02	21,180.63	37.07	2.31	1.92
Murcia (Región de): Costa Cálida	1125.53	9084.50	50.85	2.96	3.64
Pais Vasco: Costa Bizkaia	179.57	1328.02	44.66	2.02	1.97
Pais Vasco: Costa Guipuzkoa	1176.12	6737.38	62.01	1.90	2.04

The seasonal SI has been constructed from the GI of the variables used to calculate efficiency. The GI transforms the monthly data into annual data, reflecting the seasonality corresponding to each of the observations in the sample. Table 4 presents the main statistics of the inputs and outputs used.

On average, the variables indicate a seasonality that ranges from 0.091, corresponding to the average stay of domestic tourists, to 0.148 for occupancy rates. The vast majority of the coasts base their offer on sun-and-sand tourism, which is strongly dependent on the prevailing weather in the different seasons of the year, and highly exposed to climate change as well as the reduction of water resources (Saurí et al., 2013). This leads to major differences according to the sections of coastline analysed. While some coasts of Catalonia (Costa Daurada) record the maximum GI in employment and number of places on offer (0.349 and 0.377), the Island of La Palma and Tenerife barely reach 0.02 and 0.08, respectively. In terms of outputs, it is Costa da Morte, Costa de la Luz de Cádiz and Costa Daurada that have GI values exceeding 0.20 (0.362, 0.203 and 0.392, respectively). These results are strongly conditioned not only by the average temperature of the Canary Islands, but also by the greater diversification of products on offer, such as agrotourism, cultural and sports tourism (Fusté Forné, Medina & Mundet, 2020; Higham, 2021; Melo, Rheenen & Sobry, 2021; Rivero, García-Ceballos, Aso & Navarro-Neri, 2021).

Results

In the first stage of the research, intertemporal DEA and the sequential MI were used in order to assess both the level of efficiency and the efforts that may have been made to improve productivity during the five years preceding the COVID-19 pandemic. Table 5 shows the level of efficiency (EFF level), the score (EFF score), the productivity (MI) and its components (TC and EC). All calculations were performed using the deaR statistical package implemented in Rstudio (Coll-Serrano, Benítez & Bolos, 2018).

On average, it can be seen that the Spanish coasts could increase their output by 60.4% with the available inputs, but there is marked disparity in the performance of different coasts. While the level of inefficiency of the coasts of the Canary Islands ranges between 22.2% for Tenerife and 14.3% for Fuerteventura, others such as Costa Verde, Rias Baixas, Rias Altas and Costa de la Luz de Cádiz have levels of inefficiency of 139.6%, 132.9%, 132.4%, 100.7% and 100.1%, respectively. On the other hand, productivity has fallen on average by 2.8%, mainly due to a decrease in EC. There is no relationship between the level of efficiency and improvement in productivity (RQ1). For example, Costa Verde is in last place in terms of efficiency; however, its MI turns out to be among the top (2.8%) only behind Costa Bizkaia (4.9%), due to more intense efforts to introduce innovative products (TC =10.5%). There is widespread concern about improving the offer of services by introducing innovative packages that attract tourists and smooth out the seasonality. This is the case with Costa Daurada: despite its poor results, it offers an alternative culinary tourism offer, showcasing local products to visitors (Fusté Forné et al., 2020). The Costa Brava complements the summer period with activities aimed at the wine route, with marketing making great strides in this area (Casas & Crous-Costa, 2020).

In short, the results show that decreases in efficiency (EC) have been offset by improvements in innovation (TC), meaning there has been almost no change in productivity (MI). Decision-makers should adopt measures aimed at both components (EC and TC). This would allow a greater connection between efficiency levels (EFF level) and productivity improvements (MI). The role of innovation is increasingly important in management systems (Di Vaio, Palladino, Pezzi & Kalisz, 2021; Tiberius, Schwarzer & Roig-Dobón, 2021). Coastal areas need innovative policies to diversify the products and markets that support their sector, improving competitiveness and efficiency (Phucharoen & Sangkaew, 2020; Sigalat-Signes, Calvo-Palomares, Roig-Merino & García-Adán, 2020). Brandão, Breda and Costa (2019)) propose the use of territorial innovation models that rely on international relations between organizations to develop new products and services. Destination managers should abandon the strategy of consolidation in favor of introducing innovation, developing new experiences that facilitate market expansion (Gardiner & Scott, 2018; Guaita, Martín, Ostos & Ribeiro, 2021). The literature on tourism reflects this new trend towards diversification and innovation (Aldebert, Dang & Longhi, 2011; Benur & Bramwell., 2015; Clarizia, De Santo, Lombardi, Mosca & Santaniello, 2021).

Table 3
Mean productivity by Autonomous Community (2015−2019).

