

Article

Key Performance Indicators and Data Envelopment Analysis in Greek Tourism: A Strategic Planning Tool for Destinations and DMMOs

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Abstract: Over the years, the tourism sector has constantly been a driving force in strengthening the Greek economy. Therefore, being capable of leveraging a tourism business's performance can be of great importance in many aspects for destinations and destination management and marketing organizations (DMMOs). For this very purpose, this study's methodology consists of a combined application of the key performance indicators and data envelopment analysis. The research conducted is quantitative, aiming to analyze the efficiency of the Greek hotels by region and determine the effective ones, as well as the strategic and managerial changes which should be considered by the non-effective. As a result, it shall become possible for each set of hotels to know the ideal turnover and the tourism nights spent that they should achieve, based on their current capacity in terms of beds and employees. Ultimately, this process could play a pivotal role in a region's strategic planning, both from a resource management perspective, as well as in establishing an effective, measurable strategy that can be implemented by regional policy makers and destination managers in a real-time benchmarking process.

Keywords: DMMOs; key performance indicators; data envelopment analysis; strategic planning



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1. Introduction

Tourism in Greece has been considered as a major contributor to the nation's economy since the 1950s, when inbound tourism arrivals began to rise significantly, due to Greece's natural assets giving it an edge [1]. On the contrary, apart from the negative effects of seasonality which occur worldwide, the Greek tourism product as defined by the World's Tourism Organization in 1980 is characterized by an oversupply of beds and low numbers of luxury hotels compared to other European countries [2]. Either way, since 2000 and beyond, inbound tourism flows have followed an ascending pattern, resulting in a plethora of investments as well as remarkable changes in national infrastructure. Methodologies such as key performance indicators are also important strategic tools for destination management and marketing organizations (DMMOs) that manage destinations and express interest in their member hotels. As for the DMMOs, they have developed a positive attitude towards tourism activities, recognizing their contribution to economic and social growth [3]. Unsurprisingly, growth is not limited exclusively in the larger regions, as natural and cultural resources are abundant all over the nation [1].

In general, tourism can be defined as one of the few horizontal activities in the secondary sector of the economy, as its demand-driven features can affect many other sectors such as the service and transportation industries [4]. Tourism's contribution to the economy can also be displayed in metrics such as the gross domestic product. Moreover, recent research from a regional development standpoint has shown that tourist consumption could exceed a Greek region's total GDP [4]. Holistic destination management is based on the coordination of all components of the destination, through a strategic approach in

such a way that it is mandatory for modern DMMOs to utilize tools such as key performance indicators, according to the Unwto [5] and recent studies [6]. Therefore, creating performance enhancement standards for tourism development is essential for DMMOs, in order to support both private investments and social growth. At the same time, from a DMMO and destination management standpoint, however, it should be stated that tourism development has limits that can be expressed through the assessment of tourism carrying capacity [7].

From an enterprise's perspective, using the appropriate methodologies is necessary in formulating an effective strategy according to the administrative theory [8], considering that it often has to operate in a turbulent, highly competitive environment [9,10]. This continuous process of evaluating a firm's performance includes metrics such as the key performance indicators, so as to boost profitability and effectiveness. In the case of a tourism enterprise, creating and using the appropriate metrics could be crucial in maximizing performance, knowing the "perception gaps" between the tourists, the providers and destination managers [11]. Therefore, modern destination management organization DMMOs need to be more strategic and linked to other policy areas that affect the economy of tourism businesses. The aim is to take the lead in destination governance, to achieve many of their policy objectives in areas other than purely visitor attraction such as performance and hotel business performance with solutions offered by our strategic key performance indicator tools [12]. The use of econometric models in DMMOs is a source of local tourism knowledge and a bridge for tourism businesses in the field, and they will act as intelligence agents between destination stakeholders. The strategy that DMMOs will follow is to "listen" to the market through real-time data mining and turn it into strategic decisions. Similar decisions include this research on areas that affect the performance of tourism businesses [13].

