DRAWING AN INDICATOR OF TOURISM COMPETITIVENESS AND EXAMINING ITS RELATIONSHIP WITH TOURISM SEASONALITY FOR THE GREEK PREFECTURES

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Abstract

Within the context that tourism competitiveness is a complex concept, this article proposes a conceptual framework and uses Pena's P_2 distance synthetic index (DP_2) to classify the Greek prefectures according to their competitiveness. This paper aims to define the potentials of Greek prefectures through the tourism competitiveness index. Additionally, examines the relationship between tourism competitiveness and tourism seasonality which is a significant phenomenon that affects tourism every destination globally. The study utilizes a total of 66 variables, and the data were processed using the Package 'p2distance' in R Studio. The analysis reveals four groups according to their values in the tourism competitiveness index (DP_2) and tourism seasonality (RSI). In these four groups, tourism carrying capacity and tourism saturation indexes from previous studies are also presented in the last section. Overall, the analysis supports multidisciplinary and synthetic research in the modeling of tourism research and promotes the DP_2 synthetic index in the study of tourism competitiveness. The overall analysis can propose a tool for tourism management and regional policy, as these are complex concepts. The proposed approach advances the DP_2 index as a quantitative measure for tourism competitiveness and compares the results with tourism seasonality

Keywords: tourism competitiveness, tourism attractiveness, tourism seasonality, regional and tourism development, DP_2 synthetic index

JEL classification: R10, R11, R58, C43, Z32

1. Introduction

The unequal spatial development of tourist destinations affects the economy, society, and the environment and is an important factor for development strategies in a sustainable framework (Andrei et al., 2015; Romao et al., 2017; Polyzos, 2019). The study of these inequalities is highly complex, and interdisciplinary approaches have been developed in the international literature (Tsiotas et al., 2021). Because tourism is an important economic sector for many countries worldwide (Hall, 2022), and the attractiveness of destinations from emerging economies is over time increasing (Ritchie and Crouch, 2003), concepts such as tourism competitiveness and tourist attractiveness have long attracted the interest of researchers seeking to define and quantify these concepts (Gomezelj and Mihalic, 2008; Cracolici and Nijkamp, 2009). Destinations globally attempt to procced in more sustainable tourism policies (Morgan et al., 2011; Cucculelli and Goffi, 2016) looking for more resilient economies in the post-Covid-19 era (Kim et al., 2022), with more solutions and more rational planning, especially for times of crisis (Farzanegan et al., 2020), and seek to include the concepts of competitiveness and attractiveness on their policymaking (Morgan et al., 2011).

Trying to separate these two concepts, tourism attractiveness usually is limited to specific tourism characteristics of the destination and depends on subjective factors that are often associated with the emotional criteria of the visitors (Cracolici and Nijkamp, 2009; Reitsamer and Brunner-Sperdin 2017). On the other hand, tourism competitiveness is a more complex

and integrated framework that does not focus exclusively on aspects of tourism, having a more holistic approach (Shaw and Williams, 2004; Cracolici and Nijkamp, 2009). Tourism competitiveness concerns the degree which a destination can maintain its natural and cultural resources, can increase the long-term prosperity of its inhabitants, and provide unique experiences, more attractive than the experiences of other destinations (Ritchie and Crouch, 2003; Bahar and Kozak, 2007).

This approach even includes hidden cause-effects assumptions within a sustainability context it appears to be a system of definitional (Medina-Munoz et al., 2013). Nevertheless, the definition of tourism competitiveness, its measurement, and the indicators examined in such studies have not been commonly accepted (Mira et al., 2016; Abreu-Novais et al., 2018). As a result, competitiveness is also influenced by subjective factors (Cracolici and Nijkamp, 2009; Abreu-Novais et al., 2018; Vasyltsiv et al., 2021), leading to an even greater ambiguity of concept (Claver-Cortes et al., 2007). This effect of subjective factors on the assessment of tourism competitiveness is also related to the fact that the destinations in question may target different tourism markets. The destination factors are different or have a different weight on the overall competitiveness of the destination for each market (Morgan et al., 2011; Medina-Munoz et al., 2013).

In attempting to deconstruct tourism competitiveness and the different conceptual frameworks that have been developed, it appears that the concept includes two dimensions. On the one hand includes internal attributes and abilities of the residents, such as the improvement of their health and level of education, aiming at the enhancement of the quality of life, prosperity, and human development (Sharpley, 2010; Croes et al., 2020). On the other hand, includes the external environment and connects tourism with market position, comparing, for example, the tourist arrivals or overnight stays with the competing destinations (Croes et al., 2020). Many times, these two different environments (internal and external) can come into conflict.

As it turns out, the concepts of tourism competitiveness and tourism attractiveness are very complex (Medina-Munoz et al., 2013), and studies have tried to prioritize and weigh their most critical factors (Crouch and Ritchie, 2005; Zehrer et al., 2016). Most studies use a set of objective (hard data and long-term) and subjective (soft data and short-term) indicators (Cucculelli and Goffi; 2016; Usyal and Sirgy, 2019; Croes et al., 2020) to approach the concepts. It is useful, in addition to the number of visitors, the market share of a destination, or the level of price competitiveness (Seetaram et al., 2016), in the quantification of tourism competitiveness to take into account the concepts of sustainability, tourism carrying capacity, prosperity, and human development, the investment opportunities, provided services, and to include the social and cultural variables of destination (Mira et al., 2016; Romao et al., 2017; Croes et al., 2020). As a result of the complexity of the concepts, studies attempted to approach them using different techniques such as multicriteria decision analysis (Cracolici and Nijkamp, 2009), shift-share analysis (Constantino et al., 2020), multiple linear regression, phenomenographic approach (Abreu-Novais et al., 2018), fuzzy approach (Fu and Chen, 2019).