	Employment	N° Places	Mean productivity
Andalucía: Costa de Almería	2778.22	27,355.08	9.85
Andalucía: Costa de La Luz de Huelva	2244.73	17,310.72	7.71
Andalucía: Costa de La Luz de Cádiz	4517.10	31,143.62	6.89
Andalucía: Costa del Sol	11,531.02	76,366.18	6.62
Andalucía: Costa Tropical	718.82	6298.68	8.76
Andalucía	21,789.89	158,474.28	7.27
Asturias (Principado de): Costa Verde	1357.72	11,595.50	8.54
Canarias: Isla de Fuerteventura	8047.85	47,649.35	5.92
Canarias: Isla de Gran Canaria	11,911.72	63,006.82	5.29
Canarias: Isla de La Gomera	409.68	1756.12	4.29
Canarias: Isla de La Palma	634.85	4382.17	6.90
Canarias: Isla de Lanzarote	6422.08	36,614.42	5.70
Canarias: Isla de Tenerife	17,546.00	86,398.00	4.92
Canarias: Sur de Gran Canaria	10,890.00	56,481.00	5.19
Canarias: Sur de Tenerife	14,103.00	66,420.00	4.71
Canarias	69,965.18	362,707.88	5.18
Cataluña: Costa Barcelona	5137.00	44,240.00	8.61
Cataluña: Costa Brava	6011.00	51,302.00	8.53
Cataluña: Costa Daurada	3862.00	39,051.00	10.11
Cataluña	15,010.00	134,593.00	8.97
Comunitat Valenciana: Costa Blanca	8695.00	64,910.00	7.47
Comunitat Valenciana: Costa de Castellón	1764.00	15,527.00	8.80
Comunitat Valenciana: Costa Valencia	1106.00	8882.00	8.03
Comunitat Valenciana	11,565.00	89,319.00	7.72
Galicia: Costa A Mariña Lucense	270.00	2773.00	10.27
Galicia: Costa Da Morte	214.00	2302.00	10.76
Galicia: Rías Altas	977.00	10,059.00	10.30
Galicia: Rías Baixas	2478.00	21,180.00	8.55
Galicia	3939.00	36,314.00	9.22
Murcia (Región de): Costa Cálida	1125.00	9084.00	8.07
Pais Vasco: Costa Bizkaia	179.00	1328.00	7.42
Pais Vasco: Costa Guipuzkoa	1176.00	6737.00	5.73
País Vasco	1355.00	8065.00	5.95
Total	248,375.86	1591,560.82	6.41

In the second stage of the research, an SI was developed from the GI, enabling the analysis of the relationship between seasonality and the levels of efficiency (EFF level) and innovation (TC). CE was used to rank the Spanish coasts from lowest to highest seasonality (Table 6).

The results in Table 6 show reflect a degree of correspondence between seasonality and efficiency levels, but not with innovation (RQ2). The least seasonal destinations are those with the highest EFF level—that is, the most efficient—but they are not the ones introducing the most innovation (TC). Overall, the coasts of the Canary Islands have turned out to be the least seasonal and the most efficient; however, in no case do they show the greatest advances in productivity and/or innovation. Likewise, the Costa Daurada and Costa de la Luz de Cádiz are among the least efficient and the most seasonal, making great efforts to diversify their offer by introducing innovative packages (TC=11.1% and 9.5% respectively). The Canary Islands enjoy a warm climate all year round and good connectivity with much of the European territory, making them a very popular winter destination for the foreign market. However, they need to introduce changes that allow them to make progress in terms of efficiency and productivity, which is in line with what Ledesma, Lorenzo and Martín (2021)) have indicated. Therefore, it can be seen that seasonality directly affects efficiency levels, and has an inverse relationship with innovation. The least efficient coasts are introducing innovative tour packages as a way to augment supply and allay their seasonality problem. Inchausti-Sintes, Voltes-Dorta and Suau-Sánche (2021)) consider it necessary to focus efforts on tourism activities with higher added value, investing in quality and innovation of services. In this respect, Pérez-Granja and Inchausti-Sintes (2021) confirm that specialization improves the efficiency of the hotel sector. All this entails improving infrastructure while respecting the natural characteristics of each area. In this respect, marketing campaigns play a fundamental role; they must direct their efforts towards the markets most closely aligned to the tourist product on offer (Tiago, Gil, Stemberger & Borges-Tiago, 2021). In recent years, there has been a proliferation of scientific analyses relating to marketing and tourism (Cavalcante, Coelho & Bairrada, 2021; Lim, Yap & Makkar, 2021; Santos, Sousa, Ramos & Valeri, 2021), demonstrating the growing importance of the topic.

Conclusions

There is a pressing need to analyze the seasonality of tourism in coastal destinations, due to the negative effect that these fluctuations can have on the business network in those areas. Research on seasonality is important not only because of the impact of this phenomenon on the economy and society, but also because of the lack of quantitative studies that can provide tools for optimizing resources. The scarcity of related scientific studies makes this research even more interesting. Tourism seasonality particularly affects coastal destinations, with the hotel industry being especially vulnerable; this is why it has been chosen here as the subject of analysis in the context of one of the world leaders in tourism, Spain.

The novelty of this study is that it is based, on the one hand, on an analysis of efficiency in the provision of accommodation services, to check whether they have improved their productivity. On the other hand, it analyses the influence of innovation on the levels of tourism seasonality on the Spanish coasts. The incorporation into the study of the seasonality factor and its relationship with efficiency and innovation adds a unique element to this research.

