REGION
The Journal of ERSA
Powered by WU

Volume 8, Number 1, 2021, 135–152
DOI: 10.18335/region.v8i1.318

journal homepage: region.ersa.org
ISSN: 2409-5370

The Efficiency of Tourism Sector in EU Mediterranean Coastal Regions: The Effects of Seasonality and Spatiality of Demand

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Received: 19 April 2020/Accepted: 6 February 2021

Abstract. The present paper studies the effects of seasonality and spatiality of tourist flows on the regional performance of tourism sector. The empirical analysis is conducted for 36 coastal North Mediterranean EU NUTS II regions, for the period 2010-2016. Performance is estimated under the concept of efficiency under a Data Envelopment Analysis methodology and the relationship of efficiency with seasonality, spatiality, and some other contextual factors is estimated with a double bootstrap method. The empirical analysis demonstrates that a typical linear function seems to be inappropriate to describe the relationships of these tourism features, as an N-shaped relationship between performance and seasonality and a U-shaped relationship for performance and spatiality were found.

1 Introduction

Coastal destinations have seen tourism as a strong competitive advantage that may form the cornerstone for economic development. This is because tourism may create opportunities, especially concerning income and employment (Apostolopoulos et al. 2002, Gossling et al. 2018), with strong positive externalities and multiplicative effects. Utilizing a wide range of marine natural resources, coastal destinations attract tourists, mainly, through the development of the "sea, sun and sand" (henceforth: "3s") model (Hall 2001). The "3s" model embodies a couple of key features (Bramwell 2004, Batista e Silva et al. 2018): seasonality (i.e., the temporal concentration of tourism flows in the summer season), and spatiality (i.e., the spatial concentration of tourism flows on adjacent-to-the-sea areas).

Seasonality is a well-covered topic in scientific literature. According to Baum, Lundtorp (2001) 'seasonality is widely seen as a "problem" to be "tackled" at a policy, marketing and operational level' (p. 2). This is because, under the presence of seasonality, the full potential of tourism as catalyst of development cannot be exploited by destinations. This is due to the underutilization of resources (in the low demand season) and the severe fluctuation of revenues (between low and high season) as seasonality shortens the operational period in which tourism entrepreneurs generate their revenue, thus adding pressure for generating the revenue of a whole year only in a short period. Under these conditions, long term employment cannot be generated, and investors may seem reluctant in driving funds to tourism operations. Finally, there are also environmental implications, as the high flows of tourists in limited time and the overutilization of resources associated with them impose serious threats on the local ecosystems (Baum, Lundtorp 2001, Butler

2001). Nevertheless, in places facing high tourism flows, the existence of seasonality could be considered a relieving factor because it allows local ecosystems to recover within the low season (Butler 2001).

Spatiality, in contrast, is an under-studied topic in scientific literature. Some sporadic studies (Lau et al. 2017, Niavis 2020) developed ways to measure the phenomenon at a macro spatial scale, thus allowing for the comparison of the phenomenon among a capable number of regions. The vast majority of studies, however, focus on micro spatial scales (i.e., individual regions or cities), despite the existence of corresponding analytical tools.

The present paper studies the effects of seasonality and spatiality of tourist flows on the regional performance of tourism sector. Essentially, the paper seeks to provide clear-cut, empirically-based, answers indicating whether, and to what extent, temporal and spatial concentrations of tourism flows improve or harm the regional performance of the tourism sector. To this end, the paper focuses on one particular aspect of performance: efficiency. The paper employs the Data Envelopment Analysis (DEA), which has been an effective method for assessing the performance of destinations in a comparative context. Although there are papers applying DEA to measure regional tourism efficiency (see among others Assaf, Josiassen 2016, Cuccia et al. 2017), this kind of efficiency has not hitherto been used as a means to model the nexus between performance and the temporal and spatial concentration of tourism flows. This is because the few past papers that assessed the efficiency of destinations by incorporating seasonality and spatiality measures have a priori considered the two phenomena as undesirable outputs of the tourism operation (Bosetti et al. 2007, Niavis 2020). This paper differs in the sense that it does not make any a priori assumptions regarding the effect of seasonality and spatiality on regional tourism efficiency, hence allowing this to be revealed by the empirical analysis.

The analysis is conducted for 36 coastal North Mediterranean EU NUTS II regions, for the period 2010-2016. The Mediterranean Sea basin provides a fertile ground for such an analysis, given that, despite the particularities of the tourism sector, the corresponding destinations mostly experience tourism-led development. Moreover, the Mediterranean destinations have long suffered from the negative effects and externalities of the mass "3s" tourism model, and many of them have implemented initiatives to decentralize the tourism flows, on both temporal and spatial terms (Fernandez-Morales 2003). Therefore, the results of the paper could be extremely important not only for the particular areas under consideration but also for other areas facing similar spatiotemporal pressures.

The paper proceeds as follows. The next section provides a concise review of the literature dealing with the performance-seasonality-spatiality nexus. The third section presents the methodological steps of the paper. The penultimate section provides the results of the empirical analysis on the coastal Mediterranean regions. The last section offers the conclusions.

2 Literature Review

In tourism-related literature, performance is tightly connected to the concept of competitiveness. Competitiveness could be viewed by two different approaches. The first approach builds on the work of Smith and Ricardo on the comparative advantage concept and puts a premium on the factors that enable a tourism actor, call it an enterprise, destination region, or a country to sustain among competition. The second approach builds mostly on the work of Porter on the theory of competitive advantage and views the issue of competitiveness on a rather managerial perspective (Croes, Kubickova 2013). Competitiveness is important as it shapes the potential of tourism actors to provide the most beneficial results on society (Mazanec, Ring 2011).