The majority of studies approach the complex concepts by examining them at a country or group of countries level (Bahar and Kozak, 2007; Gomezelj and Mihalic, 2008; Croes et al., 2020). However, some studies approach tourism competitiveness and attractiveness in smaller destinations such as islands (Mechinda et al., 2010), large cities (Minghetti and Montaguti, 2010), specific types of destinations (Lee and King, 2006), well-known holiday destinations, and provinces (NUTS3) (Cracolici and Nijkamp, 2009). Very few studies examine tourism competitiveness comparing all the administrative spatial groups of a country (NUTS3) despite the uneven spatial development within many countries (Cucculelli and Goffi, 2016), which leads to the regional issue.

Aiming to serve the demand for quantifying the tourism competitiveness in the small administrative spatial groups (NUTS3), this paper quantifies the concept for each Greek prefecture using a synthetic index. In order to construct the synthetic index, in the beginning, a conceptual framework for the study of the concept of tourism competitiveness is proposed. To approach the concept at a lower administrative level, some main factors such as the political and legal factors, technology (Ritchie and Crouch, 2003), business environment, destination management (Cocculeli and Goffi, 2016), or global economic impacts (Ritchie

and Crouch, 2010) that referred in international literature, are difficult to be included. There aren't significant differences and data among the prefectures of a country, and in this light, it is usefull to set the framework within which the tourism competitiveness will be analyzed.

For the quantitative analysis will be constructed a synthetic index based on the method of P_2 distance (DP_2), following the approach of other similar studies (Salinas Fernandez et al., 2020). While the study of Salinas Fernandez et al. (2020) designed a synthetic index to rank 80 countries using variables from the 2017 Travel & Tourism Competitiveness Index, this study attempts to apply the approach in Greece's small administrative spatial groups after first defining the conceptual framework within which, the concept, will be analyzed. The international literature analyzed the properties that make the application of the synthetic index DP_2 particularly prevalent in different issues by replacing or supplementing methodologies such as Principal Component Analysis and Data Envelopment Analysis (Somarriba and Pena, 2009; Salinas Fernandez et al., 2020). The main advantage of this synthetic index is the quantitation of the index and at the same time the ability to calculate the weight of each variable to be used (Somarriba and Pena, 2009). Since many variables affect competitiveness, this feature is useful for the determination of the weight of each variable in the final calculation of the index.

At the second level, the study examines the relationship between tourism competitiveness and tourism seasonality. The phenomenon of tourism seasonality is the unequal distribution of demand throughout the year. The phenomenon is complex, globally, with temporal, spatial, and socio-economic dimensions, that presents differences, both between countries and within countries (Tsiotas et al., 2021). As a result, tourism seasonality is affected by various factors such as the type of the tourism product (Cuccia και Rizzo, 2011), the climate (Fang and Yin, 2015), the social configuration (Almeida and Kastenholz, 2019), the political regime (Fernandez-Morales et al., 2016), and other factors (Lee et al., 2008). A fundamental issue in quantitative studies is the quantification of tourism seasonality, which is implemented by using a specific variable within a certain period (e.g., monthly), regardless of their patterns (Ferrante et al., 2018). The most common variables for measuring tourism seasonality are the number of visitors, arrivals, and overnight stays, while, in terms of economic impacts, income-defined variables are also used. For the measurement of tourism seasonality, this study applies the Relative Seasonal Index - RSI (Lo Magno et al. 2017), which is a more suitable index than Gini, which is also a widespread index for the measuring of the phenomenon (Ferrante et al. 2018).

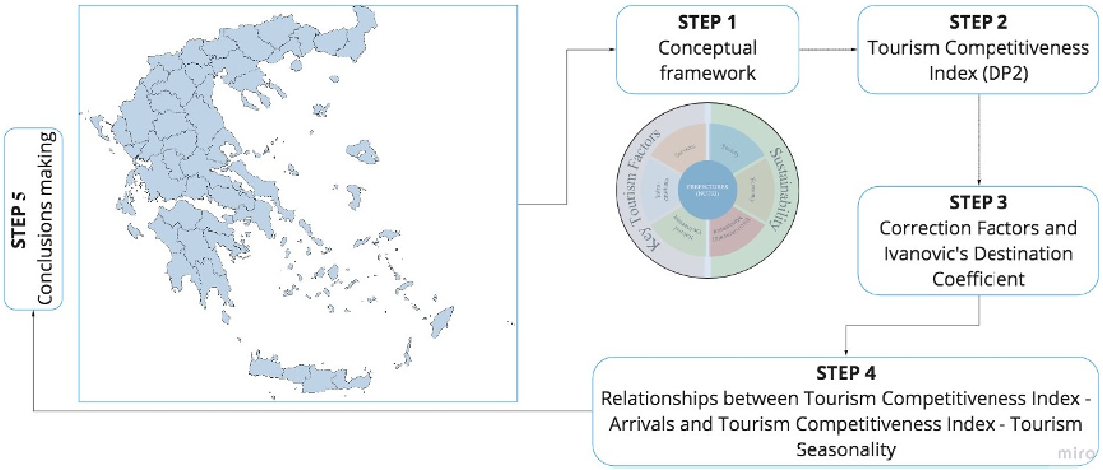
The study focuses on the case of Greece, which is a coastal country with a mixed mountainous, land, coastal, and insular morphology (Tsiotas, 2017). Tourism is a significant sector in the Greek economy as, for the year 2019 accounted for 20,8% of national GDP and 21,7% of total employment (SETE, 2021). In the country, there is high uneven spatial development among the prefectures (Polyzos, 2019), and some of them have high tourism seasonality (Tsiotas et al., 2021), tourism carrying capacity (Krabokoukis and Polyzos, 2020), and saturation indexes (Krabokoukis et al., 2021). Within this context, the study offers a quantitative tool for measuring and classifying the dynamics of the Greek prefectures by their competitiveness. This consideration can provide insights that may contribute to the configuration of more effective and more sustainable tourism development strategies.