The empirical analysis has used an extensive database with monthly information on the Spanish coasts for the period 2015−2019. The application of the DEA method and versions thereof has helped ensure the robustness and soundness of the results, allowing us to provide answers to the research questions raised. The results show that efficiency levels do not depend on the productivity of the tourism sector on the analysed coasts. Even the least efficient are

Table 4
Descriptive statistics of the GI (2015−2019).

	GI Employment	GI Number of places	GI occupancy rate	GI average stay domestic tourists	GI average stay foreign tourists
Mean	0.107	0.141	0.148	0.091	0.109
SD	0.093	0.111	0.079	0.034	0.081
Max	0.349	0.377	0.362	0.203	0.393
Min	0.002	0.008	0.024	0.029	0.019
Role	input	Input	output	output	output
Unit	%	%	%	%	%
N°obs.	135	135	135	135	135

Table 5
Intertemporal DEA efficiency and sequential MI (2015−2019).

	EFF level	EFF score	MI	TC	EC
Canarias: Isla de Fuerteventura	1.143	0.875	0.943	1.072	0.880
Canarias: Sur de Gran Canaria	1.145	0.874	0.946	1.053	0.898
Canarias: Isla de La Palma	1.149	0.870	0.917	1.083	0.847
Canarias: Isla de La Gomera	1.153	0.868	1.004	1.033	0.972
Canarias: Isla de Lanzarote	1.182	0.846	0.949	1.064	0.892
Canarias: Sur de Tenerife	1.192	0.839	0.951	1.048	0.908
Canarias: Isla de Gran Canaria	1.196	0.836	0.966	1.055	0.915
Canarias: Isla de Tenerife	1.222	0.819	0.944	1.047	0.902
Pais Vasco: Costa Bizkaia	1.303	0.767	1.047	1.079	0.970
Andalucía: Costa de La Luz de Huelva	1.387	0.721	1.000	1.110	0.901
Andalucía: Costa Tropical	1.397	0.716	0.935	1.118	0.836
Comunitat Valenciana: Costa Blanca	1.436	0.696	0.943	1.099	0.858
Pais Vasco: Costa Guipuzkoa	1.567	0.638	0.980	1.055	0.928
Andalucía: Costa del Sol	1.595	0.627	0.952	1.091	0.873
Comunitat Valenciana: Costa Valencia	1.636	0.611	1.009	1.088	0.928
Murcia (Región de): Costa Cálida	1.693	0.591	0.988	1.104	0.895
Andalucía: Costa de Almería	1.700	0.588	0.965	1.129	0.855
Galicia: Costa Da Morte	1.721	0.581	0.926	1.097	0.844
Comunitat Valenciana: Costa de Castellón	1.753	0.570	0.978	1.106	0.885
Cataluña: Costa Barcelona	1.794	0.557	0.977	1.094	0.893
Galicia: Costa A Mariña Lucense	1.880	0.532	0.961	1.105	0.869
Cataluña: Costa Brava	1.995	0.501	0.966	1.108	0.871
Cataluña: Costa Daurada	2.001	0.500	0.996	1.111	0.897
Andalucía: Costa de La Luz de Cádiz	2.007	0.498	0.951	1.095	0.869
Galicia: Rías Altas	2.324	0.430	0.990	1.104	0.897
Galicia: Rías Baixas	2.329	0.429	1.018	1.099	0.927
Asturias (Principado de): Costa Verde	2.396	0.417	1.028	1.105	0.930
Mean	1.604	0.659	0.972	1.087	0.894

expanding their tourism offer, including innovative activities that encourage the demand for their services. Therefore, innovation is making it possible to make up for the overall decline in efficiency (EC) observed in Spanish coasts, which is preventing the existence of a direct relationship between the level of efficiency and productivity (RQ1). This finding provides the answer to RQ1. Secondly, a relationship is observed between seasonality and the level of efficiency, at some distance from the advances in innovation. On the basis of these results, we can conclude that the coastal areas most affected by seasonality are the least efficient. Nevertheless, they are striving to diversify their offer, innovating with new products (RQ2). Thus, policies to tackle seasonality, such as the diversification of products, segments and markets, are key to improving this efficiency. This answers RQ2. This can provide clear public and business policy recommendations. It is necessary to strengthen the business network in order to bolster its competitiveness, and efficiency gains are needed to do so. Seasonality reduces this efficiency, meaning that competitiveness depends on the ability to attract stable flows of tourism throughout the year. An emphatic recommendation is to reject strategies that accept high levels of seasonality, and instead seek to actively tackle this issue through the abovementioned diversification strategies, as they will boost productivity in the destinations that need it most. We make public policy recommendations based on the results of relevant academic studies and the results of this study. It is important to diversify the tourist segments in order to attract flows of visitors with temporarily complementary travel patterns. This diversification requires, as a preliminary step, innovation in tourism products and the attraction of tourists from different markets. Product innovation makes it possible to attract a heterogeneous mix of visitors, which deseasonalises arrival flows. To guarantee the success of these strategies, it is necessary to invest in new and relevant infrastructures for tourism and in new services which can be offered to tourists, as well as to improve the image of the destination so that it is correctly positioned. Such investment and planning must come from both the public sector and private companies.