As competitiveness is a relative and multidimensional concept, scholars have long sought to conceptualize and operationalize the measurement of actors' performance in sustaining competition (Mazanec, Ring 2011, Crouch, Ritchie 2012). Therefore, performance, as a concept, is open to various definitions which are merely affected by the very conceptualization of competitiveness (Sainaghi et al. 2017). Many conceptual and empirical frameworks have been developed to measure the performance of tourism actors either according to their potential or their outcomes (Croes, Kubickova 2013). When competitiveness focuses on the potential of actors, different qualitative and quantitative indices are used in order to assess the comparative performance of tourism actors (Firgo, Fritz 2017). Cost, prices, abundance of infrastructure, and resources (human, natural, and cultural), as well as quality of services are used as proxies for measuring competitiveness when this approach is chosen (Hanafiah, Zulkifly 2019). On the other hand, when competitiveness is approached from the results' perspective, the terms of productivity and efficiency acquire a significant role in measuring performance (Hanafiah, Zulkifly 2019). This is because productivity, as a ratio of outputs to inputs, provides a solid basis for measuring the achievements of tourism actors and is tightly connected with the overall impact of tourism-related activities to society (Croes, Kubickova 2013). Profits, revenues, arrivals, nights stayed, and tourists' satisfaction are the outputs that lie at the core of this research stream and are compared with the inputs utilized in order for them to be achieved (Croes, Kubickova 2013, de la Peña et al. 2019, Hanafiah, Zulkifly 2019). When productivity is measured in a comparative context among various actors then an estimation of efficiency could be extracted by signifying the maximum possible realized output at each input level or the minimum possible use of inputs for certain levels of output (Coelli et al. 2005).

As the present paper follows the logic of the results-oriented performance, the rest of the literature review will focus on this stream of studies. Despite the fact that results-oriented performance is a, rather clearly, defined concept, a large diversity still exists in the relevant literature concerning the selection of subjects to be evaluated (such as firms, destinations, managers, and policy-makers) and the objects to conduct the evaluation (such as total nights, arrivals, profits, capacity, and occupancy) (Assaf, Josiassen 2016). Large variability is also observed in the methods employed for measuring performance. The measurement of actors' achievements can be extracted by simple ratios – synthetic indices, regression analyses – and frontier methods such as the DEA and Stochastic Frontier Analysis (SFA) (Sigala 2004, Croes, Kubickova 2013, Hanafiah, Zulkifly 2019). The selection of the method depends on the goals of each study. When productivity is assessed, indices such as Total Factor Productivity are adequate for extracting results. In addition, when efficiency is evaluated, DEA could be considered as a sound method for extracting results, considering its wide application in the tourism domain (Assaf, Josiassen 2016, Cuccia et al. 2017). Therefore, when conducting reviews of studies on the assessment of the effect of phenomena such as seasonality and spatiality on the performance of the tourism sector, the previous considerations should be considered. This is because different conclusions regarding the type of the nexus of the aforementioned phenomena could be extracted by studies that are based on different conceptions of performance as well as on different subjects and objects of performance measurement.

Considering the seasonality-performance nexus, it is unexpected that, despite the general consensus regarding the importance of seasonality on tourism destinations performance, there is only a limited number of studies which provide empirical evidence in a cross-regional context. More precisely, Ortega, Chicon (2013) assess the performance of the accommodation sector of the Spanish regions in terms of labor productivity and find that seasonality has no effect. Saito, Romao (2018), studying the exact same sample of Spanish regions conclude that seasonality negatively affects the performance of the accommodation sector. However, when there are substantial peaks of the tourism flows, some regions may also benefit from a concentrated temporal distribution of flows. This finding could be considered contradictory and, perhaps, it could be attributed to the adopted assumption of a linear relationship between performance and seasonality. Both of the aforementioned studies focus on the productivity dimension in order to quantify the regional performance of the tourism sector. More precisely, in order to extract a labor productivity measure, Ortega, Chicon (2013) use the ratio of output to labor, whilst Saito, Romao (2018) use the more holistic total factor productivity approach. Ortega, Chicon (2013) estimate seasonality through the Gini index, taking as an estimation base the monthly overnight stays of each region. Saito, Romao (2018) perform the same kind of analysis, estimating, additionally, the Coefficient of Variation metric. Finally, the effect of seasonality on performance is modeled through regression analysis in both papers. Particularly, Ortega, Chicon (2013) test on a panel dataset, covering the period 1997-

2004, one basic Ordinary Least Squares regression and one with regression Instrumental Variables to control for endogeneity. Saito, Romao (2018) test on a time-series dataset, covering the period 2001-2014, one regression to extract total factor productivity and one regression to estimate the effect of seasonality on total factor productivity.

Concerning the spatiality-performance nexus, the literature lacks empirical evidence on the nexus with performance in a cross-regional context. Even though it includes some empirical measures of spatiality across regions, incorporating metrics such as the Gini index (Wen, Sinha 2009, Li et al. 2015, Papatheodorou, Arvanitis 2014), it does not use these measures as means to explain the fluctuation of performance across the considered regions. The relationship between spatiality and tourism performance may be detected among studies with a focus on the impacts of agglomeration economies, and particularly of localization economies, on the tourism sector. The term "agglomeration economies" describes the advantages of costs or quality generated by concentrating inputs, population, firms, and collective agents at a point in space (Capone, Boix 2008). Agglomeration economies may take the form of either localization (Marshall 1890, Arrow 1962, Romer 1986) or urbanization economies (Jacobs 1969). The former type of agglomeration economies arises from intra-industry spillovers, whereas the latter arises from inter-industry spillovers. As noted by Henderson (1997), the type of agglomeration economies (whether localization or urbanization economies) for an industry has implications for regional development. If agglomeration economies take the form of localization economies, then areas specialize in one export activity and/or closely-related activities. As it has been aptly put by Thompson (1956) "nothing could seem more certain, deductively, than a close causal relationship between local industry mix and the cyclical instability of that area" (p. 16). In the same vein, Fatás (1997) explains that "regions display cycles where their level of economic activity fluctuates relative to other regions" (p. 744) and identifies the differences in the industry-mix (comparing to the other regions) and the regional policy effects as asymmetry determinants. Thus, concerning the stream of studies that focus on the relationship between spatiality and tourism performance, sectors – and, consequently, the corresponding regions – may benefit by their own geographical concentration (Beaudry, Schiffauerova 2009), and, particularly, by production enhancements and heightened demand (Chung, Kalnins 2001).