The remainder of this paper is organized as follows: Section 1 is a brief literature review discussing mainly the concept of tourism competitiveness, and secondarily the concept of tourism seasonality. Section 2 describes the methodological framework of the study, the available data, and the variables participating in the analysis. Section 3 presents the results and discusses them within the context of regional science and tourism development. Finally, in section 4, conclusions are given.

2. Methodological framework

The study aims to quantity the tourism competitiveness of Greek prefectures and examines the relationship with tourism seasonality. The further purpose of the study is to determine the dynamics of each prefecture in Greece. The study is based on the DP_2 index (Croes et al., 2020), which can calculate the weight of each variable to be used (Somarriba and Pena, 2009). The methodological framework consists of five steps, as is shown in Fig.1.

Figure 1. The conceptual diagram illustrating the methodological framework of the study.



At the first step is proposed the conceptual framework of tourism competitiveness for the study of Greek prefectures. To approach the concept at a lower administrative level, certain main factors such as the political and legal factors, technology (Ritchie and Crouch, 2003), business environment, destination management (Cocculeli and Goffi, 2016), or global economic impacts (Ritchie and Crouch, 2010), are general and thus affect almost all areas of a country. As a result, it is difficult to find useful data to apply well-known models for tourism competitiveness at this administrative level and thus is particularly useful an adjustment of the factors involved in assessing tourism competitiveness.

Figure 2. The conceptual framework diagram illustrating the tourism competitiveness as proposes for the studying of Greek prefectures (NUTS3)

From the literature review arising three main dimensions of tourism competitiveness which are the ability to attract international visitors, the ability to satisfy them, and the ability to enhance the well-being of destination residents (Sharpley, 2010; Medina-Munoz et al., 2013), which are involved in the proposed conceptual framework. Figure 2 presents the proposed conceptual framework for assessing tourism competitiveness at the level of Greek prefectures, based on key points from previous studies. It is proposed to examine tourism competitiveness in six main interacting frameworks, which form the two main pillars.

Following the approach of Usyal and Sirgy (2019), we separate as "Input" the main factors of tourism divided into three frameworks, "Output" the sustainability in its three frameworks. The balance of these two main pillars is crucial for any destination, as there isn't any competitive tourist destination if the conditions for its development do not exist or if they operate to the detriment of its viability. Since Greek tourism is based mainly on its natural characteristics (Krabokoukis et al., 2021), which do not have the expected positive impacts on competitiveness as often related to low value-added for the host communities and mass tourism (Romao et al., 2017), the proposed model includes the concept of attractiveness (natural resources), and visitor satisfaction (infrastructure and services). The concept of the well-being of the inhabitants is contained in both main pillars (key tourism factors, sustainability), as these points affect the inhabitants' daily life.

The natural environment as part of the key tourism factors (Inputs) includes indicators and variables related to climate, location, coastline, biodiversity, mountain range, particular geomorphological features, etc. These factors often shape the tourism model developed in a destination and are usually the most popular points of interest for visitors (Polyzos, 2019). The infrastructure framework includes indicators and variables related to accessibility, health, safety, local market, culture, and history. Such factors shape the first image and the first experience of each visitor to the destination. If this experience is not successful, it is difficult for the overall experience to be positive. Accordingly, the framework of the services includes intangible elements and is more related to the experience emotions and the creation of unique memories to visitors who demands authenticity and meaningful interactions with locals (Paulauskaite et al., 2017). It includes indicators and variables related to research and development, visitor satisfaction, local events, entertainment, sports, and other activities, the quality of services provided, the recognition of the destination, and the actions for its promotion. These factors shape the entire tourist experience provided by the visitor to a destination.

The pillar of sustainability, having as its framework its three dimensions, includes the results (consequences) of the tourist activity of the destination (Outputs), but at the same time the characteristics that contribute more indirectly to the improvement of the level of the tourism competitiveness. The context related to society includes elements such as human development, social prosperity, social carrying capacity, and the level of dependence on tourism. A prosperous society contributes positively to tourism competitiveness (Ritchie and Crouch, 2003; Cucculelli and Goffi, 2016; Usyal and Sirgy, 2019). The economy includes dimensions related to economic prosperity, the economic benefits of tourism, the level of wages and average household income, and investments made in the destination. Finally, the framework of environmental management is related to factors such as the protection of natural resources, the use of renewable energy sources, water management, wastewater treatment, and air pollution.

To remains a competitive destination, both the input pillar (key tourism factors) and the output pillar (sustainability) need to be improved. Destinations, for example, that focus on increasing the tourism activity without, at the same time, focusing on the destination's sustainability are likely to lead to situations of tourism saturation, over-tourism, and consequently a reduction in their overall tourist attractiveness and competitiveness. Respectively, destinations that focus on the pillar of sustainability to increase their tourism competitiveness are called upon to develop at the same time the other three points of the "inputs" pillar. The importance of each pillar depends on a variety of factors, such as the main tourism markets of each destination, the situation of each destination, and the main comparative advantages of each destination. In conclusion, linking socio-economic benefits to the local economy and sustainable local resource management is vital to tourism competitiveness (Romao et al., 2017), although tourism development in one area affects tourism in another area through a spatial spillover effect (Ma et al., 2015).

In the second step, the calculation of the synthetic index DP_2 is done by equation 1, using in total 66 components based on the conceptual framework.

$$DP_2 = \sum_{i=1}^{n} \left\{ \left(\frac{d_{ij}}{\sigma_i} \right) \left(1 - R^2_{i,i-1,i-2,\ldots,1} \right) \right\} \quad (1)$$

where n is the number of components (variables), $d_{ij}=|x_{ij}-x_{*i}|; i=1,2,\dots n,; j=1,2,\dots,m$ is the absolute value of the difference between the value obtained by the component i in prefecture j (x_{ij}) and the minimum value of the variable i in all prefectures (x_{*i}), σ_i is the standard deviation of the variable i, $R^2_{i,i-1,i-2,\dots,1}$ is the determination coefficient of regression of x_i to x_{i-1}, x_{i-2}, …, x_1.