One limitation of this analysis concerns the availability of statistical data. Information on the specific characteristics of each of the areas analysed is needed to be able to delve into the causes underlying the results. This would allow us to provide statistical evidence on the determinants of innovation, and thus offer more precise guidance for decision-makers. Finally, it would be interesting to carry out a specific study focused on the Balearic Islands since this destination could not be included in the present study given its characteristics.

Table 6
SI of Seasonality (2015−2019).

	Seasonality SI	Ranking
Canarias: Isla de Tenerife	0.176	1
Canarias: Sur de Tenerife	0.228	2
Canarias: Sur de Gran Canaria	0.252	3
Canarias: Isla de Lanzarote	0.269	4
Canarias: Isla de Gran Canaria	0.281	5
Canarias: Isla de Fuerteventura	0.305	6
Comunitat Valenciana: Costa Blanca	0.319	7
Canarias: Isla de La Palma	0.367	8
Andalucía: Costa del Sol	0.399	9
Canarias: Isla de La Gomera	0.405	10
Pais Vasco: Costa Bizkaia	0.448	11
Pais Vasco: Costa Guipuzkoa	0.450	12
Galicia: Rías Altas	0.473	13
Andalucía: Costa Tropical	0.504	14
Cataluña: Costa Barcelona	0.506	15
Murcia (Región de): Costa Cálida	0.520	16
Galicia: Rías Baixas	0.546	17
Asturias (Principado De): Costa Verde	0.571	18
Cataluña: Costa Brava	0.615	19
Galicia: Costa A Mariña Lucense	0.617	20
Comunitat Valenciana: Costa Valencia	0.642	21
Andalucía: Costa de Almería	0.678	22
Andalucía: Costa de La Luz de Cádiz	0.696	23
Comunitat Valenciana: Costa de Castellón	0.698	24
Andalucía: Costa de La Luz de Huelva	0.718	25
Galicia: Costa Da Morte	0.776	26
Cataluña: Costa Daurada	0.798	27

References

Aguiló, E., & Sastre, A. (1984). La medición de la estacionalidad del turismo: El caso de baleares. *Estudios Turísticos*, *81*, 79–88.

Aldebert, B., Dang, R. J., & Longhi, C. (2011). Innovation in the tourism industry: The case of Tourism@. *Tourism Management*, *32*(5), 1204–1213.

Apostolopoulos, Y., Apostolopoulos, Y., & Gayle, D. J. (2002). *Island tourism and sustainable development: Caribbean, pacific, and mediterranean experiences*. Westport, CT: Greenwood Publishing Group.

Bampatsou, C., Halkos, G., & Astara, O. H. (2020). Composite indicators in evaluating tourism performance and seasonality. *Operational Research*. doi:10.1007/s12351-020-00610-5 Nov.

Banker, R., Charnes, A., & Cooper, W. (1984). Models for estimation of technical and scale inefficiencies in data envelopment analysis. *Management Science*, *30*, 1078–1092.

Banki, M. B., Ismail, H. N., & Muhammad, I. B. (2016). Coping with seasonality: A case study of family-owned micro tourism businesses in Obudu Mountain Resort in Nigeria. *Tourism Management Perspectives*, *18*, 141–152.

Batista e Silva, F. B., Herrera, M. A. M., Rosina, K., Ribeiro, R., Freire, S., & Schiavina, M. (2018). Analysing spatiotemporal patterns of tourism in Europe at high-resolution with conventional and big data sources. *Tourism Management*, *68*, 101–115.

Baum, T. (1999). Seasonality in tourism: Understanding the challenges. *Tourism Economics*, *5*(1), 5–8.

Benur, A. M., & Bramwell, B. (2015). Tourism product development and product diversification in destinations. *Tourism Management*, *50*, 213–224.

Boffa, F., & Succurro, M. (2012). The impact of search cost reduction on seasonality. *Annals of Tourism Research*, *39*(2), 1176–1198.

Brandão, F., Breda, Z., & Costa, C. (2019). Innovation and internationalization as development strategies for coastal tourism destinations: The role of organizational networks. *Journal of Hospitality and Tourism Management*, *41*, 219–230.

Bresciani, S., Puertas, R., Ferraris, A., & Santoro, G. (2021). Innovation, environmental sustainability and economic development: DEA-Bootstrap and multilevel analysis to compare two regions. *Technological Forecasting and Social Change*, *172*, 121040.