Considering the agglomeration effects on tourism performance, a large diversity of results exists, regarding the direction and strength of the effects and depending on the dimension performance considered. Such a diversity highlights the complexity of the relationship between performance and agglomeration. Chung, Kalnins (2001) studying the Texas lodging industry, find that agglomeration affects the profitability (revenue per available room ratio) of hotels. The effect is positive for smaller hotels that operate close to larger ones but negative for medium- and large-sized hotels. Canina et al. (2005), also, observe a dual effect of agglomeration, finding that profitability is enhanced for the hotels of the lower-end categories, due to differentiation spillovers, whilst profitability is lower for highly-differentiated luxury hotels that co-exist with firms of low-cost strategic orientation. Chan et al. (2012) assess the nexus of agglomeration and performance in Taiwan, figuring out that agglomeration reduces profitability and improves labor productivity. Marco-Lajara et al. (2016), studying the hotel sector of the Mediterranean coastal part of Spain, extract some contradicting results, regarding the effect of agglomeration on hotels performance, finding that concentration harms income and, at the same time, reduces the costs for the hotels operating within tourism districts.

The present paper differentiates from the above literature in many aspects. On the investigation of the nexus between seasonality and performance, the present paper adds to the relevant literature by examining the effect of seasonality on tourism efficiency of regions, complementing the studies that focus merely on the productivity dimension of performance. Moreover, different functional forms of the relationship between seasonality and efficiency are tested, questioning the linear approximation of the past papers. On the investigation of the nexus between spatiality and performance, the present paper adopts a perspective that draws more from the regional science rather from the pure tourism-oriented discipline. The focus of the past papers on agglomeration was to reveal the ways concentration impacts on the performance of tourism enterprises. Conversely, the aim of the present paper is to assess the effect of the concentrated pattern of tourism development not on individual firms or firms' classes operating within agglomerations but on the performance of the sector as a whole against the sectors of other regions. That is, the question of the present paper is whether spatial concentration benefits the corresponding regions or not.

3 Methodological Framework and Variables Specification

The empirical analysis is conducted for 36 coastal North Mediterranean EU NUTS II regions, for the period 2010-2016. The NUTS II spatial level is preferred since, according to the definitions of Eurostat (2019b), it is the territorial level typically used for the application of regional policies. Although NUTS II regions normally include more than one tourism destination, they are institutionally relevant in order to address policy questions related to the integration of tourism dynamics into broader resource management or economic development policies (Romao et al. 2017). Indeed, despite the existence of the rather diversified tourism products being developed within the regions, these still encompass a common characteristic, which is their sea borders, which allow for the development of coastal tourism. The latter is the dominant type of tourism for coastal regions. The study of Batista e Silva et al. (2018) reflects this ascertainment, indicating that for the vast majority of coastal regions, summer is the peak season.

Towards studying the nexus between performance and the temporal and spatial concentration of tourism flows, the paper starts from the quantification of the considered phenomena. Particularly, for the measurement of performance, the method of DEA is selected. DEA is among the most-used efficiency estimation methods. Given a set of Decision Making Units (DMUs) utilizing some inputs to produce some outputs, DEA uses the linear combinations of the observations of the sample to construct a technology (or maximum efficiency) frontier. The distance of all DMUs from the frontier is used to compute their technical efficiency (Barros 2005, Cooper et al. 2011). Since DEA is based on real observations, it provides feasible targets for the inefficient DMUs. Moreover, it provides targets that are consistent with the very scope of benchmarking, which renders DMUs capable of realizing their improvement potential (Sigala 2004), since all DMUs are compared against the technology frontier.

In order to set a basic DEA model, it is assumed that there are n destinations using m inputs and producing s outputs. Furthermore, $x_{ij} > 0$ expresses the amount of input i used by destination j, and $y_{rj} > 0$ expresses the amount of output r produced for destination j. Under these assumptions, the efficiency for a destination o results from the solution of model 1:

$$\begin{aligned} \mathit{Effi}^* &= \max_o \mathit{Effi}_o \\ \text{s.t.} \quad & \sum_{j=1}^{n} x_{ij}\lambda_j \leq x_{io}, \quad i = 1, 2, \ldots, m \\ & \sum_{j=1}^{n} y_{rj}\lambda_j \geq \mathit{Effi}\, y_{ro}, \quad r = 1, 2, \ldots, s \\ & \lambda_j \geq 0 \quad j = 1, 2, \ldots, n \end{aligned} \tag{1}$$

where *Effi* is the efficiency score, λ_j are the weights that destination j assigns to destination o, in order to construct its efficient reference set, and the mark * expresses the optimized model (Zhu 2014). Model (1) has an output orientation, implying that each destination is evaluated according to its ability to achieve the largest output with the current level of inputs. This complies with the relevant literature, where output-oriented models have, mostly, been adopted (Assaf, Josiassen 2016), thus, marking that it is more rational for a destination to try to expand its demand than to shift its capacity into lower levels.

A major limitation of DEA is that it provides scores without any statistical properties. In order to overcome this weakness, Simar, Wilson (1998) proposed a simple bootstrapping method in order to obtain confidence intervals, within which the true efficiency of each individual DMU occurs, for the obtained scores. In addition, when environmental variables are incorporated into analysis, Simar, Wilson (2007) proposed two algorithms that can be used in order to extract consistent estimation of the effect of variables on the efficiency of DMUs. In the first algorithm, scores are extracted from the basic DEA models and the effect of environmental variables is estimated with a bootstrapped truncated regression. In the second algorithm, the effect of environmental variables is incorporated into the estimation of the scores of DMUs through a double bootstrapped truncated regression. By this way, the algorithm returns both bias-corrected DEA scores and the effect of environmental variables. In the present study, the second algorithm will be used in order to compute the efficiency scores of the considered regions and to estimate the effect of seasonality, spatiality, and of some contextual environmental variables on the efficiency of regions. To do so, the "simarwilson" command of the STATA statistical software is used with 1000 bootstrap replications (Badunenko, Tauchmann 2018).

In addition, the type of returns to scale of the DEA models should be, also, decided. DEA models could be set in order to accommodate, both Constant Returns to Scale (CRS) and Variable Returns to Scale (VRS). The estimation of efficiency under a CRS assumption accommodates both the pure technical and the scale efficiency of DMUs, whilst under the VRS assumption only the technical efficiency is computed (Cooper et al. 2011). The selection of the model type is up to the researchers and their good knowledge about the reference technology of the DMUs under consideration. In the tourism domain, and specifically in the applications of DEA on destinations' efficiency, prior research includes both type of models (Assaf, Josiassen 2016). Therefore, in the present paper both models are estimated, and their results are discussed in a comparative context.