At the third step, to estimate the discriminant power of each variable, applying Ivanovic's Discrimination Coefficient (DC) using equation 2. The index takes values in the closed space 0 and 2. When all the values of Xi are equal, the weight of the variable is 0. When only Xi takes non-zero value in a prefecture and the remaining m-1 values are zero, the determinant coefficient takes the value 2 (Salinas Fernandez et al., 2020). It is an improvement in theoretical depth as parade information for the weight of each variable (Mazanec et al., 2007).

$$DC_i = \frac{2}{m(m-1)} \sum_{j,l>j}^{k_i} m_{ji}\, m_{li} \left| \frac{x_{ji} - x_{li}}{\bar{X}_\iota} \right| \quad (2)$$

where m is the number of Greek prefectures, x_{ji} is the value of X_i in prefecture j, and x_{li} is the minimum value taken by variable X_i in prefecture j, m_{ji} is the number of Greek prefectures where the value of X_i is x_{li}, X_{im} is the average of X_i and k_i is the number of different values taken by the X_i.

To find the total information provided by the components used to estimate the synthetic tourism competitiveness index, defined the Ivanovic-Pena Global Information Coefficient as a measurement that combines the Ivanovic Discrimination Coefficient and the Pena's correction factor (Coefficient Ivanovic Pena - CIP), as proposed by (Salinas Fernandez et al., 2020). The calculation of this index is derived from relation 3.

$$CIP = \sum_{i=1}^{n} DC_i \left(1 - R^2_{i,i-1,i-2,\dots,1}\right) \quad (3)$$

where n is the number of components, DC_i is the Ivanovic's Discrimination Coefficient, and $1 - R^2_{i,i-1,i-2,\dots,1}$ is the Pena's correction factor.

To estimate the effect of each component, each component is classified using the individual relative information coefficient, as defined in equation 4 by Zarzosa (Salinas Fernandez et al., 2020). This index takes values between 0 and 1, showing the relevance of each variable when measuring the tourism competitiveness of each prefecture.

$$a_\iota = \frac{DC_i\left(1 - R^2_{i,i-1,i-2,\dots,1}\right)}{CIP} \quad (4)$$

At the fourth step, the results of the tourism competitiveness index of each prefecture are compared with the arrivals of visitors and with the tourist seasonality of each prefecture. For the estimation of the tourist seasonality the RSI index was used, to find out that is a more suitable index related to Gini (Ferrante et al. 2018). This index was defined within the context of the transportation problem, formulated as the problem of minimizing the cost of eliminating seasonality by transferring units from high to low season periods (Lo Magno et al., 2017), and the mathematical expression is described as follows:

$$S_R\left(\mu, C\right) = \frac{\sum_{i\in A}\sum_{j\in B} c_{ij} x_{ij}}{\mu \cdot max_{i\in M}\left\{\sum_{j\in M} c_{ij}\right\}} \quad (5)$$

where x_i is the *i*-th observation of variable *x*, μ is the average value of the available observations, *c* is the total cost for eliminating seasonality, *A* is the set of high-season time periods, *B* is the set of low-season time periods, and *M* is the set of all possible observed time-patterns.

The results of the analysis and the overall approach are discussed at the sixth step of the study. This approach develops a tourism competitiveness index for each prefecture and the overall approach is expected to provide a tool of quantitative analysis useful for the regional policy and tourism management.

3. Results and discussion

For calculation of the indicators, given the difficulty for measuring the indexes, especially for the relation 2, due to its iteration, this study used the programming language R and the Package 'p2distance' in R Studio. Table A, in Appendix, shows 45 of the total 66 components (variables) examined, as these components have correction factors greater than 0%. The other 21 examined components have correction factors equal to 0% means that their information does not contribute to the synthetic index of tourism competitiveness. Additionally, this Table shows the individual relative information coefficient indicator "a", as used by Salinas Fernandez et al. (2020). From this indicator resulted that these 45 components represent 70% of the total information for the tourism competitiveness indicator.

Table 1 shows the significant correction factors, with values above 10%, which represent the new information that each variable contributes when integrated into the final tourism competitiveness index.

Table 1. The variables of the synthetic tourism competitiveness index with the highest values greater than 10% in the correction factors.

Variables	Absolute Correlation Coefficient - DP_2	Correction Factors
Monthly Average of visitors per sq. km.	0.8940	1.000
Restaurants per sq. km.	0.8702	0.189
Museums per 100 sq. km.	0.8164	0.331
Road Network Density	0.7563	0.184
Per Capita GDP	0.7230	0.479
Ports and Airports per sq. km.	0.7220	0.101
Archaeological Sites per sq.km.	0.6682	0.215
Education Index	0.6408	0.160
Sum of Cultural Resources Indices	0.6226	0.192
Prosperity Index	0.6036	0.212
Length of Sandy Beaches	0.5387	0.124
Dependent Reason	0.4951	0.108
Gross Fertility Rate	0.4494	0.150

The component "Monthly Average of visitors per sq. km." has the highest absolute correlation coefficient, and 100% of the information brought from this component is incorporated into the synthetic index of tourism competitiveness. This result is logical given that competitive destinations can attract more visitors. The components "Restaurants per sq. km.", "Museums per 100 sq. km.", "Road Network Density", "Ports and Airports per sq. km.", "Archaeological Sites per sq.km.", "Sum of Cultural Resources Indices", and "Length of Sandy Beaches" relate to the infrastructures of the destination. Even though they have a high absolute correlation coefficient, only the component "Museums per 100 sq. km." has a high correction factor as contributes 33,1% of new information not collected by previous variables. These results are following the results of similar studies in Greece (Tsiotas et al., 2021). The component "Per Capita GDP" has a high absolute correlation coefficient and correction factor greater than 47% showing that it's new information not collected by previous variables. It is a significant component that shows the economic situation of each destination. The last components, "Education Index", "Prosperity Index", "Dependent Reason", and "Gross Fertility Rate", show the social situation of the destination. As a result, infrastructure components, and economic and social components shape to a large extent the tourism competitiveness index for the Greek Prefectures.