Butler, R. W. (1994). Seasonality in tourism: Issues and problems. In A. V. Seaton (Ed.), *Tourism: The state of the art*. Chichester: Wiley.
Candela, G., & Castellani, M. (2009). Stagionalità e destagionalizzazione. In A. Celant (Ed.), *L'Italia. il declino economico e la forza del turismo. fattori di vulnerabilità e potenziale competitivo di un settore strategico* Marchesi, Roma, Italy.
Casas, M., & Crous-Costa, N. (2020). Marketing as a tool for territorial management. The case of Emporda wine route (Costa Brava, Spain). *Communication Papers*, *9*(19), 123–142.
Cavalcante, W. Q. D. F., Coelho, A., & Bairrada, C. M. (2021). Sustainability and Tourism Marketing: A Bibliometric Analysis of Publications between 1997 and 2020 Using VOSviewer Software. *Sustainability*, *13*(9), 4987.
Caves, D., Christensen, L., & Diewert, E. (1982). The economic theory of index numbers and the measurement of input, output, and productivity. *Econometrica : journal of the Econometric Society*, *50*(6), 1393–1414.
Charnes, A., Cooper, W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operations Research*, *2*(6), 429–444.
Cisneros, J. D., & Fernandez, A. (2015). Cultural tourism as tourist segment for reducing seasonality in a coastal area: The case study of Andalusia. *Current Issues in Tourism*, *18*(8), 765–784.
Clarizia, F., De Santo, M., Lombardi, M., Mosca, R., Santaniello, D., et al. (2021). A contextual approach for coastal tourism and cultural heritage enhancing. In A. Bimbo, R. Cucchiara, S. Sclaroff, G. M. Farinella, T. Mei, M. Bertini (Eds.), *Pattern recognition*. Cham: Springer ICPR International Workshops and Challenges. Lecture Notes in Computer Science (vol 12667).
Coll-Serrano, V., Benítez, R., & Bolos, V. J. (2018). *Data envelopment analysis with dear*. Spain: University of Valencia.
Cooper, W. W., Seiford, L. M., & Zhu, J. (2011). *Handbook on data envelopment analysis* (2nd ed.). London: Springer Science & Business Media.
Cruz-Cázares, C., Bayona-Sáez, C., & García-Marco, T. (2013). You can't manage right what you can't measure well: Technological innovation efficiency. *Research Policy*, *42*(6−7), 1239–1250.
Cuccia, T., & Rizzo, I. (2011). Tourism seasonality in cultural destinations: Empirical evidence from Sicily. *Tourism Management*, *32*(3), 589–595.
Deng, F., Xu, L., Fang, Y., Gong, Q., & Li, Z. (2020). PCA-DEA-tobit regression assessment with carbon emission constraints of China's logistics industry. *Journal of Cleaner Production*, *271*, 122548.
Di Vaio, A., Palladino, R., Pezzi, A., & Kalisz, D. E. (2021). The role of digital innovation in knowledge management systems: A systematic literature review. *Journal of Business Research*, *123*, 220–231.
Doyle, J., & Green, R. (1994). Efficiency and cross efficiency in DEA: Derivations, meanings and the uses. *Journal of the Operational Research Society*, *45*(5), 567–578.
Falk, M., & Hagsten, E. (2018). Influence of local environment on exit of accommodation establishments. *Tourism Management*, *68*(October), 401–411.
Färe, R., Grosskopf, S., Lindgren, B., & Roos, P. (1989). *Productivity developments in swedish hospitals: A malmquist output index approach*. Southern Illinois University at Carbondale Discussion paper.
Färe, R., Grosskopf, S., Norris, M., & Zhang, Z. (1994). Productivity growth, technical progress and efficiency change in industrialized countries. *The American Economic Review*, *84*(1), 66–83.
Fernández, A. (2003). Decomposing seasonal concentration. *Annals of Tourism Research*, *30*(4), 942–956.
Fernández-Macho, J., González, P., & Virto, J. (2020). Assessing anthropogenic vulnerability of coastal regions: DEA-based index and rankings for the European Atlantic Area. *Marine Policy*, *119*, 104030.
Firsova, A., & Chernyshova, G. (2020). Efficiency analysis of regional innovation development based on DEA Malmquist Index. *Information*, *11*, 294.
Flognfeldt, T. (2001). Long-term positive adjustments to seasonality: Consequences of summer tourism in the Jotunheimen Area, Norway. In T. Baum, & S. Lundtorp (Eds.), *Seasonality in tourism* (pp. 109−117). Oxford: Pergamon.
Fusté Forné, F., Medina, F. X., & Mundet, L. (2020). The proximity of food: Gastronomy tourism and local markets in Costa Daurada (Catalonia, Spain). *Revista de Geografía Norte Grande*, *76*, 213–231.
Gardiner, S., & Scott, N. (2018). Destination innovation matrix: A framework for new tourism experience and market development. *Journal of Destination Marketing & Management*, *10*, 122–131.
Georgantzas, N. C. (2003). Cyprus' hotel value chain and profitability. *System Dynamics Review*, *19*(3), 175–212.
Getz, D., & Nilson, P. A. (2004). Responses of family businesses to extreme seasonality in demand: Case of Bornholm, Denmark. *Tourism Management*, *25*(1), 17–30.
Gómez-Vega, M., & Picazo-Tadeo, A. (2019). Ranking world tourist destinations with a composite indicator of competitiveness: To weigh or not to weigh? *Tourism Management*, *72*, 281–291.
Gossling, S., Hall, C. M., & Scott, D. (2018). Coastal and ocean tourism. In M. Salomon, & T. Markus (Eds.), *Handbook on marine environment protection* (pp. 773−790). Cham: Springer.
Grant, M., Human, B., & Le Pelley, B. (1997). *Seasonality. in insights*. London: British Tourist Authority Tourism Intelligence Papers.
Grönroos, C., & Ojasalo, K. (2004). Service productivity: Towards a conceptualization of the transformation of inputs into economic results in services. *Journal of Business Research*, *57*, 414–423.
Guaita, J. M., Martín, J. M., Ostos, M. S., & Ribeiro, D. (2021). Entrepreneurs' perceptions of official sporting events' capacity to promote their business in the long term. *Sport in Society*. doi:10.1080/17430437.2021.1932818.