A critical parameter for the extraction of the performance measurement is the selection of outputs and inputs to be incorporated in the DEA model. Most of the previous works rely on the total bed-nights in order to measure the output of the accommodation sector (Cuccia et al. 2017). Especially in studies employing DEA to assess efficiency at a subnational spatial level, monetary measures of the tourist activities output are, still, absent. This is due to the fact that tourism statistics are mostly available at the national level. Therefore, previous research provided only a partial picture of the tourism sector achievements. To fill this gap, the present paper considers two outputs of the accommodation sector. The first is the total annual bed-nights (TBN) and the second, a monetary measure of the average daily expenditures of foreign tourists (ADE). By doing so, the destinations are assessed not only on their efficiency to fill in their supply, but also on their ability to do that in the most favorable context for the regional economy. For the ADE variable, a very demanding effort involved selecting data from various sources of the countries considered in the analysis. The main sources for extracting the ADE data were the border surveys, mainly conducted by the National Banks of the considered countries. As it was difficult to disaggregate the total expenditures into various categories, due to categories-setting inconsistencies, the total expenditure of foreign tourists was considered, after subtracting any expenses for international transport, where applicable[1]. This measure provides a good approximation of the wider economic benefits of tourism than those that are strictly connected to the accommodation domain. The variable has been normalized considering the Purchasing Power Parity of the countries and in respect to the EU average (Eurostat 2020). For the inputs, the present paper incorporates measures of both capital and labor production factors. The variable of capital production function is expressed as the available Total Beds Capacity (TBC), and labor production function as the Total Labor Capacity (TLC) considering the total number of employees at the accommodation sector at each region. The data for the TBN, the TBC, and the TLC variables are obtained from Eurostat (2019a,c,e).

The Seasonality index (SI) and the Spatiality index (SPI) are constructed in a similar manner, as, for both variables, the Shannon's entropy index (Theil 1967) is utilized. The entropy index expresses the level of disorder according to which a set of observations are distributed. The basis for estimating the seasonal uniformity is the total bed-nights

[1] The variable is constructed by foreign tourists' expenditures for Accommodation, Food and beverages, Local transport and renting transport equipment, Cultural, sport and leisure services and Other items (shopping etc.).

observed over the twelve months of the year, whilst the basis for estimating the spatial uniformity index is the total-bed nights observed over NUTS III divisions per region (Eurostat 2019b)[2]. The Shannon's entropy index, is defined by the negative logarithm of a variable's probability mass function (P) (Theil 1967) and is presented in Equation (2):

$$H = -\sum_{i=1}^{N} P_i \ln P_i \tag{2}$$

The observed entropy $\hat{H}$ is calculated by Equation (3), assuming that each month or sub-division poses s_i share of the total bed-nights:

$$\hat{H} = -\sum_{i=1}^{N} s_i \ln s_i \tag{3}$$

The SI and SPI are computed by the ratio presented in Equation (4):

$$\mathrm{NH} = \frac{\hat{H}}{\hat{H}_{\max}} \tag{4}$$

which is defined as the ratio of the observed ($\hat{H}$) to the maximum entropy ($\hat{H}_{\max} = \ln n$) of a region (Cowell 2000). Larger values of the variables denote greater seasonal and spatial uniformity, whilst the corresponding lower values denote a concentration of flows in seasonal and spatial terms. It should be noted that the SPI may not fully depict the tourists' concentration at the considered regions, as it only provides a measure of the flows' dispersion among the NUTS III sub-regions. This is because regions of the same size may be divided into different numbers of sub-regions and therefore a region consisting of a rather large number of divisions may present lower concentration levels than a region of similar size and flows but less divisions. To overcome this difficulty, more detailed data for the concentration of tourists at the destination and not at the NUTS III level could be very useful. Unfortunately, this type of data is not available from official sources and therefore one should rely on other sources such as online user generated content, dedicated surveys, and mobile data providers. Considering the large scale of the present analysis, covering six countries, those data could not become available and thus the NUTS III basis is adapted as the best alternative way for measuring spatiality. The data for estimating the indicators are extracted from the National Statistics Offices or the National Tourism Authorities of the considered countries.

Having extracted the measures of the three phenomena (i.e., performance, seasonality, and spatiality), their relationship is modeled through regression analysis. The Effi index is set as the dependent variable and the SI and SPI as the independent ones. Following the specification suggested by Simar, Wilson (2007), the double bootstrap algorithm will be used to extract the coefficients of the independent variables.

In order to capture the temporal trends and the spatial heterogeneity across the observations, some additional variables are included in the model. More precisely, year dummies, with reference to 2010, are incorporated in order to capture any time trends of the efficiency. Moreover, country dummies, with reference to Greece, are included in order to account for any differences resulting from the different environments under which the various destinations are operating. Four additional variables are incorporated into the analysis in order to capture the effect of various contextual factors on the efficiency of the regions. The first variable (INS) regards the type of the regions and whether they are insular or not. Insular destinations are among the most attractive places for summer vacation but insularity may put some constraints on the potential of destinations to accommodate large flows of tourists due to connectivity issues which are amplified in the low-season periods (Papatheodorou 2001, Agius et al. 2020). Insularity is quantified by a dummy variable which takes the value 1 for insular regions and 0 for non-insular ones.

[2]Since Cyprus and Illes Balears are not divided in NUTS III regions, a customized division has been followed in order for them to be included in the analysis. More precisely, Illes Balears was divided into three sub-regions, corresponding to the three main islands (Mallorca, Minorca, and Ibiza-Formentera), and Cyprus has been divided to five sub-regions corresponding to the districts of the Republic of Cyprus.

The second variable is for population density. More urbanized areas may find it easier to attract tourists year-round due to enhanced pull capacity for different types of tourism (Niavis 2020). The variable DENS is constructed as the ratio of residents to 1 km^2 and it is extracted by Eurostat (2019d). The third variable quantifies the mix (MIX) of flows, domestic or international, evolving at each region. The MIX variable is incorporated into the estimations as the ratio of domestic overnight stays to total overnights stays and seeks to capture what type of tourism market favor the most the destinations under consideration. The data for the variable are extracted from Eurostat (2019a). Finally, the last variable measures the specialization (SPEC) level of regions in tourism activities and captures any heterogeneity potentially arising from higher productivity levels of the more tourism-oriented regional economies. The data for the variable are extracted from the Structural Business Statistics indicators of Eurostat (2019e).