Table 2 shows the discriminant power of components resulted from Table 1, using Ivanovic's discrimination coefficient, ranging from 0 to 2. The variables with the greatest discriminant power are related to the number of visitors, infrastructures, cultural and natural resources. The component "Monthly Average of visitors per sq. km." has the highest Ivanovic's discriminant coefficient (1.390), indicating that tourism is distributed unequally

among the Greek prefectures. This result is in line with other studies (Tsiotas et al., 2021). The components "Restaurants per sq. km.", "Museums per 100 sq. km.", "Ports and Airports per sq. km.", "Archaeological Sites per sq.km.", "Sum of Cultural Resources Indices" refers to general infrastructures and cultural resources of the destination having also high Ivanovic's discriminant coefficient (1.320, 1.000, 1.340, 1.090, 0.930).

Table 2. Ivanovic's discriminant coefficient and the contribution of individual relative information coefficient to the tourism competitiveness index.

Variables	Ivanovic's discriminant coefficient (DC)	Individual relative information coefficient (a)
Monthly Average of visitors per sq. km.	1.390	0.0207
Ports and Airports per sq. km.	1.340	0.0200
Restaurants per sq. km.	1.320	0.0197
Archaeological Sites per sq.km.	1.090	0.0163
Length of Sandy Beaches	1.040	0.0155
Museums per 100 sq. km.	1.000	0.0149
Sum of Cultural Resources Indices	0.930	0.0139
Prosperity Index	0.470	0.0070
Road Network Density	0.390	0.0058
Dependent Reason	0.280	0.0042
Per Capita GDP	0.220	0.0033
Gross Fertility Rate	0.170	0.0025
Education Index	0.160	0.0023

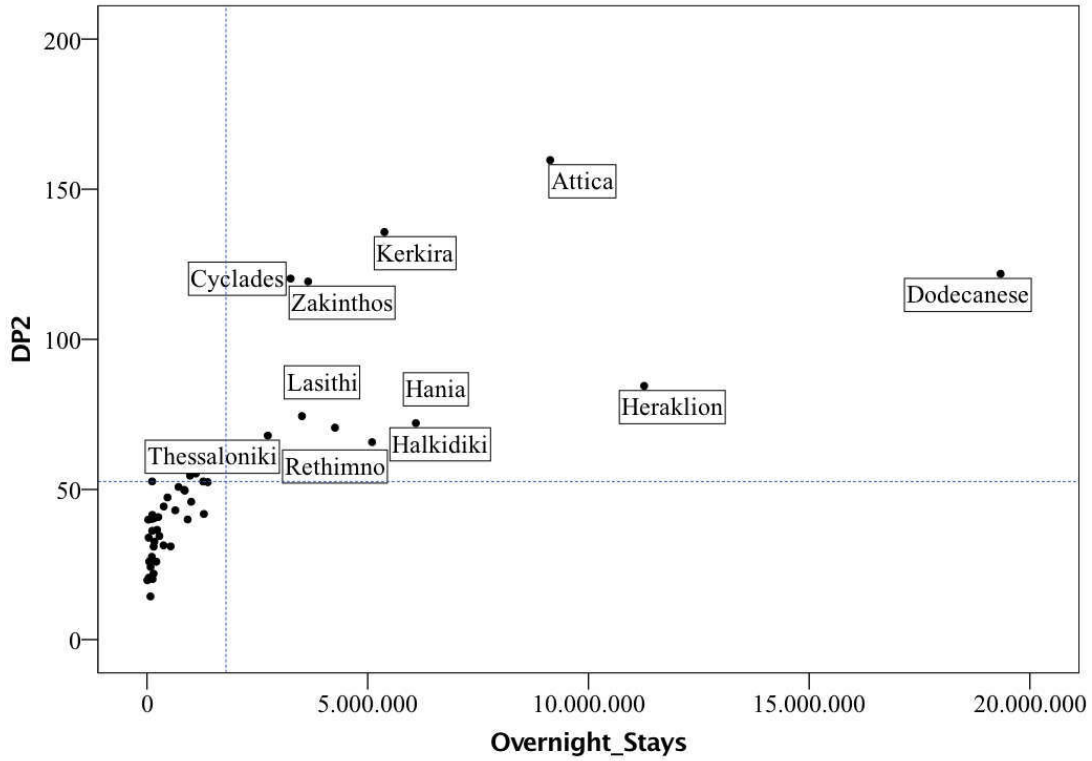
The component "Length of Sandy Beaches" represents the natural environment of the destination and has also a high value in Ivanovic's discriminant coefficient (1.040), showing the unequal distribution of Greek tourism in general. Sea is a major factor influencing tourism development in the country, given that the most representative tourism model is based on 3s (Polyzos, 2019). The other components "Road Network Density" (infrastructures), "Per Capita GDP" (economy), "Education index" (society), "Prosperity index" (society), "Dependent ratio" (society), and "Gross Fertility rate" (society), have significand values Ivanovic's discriminant coefficient (0.390, 0.220, 0.160, 0.470, 0.280 and 0.170), but lower than the other components.

The correction factors (Table 1, column 3) and Ivanovic's discriminant coefficient (Table 2, column 2) result in the significant information contributed from each component to the tourism competitiveness index. Table 2, column 3, shows this relative information coefficient indicator "a", which combines this information measuring the contribution in relative terms made by each component. In total, 13 components represent only 15% of the total information for the tourism competitiveness indicator. This result shows that despite the significance of these components, the rest of the components examined in this study include significant information. The components shown in Table A of the Appendix represent 70% of the total information for the tourism competitiveness indicator.