Guaita-Martínez, J. M., Martín, J. M., & Ostos, M. S. (2020). An analysis of the changes in the seasonal patterns of tourist behavior during a process of economic recovery. *Technological Forecasting and Social Change*, *161*, 120280.
Guaita-Martínez, J. M., Martín, J. M., Salinas, J. A., & Mogorrón-Guerrero, H. (2019). An analysis of the stability of rural tourism as a desired condition for sustainable tourism. *Journal of Business Research*, *100*, 165–174.
Hall, C. M. (2001). Trends in ocean and coastal tourism: The end of the last frontier? *Ocean and Coastal Management*, *44*, 601–618.
Higham, J. (2021). Sport tourism: A perspective article. *Tourism Review*, *76*(1), 64–68.
Higham, J., & Hinch, T. D. (2002). Tourism, sport and seasons: The challenges and potential of overcoming seasonality in the sport and tourism sectors. *Tourism Management*, *23*(2), 175–185.
Hylleberg, S. (1992). General introduction. In S. Hylleberg (Ed.), *Modelling seasonality* (pp. 3−14). Oxford: Oxford University Press.
Inchausti-Sintes, F., Voltes-Dorta, A., & Suau-Sánche, P. (2021). The income elasticity gap and its implications for economic growth and tourism development: The Balearic vs the Canary Islands. *Current Issues in Tourism*, *24*(1), 98–116.
Jolliffe, L., & Farnsworth, R. (2003). Seasonality in tourism employment: Human resource challenges. *International Journal of Contemporary Hospitality Management*, *15*(6), 312–316.
Karakitsiou, A., Kourgiantakis, M., Mavrommati, A., & Migdalas, A. (2020). Regional efficiency evaluation by input-oriented data envelopment analysis of hotel and restaurant sector. *Operational Research*, *20*, 2041–2058.
Kastenholz, E., & Lopes de Almeida, A. (2008). Seasonality in rural tourism − The case of North Portugal. *Tourism Review*, *63*(2), 5–15.
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. E. (2005). Seasonality research: The state of the art. *International Journal of Tourism Research*, *7*(4−5), 201–219.
Koening, N., & Bischoff, E. (2003). Seasonality of tourism in Wales: A comparative analysis. *Tourism Economics*, *9*(3), 229–238.
Kuvan, Y., & Akan, P. (2005). Resident's attitudes toward general and forest-related impacts of tourism: The case of Belek, Antalya. *Tourism Management*, *26*(5), 691–706.
Ledesma, F. J., Lorenzo, R. M., & Martín, R. (2021). A study of hotel sector efficiency in the Canary Islands. *Journal of Tourism Analysis - Revista de Análisis Turístico*, *28*(1).
Lim, W. M., Yap, S. F., & Makkar, M. (2021). Home sharing in marketing and tourism at a tipping point: What do we know, how do we know, and where should we be heading? *Journal of Business Research*, *122*, 534–566.
Liu, K., Yang, G., & Yang, D. (2020). Investigating industrial water-use efficiency in mainland China: An improved SBM-DEA model. *Journal of Environmental Management*, *270*, 110859.
Lobo, M. O., Flores, C. A., Quiroz, J., & Cruz, I. (2018). Factors that affect the demand of tourism in Mexico: Competitive analysis. *Journal of Tourism Analysis - Revista de Análisis Turístico*, *25*(2), 154–166.
López, J. M., & López, L. M. (2006). La concentración estacional en las regiones españolas desde una perspectiva de la oferta turística. *Revista de Estudios Regionales*, *77*, 77–104.
Malmquist, S. (1953). Index numbers and indifference surfaces. *Trabajos de Estadística*, *4*, 209–242.
Marti, L., & Puertas, R. (2020). Assessment of sustainability using a synthetic index. *Environmental Impact Assessment Review*, *84*, 106375.
Martín, J. M., Salinas, J. A., Rodríguez, J. A., & Jiménez, J. D. (2017). Assessment of the tourism's potential as a sustainable development instrument in terms of annual stability: Application to Spanish rural destinations in process of consolidation. *Sustainability*, *9*(10), 1692.
Martín, J. C., & Mendoza, C. (2013). A DEA approach to measure the quality-of-life in the municipalities of the Canary Islands. *Social Indicators Research*, *113*, 335–353.
Martín, J. M., Jimenez, J. D., & Molina, 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.
Martín, J. M., Prados, J. F., de Castro, M., & Jiménez, J. D. (2021). Exploring conflicts between stakeholders in tourism industry. Citizen attitude toward peer-to-peer accommodation platforms. *International Journal of Conflict Management*, *32*(4), 697–721.
Martín, J. M., Prados, J. F., Jiménez, J. D., & Porras, E. (2020). Interferences generated on the well-being of local communities by the activity of online platforms for tourist accommodation. *Journal of Sustainable Tourism*. doi:10.1080/09669582.2020.1861455.
Martín, J. M., Rodríguez, J. A., Zermeño, K., & Salinas, J. A. (2018). Effects of vacation rental websites on the concentration of tourists—Potential environmental impacts. An application to the Balearic Islands in Spain. *International Journal of Environmental Research and Public Health*, *15*(2), 347.
Martín, J. M., Salinas, J. A., & Rodríguez, J. A. (2019). Comprehensive evaluation of the tourism seasonality using a synthetic DP2 indicator. *Tourism Geographies*, *21*(2), 284–305.
Melo, R., Rheenen, D., & Sobry, C. (2021). Sport tourism events and local sustainable development: An overview. *Small Scale Sport Tourism Events and Local Sustainable Development: A Cross-National Comparative Perspective*, *18*, 19.
Mill, R. C., & Morrison, A. M. (1998). *The tourism system: An introductory text*. Dubuque: Kendall.
Mohsin, M., Hanif, I., Taghizadeh-Hesary, F., Abbas, Q., & Iqbal, W. (2021). Nexus between energy efficiency and electricity reforms: A DEA-Based way forward for clean power development. *Energy policy*, *149*, 112052.
Msann, G., & Saad, W. (2020). Assessment of public sector performance in the MENA region: Data envelopment approach. *International Review of Public Administration*, *25*(1), 1–21.
Murphy, P. E. (1985). *Tourism: A community approach*. London: Methuen.