In contrast with the past empirical studies on the relationship of performance and seasonality, which assumed a linear relationship between performance and seasonality, in the present paper, the type of relationship is not presumed since the final functional relationship is configured using a stepwise approach. The same stands true for all the variables of the model. The pairwise correlations of the remaining variables are found to be quite moderate (< 0.67) and, thus, their insertion in the model can be considered as not causing any bias on the estimations. This is also reflected by the fact that the value of all Variance Inflation Factors (VIF) does not exceed the critical threshold of 10 (Dormann et al. 2013). Therefore, Equation (5) represents the final configuration of the model:

$$\begin{aligned} \mathit{Effi}_{ij} \quad = \quad & \beta_0 + \beta_{DES} DES_i + \beta_{DFR} DFR_i + \beta_{DIT} DIT_i + \beta_{DMT} DMT_i + \\ & \beta_{CY} DCY_i + \beta_{D2011} D2011_i + \beta_{D2012} D2012_i + \beta_{D2013} D2013_i + \\ & \beta_{D2014} D2014_i + \beta_{D2015} D2015_i + \beta_{D2016} D2016_i + \beta_{SI} SI_i + \beta_{SI^2} SI_i^2 + \\ & \beta_{SI^3} SI_i^3 + \beta_{SPI} SPI_i + \beta_{SPI^2} SPI_i^2 + \beta_{INS} INS_i + \beta_{DENS} DENS_i + \\ & \beta_{MIX} MIX_i + \beta_{SPEC} SPEC_i \quad i = 1, 2, \ldots, N\text{regions}, j = \text{crs}, \text{vrs} \end{aligned} \tag{5}$$

where,

Effi The efficiency scores of each region, as extracted by the application of the W-DEA analysis

DES, DFR, DIT, DMT, DCY The country dummies with reference to Greece

$SD_{2011-2016}$ The year dummies with reference to 2010

SI The seasonality index scores

SPI The spatiality index scores

INS A dummy variable taking the value 1 for insular regions and 0 otherwise

$DENS$ The population density of the regions

MIX The proportion of domestic bed-nights to total bed-nights for each region

$SPEC$ The specialization of regions in tourism related activities (based on employment)

β The regression parameters to be estimated

ϵ The error term

4 Results and Discussion

The 36 coastal North Mediterranean EU NUTS II regions under consideration[3] are located in 6 Mediterranean EU countries and are presented in the bottom of Table 1. Table

[3]The Croatian coastal region Jadranska Hrvatska is not included in the analysis because official data for seasonality have become available only after 2015.

Table 1: The descriptive statistics of the DEA variables and the bias corrected efficiency scores

Statistics	Variables					
	TBC	TLC	TBN	ADE	Effi$_{CRS}$	Effi$_{VRS}$
Mean	111115	13,198	13,608,642	75.178	1.709	1.443
St. Dev	93,547	11,264	13,860,830	19.605	0.464	0.291
Min	5,956	573	271,525	33.757	1.015	1.013
Max	358,169	52,093	59,000,000	127.124	3.262	2.225
Min Region	Molise	Molise	Molise	Molise	Malta	Malta
Max Region	Illes	Cataluña	Illes Balears	Illes Balears	Sterea Ellada	Anatoliki Makedonia, Thraki

Source: Elaboration from Eurostat (2019a,c,e) and National Statistic Authorities or Tourism Organizations of the considered countries

Note: **Total** (NUTS – II) Regions: 36; *Spain* (4): Cataluña, Comunidad Valenciana, Illes Balears, Andalucia; *France* (3): Occitanie, Provence-Alpes-Côte d'Azur, Corse; *Italy* (15): Liguria, Veneto, Friuli-Venezia Giulia, Emilia-Romagna, Toscana, Marche, Lazio, Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicilia, Sardegna; *Greece* (12): Anatoliki Makedonia, Thraki, Kentriki Makedonia, Ipeiros, Thessalia, Ionia Nisia, Dytiki Ellada, Sterea Ellada, Peloponnisos, Attiki, Voreio Aigaio, Notio Aigaio, Kriti; *Malta* (1); *Cyprus* (1);

1 also includes the basic descriptive statistics for the variables of the DEA model and the bias-corrected DEA scores under both returns to scale specifications. The lowest scale of activity is observed over the rather small region of Molise, as it accounts for the minimum values of all four variables of the DEA models. The highest activity is observed over the Balearic Islands as the region presents the highest number of overnights stays while accounting for the highest average daily expenses of the foreign tourists. The mean efficiency score is estimated at 1.709 under CRS and 1.443 under the VRS specification. The CRS model comes up with higher inefficiency than the VRS, as it also accommodates the scale differences among regions. The most efficient region is Malta under both models, while the least efficient regions, under both models, are Greek; Sterea Ellada under the CRS model, and Anatoliki Makedonia and Thraki under the VRS one. This result signifies how the scale parameter might have harmed the efficiency of Sterea Ellada whose rank clearly improved when the pure technical efficiency is estimated through the VRS model.

The independent variables incorporated into the bootstrapped truncated regression are presented in Table 2. The mean value of the seasonality index is estimated at 0.894, while the mean value of spatiality at 0.773. The two indices present substantial differences on their standard deviation values, with the latter showing larger variability. The larger variability is observed by examining the range of the two indices, which is substantially larger for the spatiality index. On the individual records of the regions, Ionia Nisia presents the highest seasonal concentration and Attiki presents the most diverse allocation of flows across the twelve months. Malta is the region with the most spatially concentrated flows of tourists and Corse is the region with the most spatially balanced tourism flows. The DENS variable presents a large variability as the St. Dev value exceeds this of the mean. On average, the Mediterranean regions present a population density of 196 residents per km2 with the highest density observed in Malta and the lowest in the Greek region of Sterea Ellada. In addition, the mean of the MIX variable denotes that, on average, the regions of the Mediterranean present a balanced mix of domestic and foreign tourism, as expressed by the total bed-nights. Nevertheless, there are remarkable differences across regions. The share of domestic bed-nights hardly exceeds the 4% in Malta, whilst it reaches the 90% in the Italian region of Molise. Finally, the tourism activities account, on average, for the 5% of the regional employment. The highest tourism specialization is found in the insular region of Notio Aigaio where more than 27% of the local employment jobs concern those of the accommodation sector, and the lowest specialization in the Attiki region with a tally of about 1%.