Consequently, in order to deal with these kinds of issues, performance evaluation should also be addressed in more than one dimension, using additional methodological tools such as data envelopment analysis which can take multiple inputs and outputs into consideration, aiding the decision-making process [14], while there is no need to set assumptions for the production function [15]. More specifically, it creates an efficient frontier for the production management of every decision-making unit in the analysis, based on the principles of linear programming [16]. To our knowledge, there is a lack of studies applying the analysis in Greek tourism, as the majority of DEA models are considered "too complex" for upper managers with no experience in linear programming to adopt [15]. That is why this research will invest in providing quantitative strategic and managerial implications, while also being as simplistic as possible. DMMOs and Greek destination regions will be considered as decision-making units for this particular study, which is also usually the case for the tourism industry.

2. Theoretical Background

2.1. Key Performance Indicators as a Strategic Tool in the Tourism Sector

Every business unit in the hospitality industry, as well as in most cases, chooses to monitor specific metrics which seem to be the most appropriate at the time, while always keeping an eye on the competition. However, in order to establish a holistic approach of corporate reporting, enterprises should focus on four kinds of information: a summary of the factors that could change the market's conditions, an extended cover of the company's strategy included its goals and objectives, a description of crucial non-financial activities which add value to the company and the managerial ways of measuring financial performance [17]. The majority of the industry's reporting metrics are expressed through average values, though recent studies have highlighted the importance of combining them with other statistical measurements such as the median, mode and standard deviation in order to enhance the decision-making process [18]. Moreover, most of the commonly-used indicators demonstrate the variability in a hotel's bottom line, along with the hotel's age, type and brand loyalty [19].

Based on revenue management studies in hospitality, these indicators usually include the following: occupancy rate, average daily rate, revenue per available room, average length of stay and gross operating profit per available room [20]. These factors are considered more specifically below.

The occupancy rate is considered to be one of the key measurement tools that a tourist enterprise can standardize, as it can provide managerial implications in both the short-term and long-term period. In addition, being able to accurately predict its future values is also important for business units, using forecasting models [21] and more up-to-date methods as technology advances, such as online tourist reviews [22].

It can be defined as $\frac{\text{Total Number of Occupied Rooms}}{\text{Total Number of Available Rooms}}$.

Through the occupancy rate's calculation, a manager will be able to see how the chosen marketing mix affects corporate performance and make the appropriate adjustments that will be required, which often include extra additions in the services package. As for the number of factors that can alter the occupancy rate, they could be related to the day of the week, tourist type, special occasions and time of the year.

More specifically, the hotels which target the corporate travelers, experience a higher occupancy rate on weekdays, whereas the ones that offer holiday packages benefit more at the weekend [17]. Moreover, corporate travelers usually choose one-bed rooms, which in turn affects the occupancy rate per bed indicator. Special occasions and happenings in the tourism destination also boost tourist demand and have similar effects on the metric. Seasonality is another factor which should be taken into consideration, as seaside resorts have to deal with bigger tourist flows in the summer, while this is not the case for winter destinations. Demographic data like age, marital status, gender, profession and monthly income could also play a major role in the indicator's variability as well [23]. Ultimately, occupancy rate is regarded as a bigger contributor to a hotel's profitability than the average daily rate metric, especially when the economy is in a recession. This could be confirmed with the hotels' effective strategy of intentionally reducing the average daily rate for increased occupancy, in order to deal with low tourist demand [24]. However, in times of economic stability, tourism businesses tend to be focusing on the latter.

The average daily rate can be defined as: $\frac{\text{Room Revenue}}{\text{Number of Rooms Sold}}$.

Similar to the occupancy rate's estimation, it is important to accurately predict its future values, using models that can process current hotel prices on the market [25]. The average daily rate's usefulness also lies in the ability of benchmarking with competitors [26] and in comparing the business's performance to previous periods. Moreover, according to recent studies, it is a more accurate way of forecasting a hotel's future value than the gross operating margin [20]. On the contrary, it does not take into account the cost of unsold rooms; as a result, it should be combined with other methodological standards in order to come to accurate conclusions. In addition, the average daily rate is only able to capture room revenues, which means that extra supply packages in luxury hotels cannot be taken into consideration. Along with the factors that can alter occupancy rate's variability, the average daily rate can also be affected by hotels' contracts with travel agencies, which often include lowering the price and specific terms in the booking process [27].