National Statistics Institute. (2020). *Encuesta de ocupación hotelera*. (p. 2020).
Niavis, S. (2020). Evaluating the spatiotemporal performance of tourist destinations: The case of Mediterranean coastal regions. *Journal of Sustainable Tourism*, *28*(9), 1310–1331.
Niavis, S., & Kallioras, D. (2021). The efficiency of tourism sector in EU Mediterranean coastal regions: The effects of seasonality and spatiality of demand. *Region*, *8*(1), 135–152.
Nurmatov, R., Fernandez, X. L., & Coto Millán, P. P. (2020). The change of the spanish tourist model: From the sun and sand to the security and sand. *Tourism Economics*, *27*(8), 1650–1668.
Oklevik, O., Gössling, S., Hall, C. M., Steen Jacobsen, J. K., Grøtte, I. P., & McCabe, S. (2019). Overtourism, optimisation, and destination performance indicators: A case study of activities in Fjord Norway. *Journal of Sustainable Tourism*, *27*(12), 1804–1824.
Oliveira, R., Zanella, A., & Camanho, A. S. (2020). A temporal progressive analysis of the social performance of mining firms based on a Malmquist index estimated with a Benefit-of-the-Doubt directional model. *Journal of Cleaner Production*, *267*, 121807.
Park, S., Yaduma, N., Lockwood, A. J., & Williams, A. M. (2016). Demand fluctuations, labour flexibility and productivity. *Annals of Tourism Research*, *59*, 93–112.
Pérez-Granja, U., & Inchausti-Sintes, F. (2021). On the analysis of efficiency in the hotel sector: Does tourism specialization matter? *Tourism Economics* September.
Phucharoen, C., & Sangkaew, N. (2020). Does firm efficiency matter in the hospitality industry? An empirical examination of foreign demand for accommodation and hotel efficiency in Thailand. *Journal of Tourism Analysis - Revista de Análisis Turístico*, *27*(1), 62–80.
Puertas, R., & Marti, L. (2021). Eco-innovation and determinants of GHG emissions in OECD countries. *Journal of Cleaner Production*, *319*, 128739.
Puertas, R., Marti, L., & Guaita-Martinez, J. M. (2020). Innovation, lifestyle, policy and socioeconomic factors: An analysis of European quality of life. *Technological Forecasting and Social Change*, *160*, 120209.
Pulina, M., Detotto, C., & Paba, A. (2010). An investigation into the relationship between size and efficiency of the Italian hospitality sector: A window DEA approach. *European Journal of Operational Research*, *204*, 613–620.
Rivero, P., García-Ceballos, S., Aso, B., & Navarro-Neri, I. (2021). Augmented Reality in Spain: Heritage Education, Cultural Tourism and Museums. *Augmented reality in tourism, museums and heritage* (pp. 109−125). Cham: Springer.
Roselló, J., Riera, A., & Sausó, A. (2004). The economic determinants of seasonal patterns. *Annals of Tourism Research*, *31*(3), 697–711.
Ruggiero, J. (2007). A comparison of DEA and the stochastic frontier model using panel data. *International Transactions in Operational Research*, *14*, 259–266.
Salinas, J. A., Guaita, J. M., & Martín, J. M. (2021). An analysis of the competitiveness of the tourism industry in a context of economic recovery following the COVID19 pandemic. *Technological Forecasting and Social Change*, *174*, 121301.
Salinas, J. A., Serdeira, P., Martín, J. M., & Rodríguez, J. A. (2020). Determinants of tourism destination competitiveness in the countries most visited by international tourists: Proposal of a synthetic index. *Tourism Management Perspectives*, *33*, 100582.
Santos, V., Sousa, B., Ramos, P., & Valeri, M. (2021). Emotions and involvement in tourism settings. *Current Issues in Tourism*, 1–6.
Saurí, D., Olcina, J., Fernando Vera, J., Martín-Vide, J., March, H., Serra-Llobet, A., et al. (2013). Tourism, climate change and water resources: Coastal Mediterranean Spain as an example. *European climate vulnerabilities and adaptation: A spatial planning perspective*231–252 ch13.