The longitudinal variability of values of four indices for the years 2010-2016 is presented

Table 2: The descriptive statistics of the independent variables of the double bootstrapped truncated regression

Statistics	Variables				
	seasonal	spatial	density	mix	specialization
Mean	0.894	0.773	196.035	0.501	0.041
St. Dev	0.075	0.174	262.697	0.258	0.042
Min	0.716	0.218	35.900	0.039	0.011
Max	0.997	0.990	1450.200	0.913	0.272
Min Region	Ionia Nisia	Malta	Sterea Ellada	Malta	Attiki
Max Region	Attiki	Corse	Malta	Molise	Notio Aigaio

Source: Elaboration from Eurostat (2019a,c,e) and National Statistic Authorities or Tourism Organizations of the considered countries

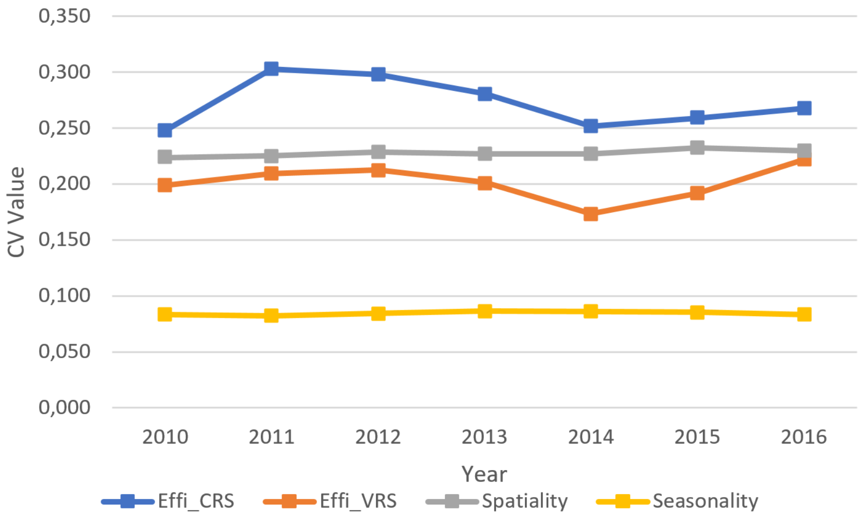

Figure 1: Annual Coefficient of Variation (CV) values for the indices of efficiency, spatiality, and seasonality across Mediterranean regions (2010-2016)
Source: Elaboration from Eurostat (2019a,c,e) and National Statistic Authorities or Tourism Organizations of the considered countries

in Figure 1. The CV values show that the highest dispersion is observed on the EffiCRS scores and the lowest on seasonality. On the one hand, this result signifies that there are very low variations in the seasonal dispersion of tourists across the coastal regions of the Mediterranean. On the other hand, the higher efficiency and spatiality variations portray that the utilization of resources and the diffusion of flows at the inner parts of the regions could be seen as more significant differentiation factors for the way that the tourism phenomenon evolves in the Mediterranean region. As far as the trends are concerned, the variation of efficiency scores shows a peak during the 2011-2012 period and it decreases in the following years, just to show trend upward again after 2014. This upward trend makes the variation of the EffiVRS scores reach the spatiality index in 2016. Finally, the changes of the annual seasonality and spatiality scores variability should be considered as only marginal if not zero.

The results of the application of Simar, Wilson (2007) for the two efficiency indices are presented in Table 3. In total, 252 observations were used to conduct the regression analysis. The values of the Wald Test (440.83 for the first model and 358.94 for the second model) exceed the critical value of the chi-square distribution for 20 degrees of freedom (df), thus the null hypothesis, that the models' variables have no effect on the dependent variable, is rejected for both models at a significance level of (< 0.01). As for the statistically significant coefficients, their signs remain the same under both specifications except for the ones estimated for the ISL and DENS variables. In addition, there are

Table 3: Results of the EffiCRS and EffiVRS bootstrapped truncated regression models

Coefficient	EffiCRS Model (1)		EffiVRS Model (2)	
	Estimation	Significance Level	Estimation	Significance Level
β_0	-167.071	0.01	-122.076	0.01
β_{DES}	-1.256	0.01	-0.688	0.01
β_{DFR}	-1.230	0.01	-0.465	0.01
β_{DIT}	-0.597	0.01	-0.368	0.01
β_{DCY}	-0.622	0.01	-0.282	0.05
β_{DMT}	-1.360	0.05	-1.124	0.05
β_{2011}	0.003	NS	-0.038	NS
β_{2012}	0.087	NS	0.001	NS
β_{2013}	0.051	NS	-0.063	NS
β_{2014}	-0.022	NS	-0.108	0.05
β_{2015}	-0.001	NS	-0.100	0.05
β_{2016}	0.016	NS	-0.056	NS
β_{SI}	580.613	0.01	418.083	0.01
β_{SI^2}	-667.406	0.01	-469.673	0.01
β_{SI^3}	254.818	0.01	174.347	0.01
β_{SPI}	2.532	0.05	1.926	0.05
β_{SPI^2}	-1.890	0.01	-1.254	0.05
β_{ISL}	0.144	0.10	-0.106	0.05
β_{DEN}	-0.001	0.05	0.001	NS
β_{MIX}	1.305	0.01	0.477	0.01
β_{SPEC}	1.823	0.01	-0.615	NS

Source: Elaboration from Eurostat (2019a,c,e) and National Statistic Authorities or Tourism Organizations of the considered countries

some minor differences regarding the magnitude of the estimated coefficients and their statistical significance. More precisely, β_{D2014} and β_{D2015} are found to be statistically significant only under the VRS efficiency specification. The exact opposite estimation is found for the β_{DEN} and β_{SPEC} as they were only found statistically significant under the CRS specification. Finally, some differences on the estimated significance levels are found for the coefficients β_{DCY}, β_{SPI^2} and β_{ISL}. In essence, the models produce similar results, especially for the seasonality and spatiality indices, facilitating, in this way, the common interpretation of the estimated coefficients and the drawing of more robust conclusions.