Table B of the Appendix shows the Greek prefectures sorted in descending order according to their tourism competitiveness index (DP_2), corresponding tourism seasonality indexes (RSI), and their total overnight stays for both categories of visitors (domestic and foreign). More specifically, the tourism competitiveness index (DP_2) shows the distance of a prefecture from a hypothetical prefecture in which all components have the minimum price and is not a tourism competitive prefecture (DP_2=0). The most tourism competitive prefecture is Attica (on which belongs the capital of Greece, Athens), followed by island prefectures (Kerkira, Dodecanese, Cyclades, Zakynthos, Heraklion, Lasithi, Hania, and Rethimno). These nine prefectures represent 72% of total overnight stays for the year 2018. As resulted from Figure 3, these prefectures additionally to the prefectures Thessaloniki and Halkidiki are the only prefectures with higher values than the average values, in both the tourism competitiveness index and the total overnight stays, for the year 2018. Most of the Greek

prefectures are in the first quadrant, where the values in the tourism competitiveness index and the total overnight stays for the year 2018 are lower than the national average.

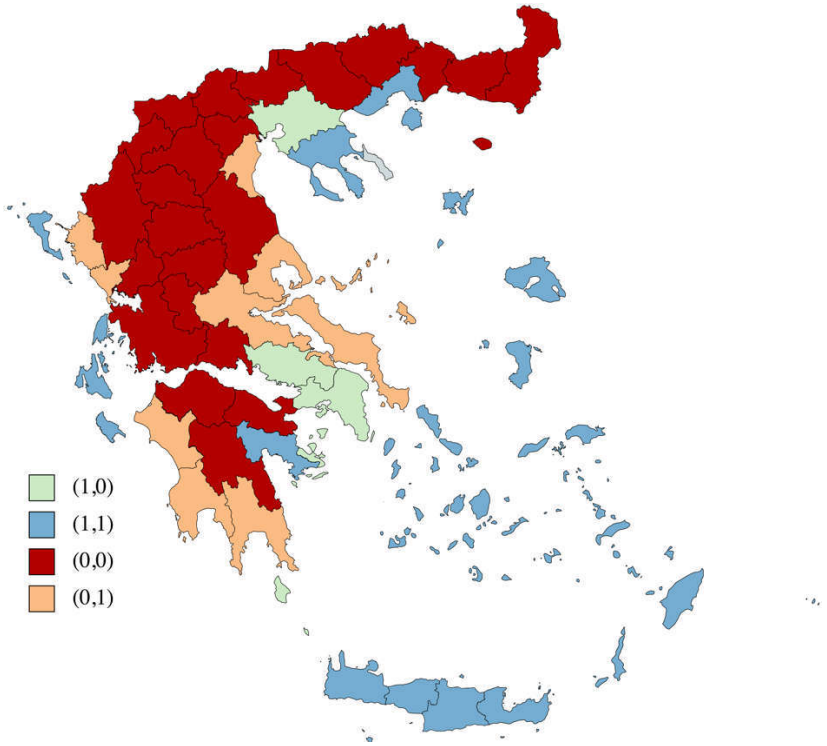
Figure 3. The prefectures with higher than the average values in tourism competitiveness index and total overnight stays, for the year of 2018.



As arises from Figure 3, there isn't a linear relationship between the tourism competitiveness index and overnight stays. A similar conclusion also emerged from the study of Perles-Ribas, et al. (2014), who used rank correlation to analyze the relationship among these variables. This observation is particularly important as it highlights that a destination with a higher tourist demand than another destination, is not necessarily a more competitive one. In Figure3, there is a group of the destinations of Lasithi, Hania, Thessaloniki, Rethimno, and Halkidiki, that even, in general lines, have a similar number of overnight stays with the group of the destinations of Kerkyra, Cyclades, and Zakinthos, their tourism competitiveness indexes are lower. The explanation arises from the variables that are applied for the quantification of tourism competitiveness., which, as shown in table A in the Appendix, are in an analog context (e.x. per sq. km., per 100 inhabitants).

Figure 4 shows the prefectures classified in four quadrants according to their values in the tourism competitiveness index (DP_2) and tourism seasonality (RSI) for the year 2018. The first group of prefectures (1,0) includes the prefectures that have higher than the average values in the tourism competitiveness index (DP_2) and lower than the country's average tourism seasonality (RSI) for the year 2018, showing that there is tourism potential. These prefectures are Attica, Thessaloniki, which includes the most populated cities of the country, and the prefecture of Voiotia. According to other studies, these prefectures have a high tourism saturation index (Krabokoukis et al., 2021), and except for Voiotia, they have a high tourism carrying capacity index (Krabokoukis and Polyzos, 2020).

Figure 4. The classified prefectures in four quarters according to their values in the tourism competitiveness index (DP_2) and tourism seasonality index (RSI), for the year 2018.



The second group (1,1) includes the most touristic destinations. They have higher than the average values in the tourism competitiveness index (DP_2) and higher tourism seasonality (RSI), for the year 2018. These prefectures are all the island prefectures (Kerkira, Dodecanese, Cyclades, Zakynthos, Heraklion, Lasithi, Hania, Rethimno, Kefalonia, Lefkada, Chios, Lesvos, Samos), while are also included three mainland prefectures (Halkidiki, Argolida, Kavala). These prefectures except Lefkada, and Chios, have high values in tourism saturation (Krabokoukis et al., 2021), and except Chios, Lesvos, and Kavala high values in tourism carrying capacity (Krabokoukis and Polyzos, 2020). As a result, there is a need for a different approach to the development policies of the prefectures of this category.