Revenue per available room could also serve as an important methodological tool and can be defined as

$$\text{Average Daily Rate} \times \text{Occupancy Rate} \text{ or } \frac{\text{Room Revenue}}{\text{Total Number of Available Rooms}}$$

There could also be some downsides in using RevPaR as a measurement standard, as it might be a useful complement to the average daily rate metric, but it does not take into consideration the hotel rooms' operating cost. Consequently, it cannot be taken into account when measuring its profitability [21]. Nevertheless, with the RevPar indicator it becomes clear whether a hotel could benefit more from focusing on the occupancy rate or on a higher price, which is the biggest reason why it is the most commonly used amongst the key performance indicators in the hospitality industry.

The average length of stay is also a widely-used indicator in the industry and can be defined as

$$\frac{\text{Total Occupied Room Nights}}{\text{Number of Bookings}}$$

This measurement standard might often lead to changes in the current pricing strategy, such as increasing the price for lower overnight stays or lowering it in the hope of maximizing the length of stay. In general, it is mostly explained by the tourist's social-demographic profile and also moderated by the destination's perceived characteristics [28].

Finally, the gross operating profit per available room is also a useful metric to standardize, as it takes capacity into consideration when calculating profitability, indicating the hotel's value as an asset. It can be defined as

$$\frac{\text{Total room Revenue} - \text{Gross Operating Expenses}}{\text{Number of Available Rooms}}$$

2.2. Data Envelopment Analysis in the Tourism Sector

In a data-driven way of evaluating performance of n decision-making units (DMUs), it is assumed that m number of inputs is used to produce s number of outputs, where the y_{rj} of output r is the result of exploiting x_{ij} amount of input i . It is further assumed that $X_{ij} \geq 0, Y_{rj} \geq 0$, where every DMU uses at least one positive input for at least one positive value [29]. Charnes, Cooper and Rhodes [30] developed a linear programming version of the analysis, to find a φ in an output maximization process, so that

$$\text{Max } \varphi + \varepsilon \left(\sum_{i=1}^m s_i^- + \sum_{r=1}^s s_r^+ \right)$$

subject to:

$$\begin{aligned} \sum_{j=1}^n x_{ij} \lambda_j + s_i^- &= x_{i0} \quad i = 1, 2, \dots, m \\ \sum_{j=1}^n y_{rj} \lambda_j - s_r^+ &= \varphi y_{r0} \quad r = 1, 2, \dots, s \\ \lambda_j &\geq 0 \quad j = 1, 2, \dots, n \end{aligned}$$

where

- y_{r0} → observed output of the decision-making unit;
- s_i^- → a slack variable that indicates excessive input of the decision-making unit;
- s_r^+ → a slack variable which indicates excessive output of the decision-making unit;
- ε → a non-Archimedean element which contributes in getting the optimal solution to the problem.

In the equivalent linear programming dual problem for input minimization, the result is a min θ so that the following is obtained [29]:

$$\text{min } \theta - \varepsilon \left(\sum_{i=1}^m s_i^- + \sum_{r=1}^s s_r^+ \right)$$

subject to:

$$\begin{aligned} \sum_{j=1}^n x_{ij} \lambda_j + s_i^- &= \theta x_{i0} \quad i = 1, 2, \dots, m \\ \sum_{j=1}^n y_{rj} \lambda_j - s_r^+ &= y_{r0} \quad r = 1, 2, \dots, s \\ \lambda_j &\geq 0 \quad j = 1, 2, \dots, n \end{aligned}$$

In the case of a variable economies of scale assumption, an extra constraint should be added so that the following is obtained [31]:

$$\sum_{j=1}^n \lambda_j = 1$$

In general, data envelopment analysis considers a DMU as effective if and only if the following is satisfied [32]:

$$\begin{aligned}\varphi^*(\theta^*) &= 1 \\ s_r^+ &= s_i^- = 0\end{aligned}$$

If only the first assumption is met, the DMU would be considered as “weakly efficient” in the DEA literature [29–32].