At the country level, the estimated coefficients of the countries' dummy variables, which are all statistically significant at least at the (< 0.05) level, signify that the Greek regions suffer from inefficient resources' management when compared to the regions of the other countries. Greek destinations suffer from both scale and managerial inefficiencies as they fail to fill up their capacity and trigger an adequate spending of the foreign tourists in comparison with other parts of the Mediterranean. Considering the value of the coefficients, the largest gap is observed between the Greek destinations and Malta. Therefore, for the Greek case there seems to be some disfavoring conditions, either at the policy or at the social environment, which do not allow the various destinations to attain a satisfactory management level. Regarding the year dummy variables, the results signify that little variability is observed in the efficiency of the Mediterranean throughout years, since no statistically significant estimation is extracted for the respective dummy variables in the CRS model. On the other hand, some variability is observed on the VRS model since the statistically significant estimations for the 2014 and 2015 dummies show that in these years, destinations operated, on average, more efficiently than they did in 2010. This finding signifies that when the scale factor is omitted from the estimations, pure managerial efficiency may be more sensitive to the effect of the external environment.

In addition, the statistically significant estimation of the seasonality coefficients reveals that efficiency and seasonality are related with an N-shaped curve. This finding portrays that seasonality has mixed effects on the performance of the accommodation sector. In order to estimate the turning points and to better define the functional relationship of the two variables, the average marginal effects of the SI on efficiency scores of over 1, are first evaluated using the "margins" Stata command (Badunenko, Tauchmann 2018). After obtaining the marginal effects, the two turning points are, approximately, computed using the estimated coefficients by the Equation (6) (Plassmann, Khanna 2007):

$$\mathrm{TP}_{1,2} = \frac{-\beta_{SI^2} \pm (\beta_{SI^2}^2 - 3\beta_{SI}\beta_{SI^3})}{3\beta_{SI^3}} \tag{6}$$

The two turning points for the SI variable are 0.82 and 0.93 under the CRS efficiency specification and 0.81 and 0.98 under the VRS efficiency specification. Within the zone of the lowest values of the SI (SI < 0.82 or 0.81), where substantial peaks of flows are observed, performance is affected negatively, since the imbalance of tourism overnight stays among the high and low season is such that causes severe under-utilization of resources in the latter. To put it simply, it is hard for these regions to fill up the high capacity needed for coping with the relatively high demand of summer during the remaining months. Moreover, destinations that are based only on seasonal tourism find it difficult to keep a standard level of prices all year round and thus the lowering of prices to lure demand on the lowest seasons may harm the overall tourism spending. Since the ADE variable incorporates other tourism expenses, the present result may also highlight the inability of one peak season destinations to provide added value services in the mild and low seasons, as well. On the other side, as the seasonality phenomenon becomes smoother (0.79 < SI < 0.89 or 0.81 < SI < 0.98), destinations' performance seems to be favored. This is the case where the imbalances among the peak and low months become lower, thus, leading to less under-utilization of resources in the latter period and better performance in tourism receipts. In these destinations, seasonality is under control and is welcomed as a means for reversing the possible losses of the low months. Finally, as seasonality tends to its lowest levels (SI > 0.89 or 0.98), its effect on performance is becoming negative again. Destinations with this type of seasonality are dealing with the challenge of filling up their capacity in a year-round basis without any push of increased flows in a month or season of the year that would increase the total annual utilization of their resources and the achievement of high room prices and receipts from added value services. Finally, a comment should be made about the interesting finding of the different turning points resulting from the two different efficiency specifications. The distance between the two turning points is wider under the VRS efficiency specification, also including the respective range of CRS turning points. This result signifies that seasonality favors the pure managerial efficiency of destinations the most, and to a lesser extent, the overall efficiency including the scale factor.

Considering the comparative basis on which the performance assessment has been realized in the present paper, the general finding of the performance-seasonality analysis is that the latter can be a competitive advantage for the destinations with coastal tourism. This finding contradicts the finding of Ortega, Chicon (2013), who found no relationship between performance and seasonality. Nevertheless, it should be noted that a direct comparison is not feasible because the paper of Ortega, Chicon (2013) approached performance through labor productivity, which is more easily adjusted to seasonal fluctuations (Saito, Romao 2018) and, therefore, it cannot depict the total performance gains or losses due to seasonality.

In addition, the paper validates only partially the findings of Saito, Romao (2018), who observe that, although seasonality is, in general, negatively related to the regional performance, the performance losses could still be offset by increased demand in the peak season. The empirical model of the present paper takes the analysis a step further by defining zones of seasonality that affect performance in a varying way. Therefore, the paper validates that seasonal peaks may turn up as beneficial for the destinations, but only below a certain threshold. Nevertheless, the direct comparison of these findings should be treated with caution because the present paper focuses only on coastal regions, the variables quantifying seasonality are different and, finally, the functional form of the relationship is polynomial in the present study and linear in the study of Saito, Romao (2018).

As for the SPI variable, the estimations of both the linear and quadratic coefficients are statistically significant at the (< 0.05) level at least but yield different signs. More precisely, the sign of the linear term is positive, whilst the sign of the quadratic term is negative, thus, denoting that performance and spatiality are linked through an inverse U-shaped curve. This type of relationship is validated by both models. This finding portrays that for the lower values of SPI, where concentration of flows is higher, the inefficiency tends to be increasing. After a point, the effect of spatiality is inversed, thus, denoting that regions, which manage to achieve a rather equal diffusion of flows across their sub-divisions, are operating more efficiently. The turning point of the curve is extracted, after obtaining the average marginal effects of the variables, by (7) (Plassmann, Khanna 2007):

$$\frac{\beta_{SPI}}{2\beta_{SPI^2}} \tag{7}$$

For the present sample, the turning point is estimated at 0.67 for the CRS model and 0.76 for the VRS case, which are slightly lower than the mean value of the observations (0.77). The finding denotes that it is to the greatest benefit of regions to diffuse the tourism flows on all their sub-divisions, as a means for utilizing better their capacity and increase tourists' spending. This is because the high spatial concentration of tourist flows in popular destinations of a region is not able to offset the possible under-utilization of resources occurring at the less popular destinations. Moreover, the lack of an adequate number of popular destinations in a region may lower tourism expenses due to low demand for a series of services such as transportation within the region, booking of excursions, and car rental. To put the results in perspective with the past research on agglomeration-performance nexus, the paper shows that at a regional scale agglomeration is beneficial for performance only in very polarized regions where a large variety of services can be provided on site. As polarization decreases, so does the efficiency until the regions shift toward a better spatially balanced model where efficiency seems to improve.