The third group (0,0) includes the prefectures with lower values than the average values in the tourism competitiveness index (DP_2) and tourism seasonality (RSI) for the year 2018. Most of them are in mainland Greece without instant access to the sea, which is the main factor for the tourism development in the country (Ioannina, Kozani, Florina, Imathia, Trikala, Kastoria, Kilkis, Karditsa, Grevena, Pella, Drama, Evritania), but there are also coastal prefectures in this group (Achaia, Korinthia, Arkadia, Larisa, Aitoloakarnania, Evros, Xanthi, Fokida, Arta, Rodopi, Serres). The fact that almost 45% of the Greek prefectures have lower than the average tourism competitiveness index, shows the great unequal tourism development of the country. Additionally, these prefectures have a low tourism carrying capacity index (Krabokoukis and Polyzos, 2020), and except the prefectures of Ioannina, Achaia, and Korinthia, have a low tourism saturation index (Krabokoukis et al., 2021).

The last category (0,1) shows the prefectures with lower values than the average values in the tourism competitiveness index (DP_2) and higher in tourism seasonality (RSI) for the year 2018. These prefectures are all coastal (Magnesia, Messinia, Lakonia, Evia, Preveza, Pieria, Thesprotia, Ilia, Fthiotida), but they are not tourism. These prefectures have also low tourism carrying capacity (Krabokoukis and Polyzos, 2020), and except Lakonia Preveza, Thesprotia have also high values in the tourism saturation index (Krabokoukis et al., 2021). As a result, showing that there is a need for the development of new tourism policies to become more competitive in the context of sustainability.

4. Conclusions

This paper provided a conceptual framework for the tourism competitiveness in Greek prefectures and the quantity of the concept. The proposed approach builds on the DP_2 index

with which it was possible to identify the components that participated most in the calculation of the index. As shown, components related to infostructures, economy, and society, shape to some extent the tourism competitiveness index for the Greek Prefectures. The analysis resulted in four groups according to their values in the tourism competitiveness index (DP_2), and tourism seasonality (RSI). In particular, the first group (1,0), including the most populated prefectures (Attica and Thessaloniki), and the prefecture of Voiotia which borders the prefecture of Attica, had higher than the average values in the tourism competitiveness index (DP_2), and lower in tourism seasonality (RSI), showing a dynamic. Additionally, these groups have high indexes in tourism saturation and tourism carrying capacity, showing that despite their tourism competitiveness new tourism models are needed to be applied. The second group (1,1) includes the most touristic destinations. These prefectures have higher than the average values in both examined variables (DP_2 and RSI), but additionally in variables tourism saturation and tourism carrying capacity. To continue to be tourism competitive prefecture new tourism approaches, more sustainable, are needed. The third group (0,0) has lower than the average values in both examined variables (DP_2 and RSI), and additionally in tourism saturation and tourism carrying capacity. Includes the 45% of the Greek prefectures, showed the unequal tourism development of the country, and the difficulties to develop tourism models away from the sea. The last group (0,1) includes coastal mainland prefectures that are not so competitive in the tourism sector but have high values in tourism seasonality. Additionally, they have high values in tourism saturation and low values in tourism carrying capacity. The overall analysis can propose a useful tool for tourism management and regional policy, as these are complex concepts, and points out that a destination with a higher tourism demand than another destination, is not necessarily more tourism competitive. The proposed method advances the DP_2 index to be used as a quantitative measure of tourism competitiveness and compares the results with tourism seasonality.

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6. Appendix

Table A. The 45 of total 66 used variables, sorted in descending order according to their correction factor index and their corresponding values in the Individual relative information coefficient (a)

Components	Correction Factors	a	Source
Monthly Average Visitors per sq. km.	1.0000	0.0207	Hellenic Statistical Authority
Per Capita GDP	0.4790	0.0033	Hellenic Statistical Authority
Museums per 100 sq. km.	0.3309	0.0149	Hellenic Statistical Authority
Archaeological Sites per sq. km.	0.2147	0.0163	Hellenic Statistical Authority

Components	Correction Factors	a	Source
Prosperity Index	0.2120	0.0070	Polyzos, 2019
Sum of Cultural Resources Indices	0.1918	0.0139	Polyzos, 2019
Restaurants per sq. km.	0.1892	0.0197	Hellenic Statistical Authority
Road Network Density	0.1841	0.0058	Hellenic Statistical Authority
Education Index	0.1597	0.0023	Polyzos, 2019
Gross Fertility Rate	0.1503	0.0025	own elaboration
Length of Sandy Beaches	0.1237	0.0155	Hellenic Statistical Authority
Dependent Ratio	0.1083	0.0042	own elaboration
Ports and Airports per sq. km.	0.1006	0.0200	Institute of SETE-INSETE
Average of all Location Quotients Indicators	0.0942	0.0017	own elaboration
Ancient Monuments	0.0926	0.0134	Hellenic Statistical Authority
Visitors per inhabitant	0.0824	0.0174	Hellenic Statistical Authority
Number of Organized Beaches	0.0810	0.0198	Hellenic Statistical Authority
Ski resorts	0.0768	0.0218	Hellenic Statistical Authority
5-star Hotel Beds per inhabitant	0.0684	0.0244	Institute of SETE-INSETE
Productive Dynamics Index	0.0679	0.0052	Polyzos, 2019
Tourism Industry Specialization Index (sector 4)	0.0613	0.0071	own elaboration
Listed Restaurants on Tripadvisor per sq. km.	0.0505	0.0194	TripAdvisor
Listed Activities on Tripadvisor per sq. km.	0.0503	0.0218	TripAdvisor
Occupancy Rate	0.0448	0.0059	Hellenic Statistical Authority
Labor Productivity of the Tourism Sector	0.0401	0.0048	own elaboration
Accommodation and Catering companies per sq. km.	0.0365	0.0160	Institute of SETE-INSETE
Woodland	0.0335	0.0122	Hellenic Statistical Authority
Average Annual Tourist Employment Index	0.0314	0.0085	own elaboration
Attractiveness Index	0.0286	0.0209	Krabokoukis and Polyzos, 2020
Indirect Potential	0.0282	0.0066	Polyzos, 2019
Hotel Beds per sq. km.	0.0258	0.0216	Institute of SETE-INSETE
Number of Blue Flags	0.0232	0.0194	Blue Flag
Camping places per sq. km.	0.0195	0.0245	Institute of SETE-INSETE
Hotel Beds per 100 inhabitants	0.0178	0.0191	Institute of SETE-INSETE
Indigenous Tourist Penetration Index	0.0162	0.0109	own elaboration
Tourist Intensity Index	0.0156	0.0167	own elaboration
Visitors per sq. km during the high season	0.0150	0.0216	own elaboration
Wholesale and Retail Trade Companies per sq. km.	0.0121	0.0151	Hellenic Statistical Authority
Length of Coasts	0.0112	0.0189	Hellenic Statistical Authority
Human resources	0.0100	0.0176	Polyzos, 2019
Foreigners Tourist Penetration Index	0.0092	0.0229	own elaboration
Total Beds per sq. km.	0.0067	0.0214	Institute of SETE-INSETE
5-star Hotel Beds per sq. km.	0.0051	0.0235	Institute of SETE-INSETE
Hospital Beds per 100 sq. km.	0.0033	0.0169	Institute of SETE-INSETE