The first data envelopment analysis applications in the tourist industry can be found in the mid-1980s both from a microeconomic and, to a smaller extent, from a macroeconomic perspective, while it could also be used in hospitality strategy formulation [33]. As for the microeconomic approaches, the first studies focused on increasing hospitality business’ effectiveness, while the macroeconomic ones studied destinations’ tourism demand and productivity [34].

In general, there is a wide range of variables that can be applied in a tourist-oriented analysis, but it must be ensured that both inputs and outputs capture the true goals of the decision-making units. Numerous studies report the absence of environmental and cultural variables, with an analytical average of four inputs related to financial capital and human resources and two outputs related to financial performance and customer satisfaction [34].

From a macroeconomic standpoint, some studies [35] have focused on the relative efficiency of twenty-nine European countries, assuming constant economies of scale and using two inputs (number of available beds and number of employees) and two outputs (tourism expenditure and number of nights spent) in an input-oriented model. In addition, Hadad, Hadad, Malul and Rosenboim [36] in a four-input (number of available beds, natural resources, cultural resources and number of employees) and two-output (number of tourists and income per capita) model focused on the efficiency of thirty-four developed and seventy-one developing countries, stating the importance of globalization in labor productivity.

As for the microeconomic approach, which is usually the case in the data envelopment analysis literature, Sigala [37] analyzed the efficiency of three-star hotels in the United Kingdom and stated the factors that can alter a hotel’s productivity, such as average revenue per room, the number of beds and tourism demand’s variability. Moreover, she stressed the fact that data envelopment analysis can be used as a diagnostic methodological tool for DMMOs and individual managers, to address issues in capacity, resource management and tourist demand.

From a Greek tourism businesses’ perspective, only three studies in the international literature have applied data envelopment analysis in the hospitality sector. More specifically, Mavromati et al. [38] analyzed the hotel efficiency by region both in a constant economies of scale scheme and in a variable economies of scale scheme, using five inputs (number of available beds, net hotel value, total liabilities, total equity and total assets) and two outputs (turnover and net income), thus finding the most effective regions. Moreover, Apostolakis and Manasakis [39] studied the relative efficiency of hotels on the island of Crete, selecting three inputs (number of employees, number of available beds and operational cost) and two outputs (total revenue and total number of nights spent). Their results indicated that nationally branded hotels are more efficient than internationally branded ones, mainly because the latter are less scale efficient and not very flexible in changes.

In the third and most recent study, Karakitsiou et al. [40] analyzed the efficiency of the hotel and the restaurant sector by region over a ten-year span, using three inputs (number of local units, number of employees and investments) and one output (turnover). Their results highlighted the importance of decentralization, by letting every region adjust strategic planning based on its own needs.

3. Methodology

The current research’s methodology was based on a regional development perspective. The literature review was based on primary sources, meaning information that has not

been processed, such as thesis statements, scientific journals and publications [41], followed by a quantitative analysis of the Greek regions using data from National Institutes like the Bank of Greece, Hellenic Statistic Authority and the Greek Tourism Confederation. This hybrid methodological approach can become an important strategic decision tool for both DMMOs and individual hotel enterprises.

The research field was chosen mainly because of the findings that came from the Greek literature, which highlighted the importance of choosing the right number of inputs to maximize outputs, in the tourism business's decision-making process. Along with the fact that tourism expenditure is a major economic contributor especially in the smaller regions, it becomes evident that the findings of the analysis could be a big part of a decision-making unit's strategic planning. In order to create a holistic framework, regions' efficiency will be evaluated through the scope of key performance indicators and data envelopment analysis, using yearly data from 2023, to ultimately come up with the effective ones and the changes that will need to be made by the non-effective.