Moreover, the estimation of the INS variable coefficient shows that insularity has a dual effect on the efficiency of regions. More precisely, insularity is found to have a negative effect on the CRS efficiency and a positive effect on VRS efficiency. This finding shows that connectivity issues might impede destinations to fill up their capacity, but when the scale factor is omitted, insular regions seem to operate rather more efficiently than their terrestrial competitors. In addition, the DENS coefficient has a negative sign and thus it favors the efficiency of regions. This relationship is found significant only for the CRS case, which is something reasonable as more urbanized regions are favored by large number of tourists' flows and thus acquire a competitive advantage in scale terms. Furthermore, the estimated coefficient for the MIX variable is positive and statistically significant at the (< 0.01) level. This result indicates that foreign tourism is the driver of performance for the coastal Mediterranean regions, since the regions where domestic tourism acquires a large proportion of the total nights present higher levels of inefficiency. This inefficiency arises both from the inability to fill up the supply of beds and from the reduced spending of foreign tourists as destinations whose target market is the domestic population may not have the capacity to develop added value services for foreigners. Therefore, strategies for performance improvement should consider that destinations should be able to attract non-domestic tourism in order to achieve larger efficiency gains. Finally, the SPEC variable was found to have an effect only on the CRS efficiency of the regions and according to the estimated sign it seems that regions which are highly specialized in tourism activities are found to perform less efficiently than the others. This is a quite unexpected finding and maybe should be attributed to the fact that for the Mediterranean region, the higher specialization is found for the islands. Therefore, specialized regions tend to suffer from their inability to maintain a rather stable flow of tourists all year round and therefore are struggling to cover their existing capacity. When the scale factor is omitted (VRS model) this effect is not so strong. Overall, in a Mediterranean context the most favored destinations are those that can combine urban and coastal tourism so as to achieve high occupancy rates and rather high levels of spending.

5 Conclusions

The present paper studies the effects of seasonality and spatiality of tourist flows on the regional performance of tourism sector. The empirical analysis is conducted for 36 coastal North Mediterranean EU NUTS II regions, for the period 2010-2016, and is based on a triplet of quantitative indices and on a double bootstrapped truncated regression. As far as seasonality is concerned, the empirical application of the proposed methodological framework shows that seasonality and performance are linked with a rather complex relationship. This relationship is portrayed with an N-shaped curve, which shows that the general question "is seasonality desired by the accommodation sector" should be better replaced by the question "how much seasonality is desired by the accommodation sector". Therefore, future studies on the nexus of performance and seasonality should avoid the adoption of a linear relationship assumption. Moreover, the paper sheds light on spatiality, whose effect on destinations performance has remained rather under-studied up to now. The results of the empirical analysis show a U-shaped relationship between performance and spatiality. This means that the uncontrolled spatial concentration of flows could pose severe threats on the ability of destinations to perform efficiently and to achieve a satisfactory utilization of their resources. Moreover, performance is affected by geographical and structural characteristics, which should be considered when conducting comparative evaluations of performance.

The findings of the paper come up with several policy implications towards the improvement of the performance of coastal destinations. The analysis shows that performance hardly changes in the short-run. The same stands true for seasonality and spatiality. Therefore, a constant effort should be made by regional and tourism authorities in order for substantial improvements to take place. Although seasonality has been at the spot of nearly all strategic plans of tourism, the efforts to be made on its confrontation should aim at bringing the destinations to levels of seasonality which correspond to those being met at the middle zone of the N-shaped relationship curve.

Moreover, from a regional development perspective, it is critical for strategic planning to aim at the reduction of the uncontrolled spatial concentration of flows. Therefore, actions aiming at the diversification of the tourism product, as a means for confronting seasonality, should consider that larger imbalances could be generated if diversification takes place only in specific areas of a region. This is because destinations of the same region, that formerly operated as complementary, may turn up to be competitive if diversification in one area eliminates the competitive advantage of another. This fact may be considered as a natural process, within the frame of the destinations' lifecycle and the competitive market of tourism, but, under a regional development perspective, it may compromise the targets of the balanced economic development and efficient use of resources within the regions and, furthermore, the competitive position of regions as economic entities.

Furthermore, the balance of foreign and domestic tourist flows has a significant role in shaping the ability of destinations to perform efficiently. Places which attract more foreign tourists find it easier to fill in their capacity and benefit from higher foreign tourists spending. The way that the monetary output was incorporated into the present estimations excluded the domain tourists' expenditures due to a lack of data. Therefore, if some destinations manage to accommodate domestic tourists with the same rate of expenditures as this of foreign then they can offset the deficit of international demand. Nevertheless, this is hardly the case in Mediterranean, as the foreigners' spending is usually higher than this of the residents. Therefore, a double challenge arises for the more domestic-oriented destinations as they need not only to attract more international flows but also to improve their tourism offer and to develop added value services in order to achieve more average daily spending from the existing flows of foreign tourists.

The findings of the present paper signify that the complexity of the tourism phenomenon requires tailor-made, focused, empirical approaches in order to decompose the latent relationships between the multiple dimensions of tourism. To this end, the present paper sheds light to one of the possible impacts of seasonality and spatiality, which has to do with the effect of the phenomena on the performance of the accommodation sector. Such a decomposition approach may help authorities to develop more efficient monitoring tools than those of simple indicators, which may provide an assessment of seasonality and capacity utilization but ignore the impacts of the former on the latter (i.e., European Tourism Indicators System). Therefore, more sophisticated models of sustainability assessment may be developed if the interactions among the dimensions of tourism under consideration can be modeled.

The present results mainly concern developed countries and regions, where coastal tourism is the dominant form of tourism. Therefore, additional research should follow in order to test the relationships of seasonality, spatiality, and performance in other types of tourism and areas. Finally, since spatiality and seasonality are phenomena, which can be altered only in the long-run, the extension of the period of analysis, adopted by the present paper, may offer more comprehensive assessments of their impacts.

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