Senbeto, D. L., & Hon, A. H. Y. (2021). Shaping organizational culture in response to tourism seasonality: A qualitative approach. *Journal of Vacation Marketing*, *27*(4), 466–478.
Sexton, T.R., .Silkman, R.H., .& Hogan, A.J. (1986). Data envelopment analysis: Critique and extensions. In R. H. Silkman RH (Eds.) *Measuring efficiency: An assessment of data envelopment analysis*, vol 32 (pp.73−105). Jossey-Bass: San Francisco.
Sharma, S., Jaisinghani, D., Joshi, M., Goyal, J., & Aggarwal, A. (2021). Persistence of financial efficiency in tourism and hospitality firms. *International Journal of Tourism Research*. doi:10.1002/jtr.2491.
Shen, S., Li, G., & Song, H. (2009). Effect of seasonality treatment on the forecasting performance of tourism demand models. *Tourism Economics*, *15*(4), 693–708.
Sigalat-Signes, E., Calvo-Palomares, R., Roig-Merino, B., & García-Adán, I. (2020). Transition towards a tourist innovation model: The smart tourism destination: Reality or territorial marketing? *Journal of Innovation & Knowledge*, *5*(2), 96–104.
Tiago, F., Gil, A., Stemberger, S., & Borges-Tiago, T. (2021). Digital sustainability communication in tourism. *Journal of Innovation & Knowledge*, *6*(1), 27–34.
Tian, N., Tang, S., Che, A., & Wu, P. (2020). Measuring regional transport sustainability using super-efficiency SBM-DEA with weighting preference. *Journal of Cleaner Production*, *242*, 118474.
Tiberius, V., Schwarzer, H., & Roig-Dobón, S. (2021). Radical innovations: Between established knowledge and future research opportunities. *Journal of Innovation & Knowledge*, *6*(3), 145–153.
Törnqvist, L. (1936). The bank of Finland's consumption price index. *Bank of Finland Monthly Bulletin*, *10*, 1–8.
Tulkens, H., & Eeckaut, P. V. (1995). Non-parametric efficiency, progress and regress measures for panel data: Methodological aspects. *European Journal of Operational Research*, *80*(3), 474–499.
UN, United Nations. (2004). *Indicators of sustainable development for tourism destinations*. Madrid: United Nations.
Vivel-Búa, M., Lado-Sestayo, R., & Otero-González, L. (2019). Influence of firm characteristics and the environment on hotel survival across MSMES segments during the 2007−2015 period. *Tourism Management*, *75*(December), 477–490.
Waitt, G. (2003). Social impacts of Sydney Olympics. *Annals of Tourism Research*, *30*(1), 194–215.
Wanhill, S. (2007). What do economists do? Their contribution to understanding tourism. *The Sixth DeHaan Tourism Management Conference, The Economics of Tourism, Business Schoo*. UK: Nottingham University.
Wanhill, S. R. C. (1980). Tackling seasonality: A technical note. *International Journal of Tourism Management*, *1*(4), 243–245.
Yacoumis, J. (1980). Tackling seasonality: The case of Sri Lanka. *International Journal of Tourism Management*, *1*(4), 84–98.
Yu, M. M., & Chen, L. H. (2020). Evaluation of efficiency and technological bias of tourist hotels by a meta-frontier DEA model. *Journal of the Operational Research Society*, *71*(5), 718–732.
Zha, J., Zhu, Y., He, D., Tan, T., & Yang, X. (2020). Sources of tourism growth in Mainland China: An extended data envelopment analysis-based decomposition analysis. *International Journal of Tourism Research*, *22*(1), 54–70.
Zhang, D., & Xie, J. (2021). Influence of tourism seasonality and financial ratios on hotels' exit risk. *Journal of Hospitality & Tourism Research*. doi:10.1177/10963480211016038 May.
Zhou, Y., Liu, W., Lv, X., Chen, X., & Shen, M. (2019). Investigating interior driving factors and cross-industrial linkages of carbon emission efficiency in China's construction industry: Based on Super-SBM DEA and GVAR model. *Journal of Cleaner Production*, *241*, 118322.