Components	Correction Factors	a	Source
Overnight Index	0.0032	0.0209	own elaboration
Total Beds per 100 inhabitants	0.0007	0.0194	Institute of SETE-INSETE
Doctors per 1000 inhabitants	0.0003	0.0056	Hellenic Statistical Authority
UNESCO Monuments	0.0000	0.0244	Hellenic Statistical Authority
Tourist Accommodation Potential Index	0.0000	0.0214	own elaboration
National Parks	0.0000	0.0254	Hellenic Statistical Authority
Water Resources	0.0000	0.0151	Hellenic Statistical Authority
Number of Blue Flags per Organized Beach	0.0000	0.0292	own elaboration
Beds in Rooms to Let per 100 inhabitants	0.0000	0.0210	Institute of SETE-INSETE
Beds in Rooms to Let per sq. km.	0.0000	0.0220	Institute of SETE-INSETE
Camping places per 100 inhabitants	0.0000	0.0206	Institute of SETE-INSETE
Mountain activities	0.0000	0.0157	Hellenic Statistical Authority
Mountain Routes	0.0000	0.0168	Hellenic Statistical Authority
Rafting points	0.0000	0.0262	TripAdvisor
Canyoning points	0.0000	0.0251	Hellenic Statistical Authority
Length of skiing routes	0.0000	0.0244	Hellenic Statistical Authority
Saturation Index	0.0000	0.0008	Krabokoukis et al., 2021
Tourism Operation Index	0.0000	0.0193	own elaboration
Visitors per sq. km during the low season	0.0000	0.0186	own elaboration
Total Potential	0.0000	0.0081	Polyzos, 2019
Exports to GDP	0.0000	0.0157	Polyzos, 2019
Exports to Imports	0.0000	0.0151	Polyzos, 2019

Table B. Greek prefectures sorted in descending order according to their tourism competitiveness index (DP_2) and corresponding tourism seasonality indexes (RSI) and total overnight stays, for both categories of visitors (domestic and foreign).

Prefecture	DP_2	Total RSI 2018	Total Overnight stays 2018
Attica	159.683	0.1815	9,132,778
Kerkira	135.734	0.5635	5,378,036
Dodecanese	121.819	0.5499	19,335,953
Cyclades	120.239	0.5807	3,253,224
Zakynthos	119.259	0.5990	3,649,380
Heraklion	84.482	0.5062	11,262,869
Lasithi	74.425	0.5393	3,509,508
Hania	72.100	0.5258	6,089,434
Rethimno	70.588	0.4925	4,258,102
Thessaloniki	67.945	0.0942	2,736,541
Halkidiki	65.747	0.5913	5,098,659
Kefalonia	63.740	0.6166	945,669
Lefkada	62.928	0.6255	364,363
Hios	58.801	0.3454	156,246
Lesvos	56.948	0.5336	706,798

Prefecture	DP_2	Total RSI 2018	Total Overnight stays 2018
Argolida	55.296	0.4533	1,108,308
Samos	54.622	0.5562	974,165
Voiotia	52.666	0.0531	115,137
Kavala	52.664	0.5607	1,271,909
Magnesia	52.440	0.4465	1,375,651
Achaia	50.832	0.2766	713,425
Korinthia	49.872	0.3193	842,066
Messinia	49.632	0.4727	854,151
Lakonia	47.338	0.4440	464,096
Evia	45.892	0.4768	1,001,323
Preveza	44.336	0.5753	378,484
Ioannina	43.056	0.0461	640,467
Pieria	41.836	0.5630	1,287,624
Arkadia	41.542	0.1405	121,529
Larisa	40.795	0.1288	255,116
Thesprotia	40.417	0.5202	157,383
Kozani	40.183	0.0483	107,167
Ilia	39.998	0.4973	921,843
Florina	39.953	0.0543	27,484
Fthiotida	36.528	0.3260	228,048
Imathia	36.218	0.1060	115,797
Aitoloakarnania	34.479	0.2194	280,272
Evros	33.937	0.2732	368,12
Xanthi	32.632	0.0592	167,553
Fokida	31.397	0.2623	374,649
Trikala	31.044	0.1099	535,133
Kastoria	30.947	0.0908	149,828
Pella	27.569	0.0933	110,072
Arta	25.984	0.1408	48,579
Rodopi	25.929	0.2058	212,404
Drama	24.175	0.1530	81,822
Serres	21.950	0.0473	148,052
Kilkis	20.608	0.1458	41,964
Karditsa	20.142	0.0524	124,821
Grevena	19.762	0.1214	8,772
Evritania	14.367	0.1411	78,663