4. Research

4.1. Hotels' Efficiency by Region

Applying Key Performance Indicators

The first step of the evaluation will include performance assessment with the most common Kk indicators using past years' data from the Greek Tourism Confederation and the Hellenic Statistic Authority, particularly the following: occupancy rate, average daily rate, revenue per available room and average length of stay. For the second part, the regions will be evaluated through a set of financial performance indicators, namely net assets per room, equity per room and long-term debts per room. This is shown more specifically below (Figure 1).

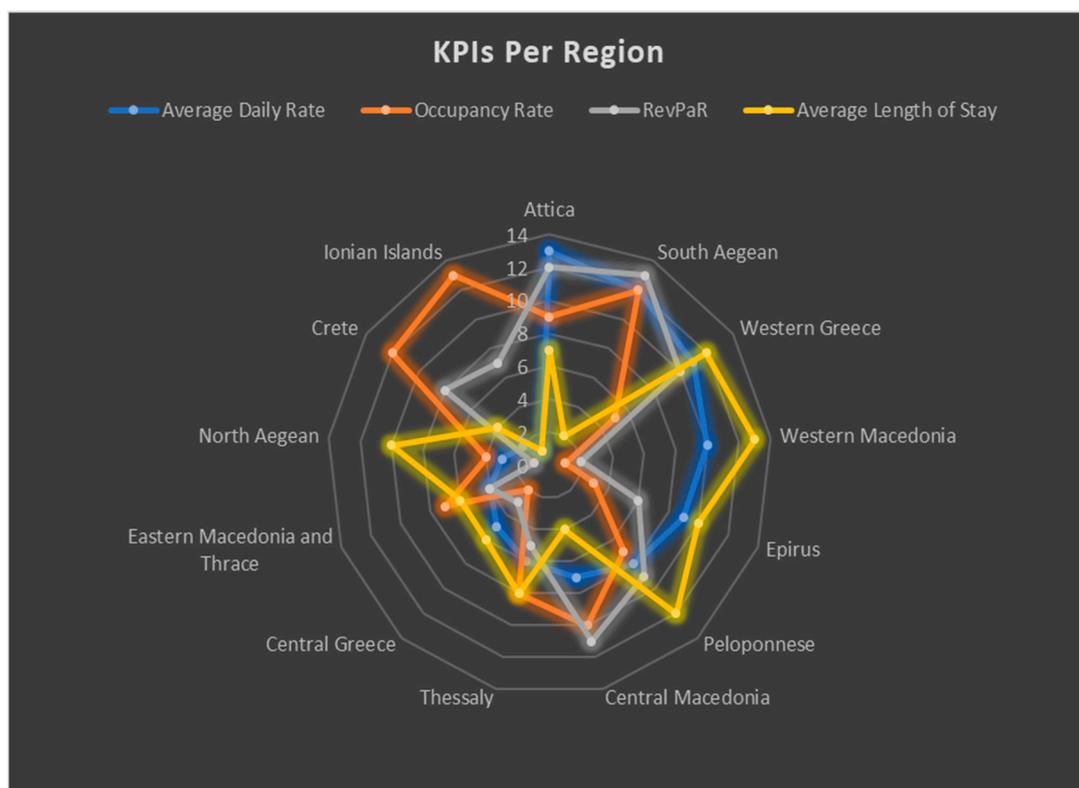


Figure 1. Key performance indicators per region.

In the above diagram, the thirteen Greek regions are being evaluated from 1 (minimum) to 13 (maximum), based on the four most widely-used key performance indicators. As for

the occupancy rate in beds, the Ionian islands have the edge, selling an approximate 53% of their total capacity, while Crete and South Aegean are a close second with 51%. Pretty intriguing are the results of the average daily rate, where Western Greece and Western Macedonia are performing well, despite them having a relatively low occupancy rate. Moreover, South Aegean is top three in this metric as well.

This is also carried in the revenue per available room indicator, which is expected, as it is the product between the first two metrics. Finally, regarding the average length of stay, it should be stated that it is the sole high metric for North Aegean out of the four indicators with an average of 5.2, while Central Macedonia, Eastern Macedonia and Thrace along with Western Greece manage an average of 3.

As for the financial performance indicators, their results are below (Figure 2).

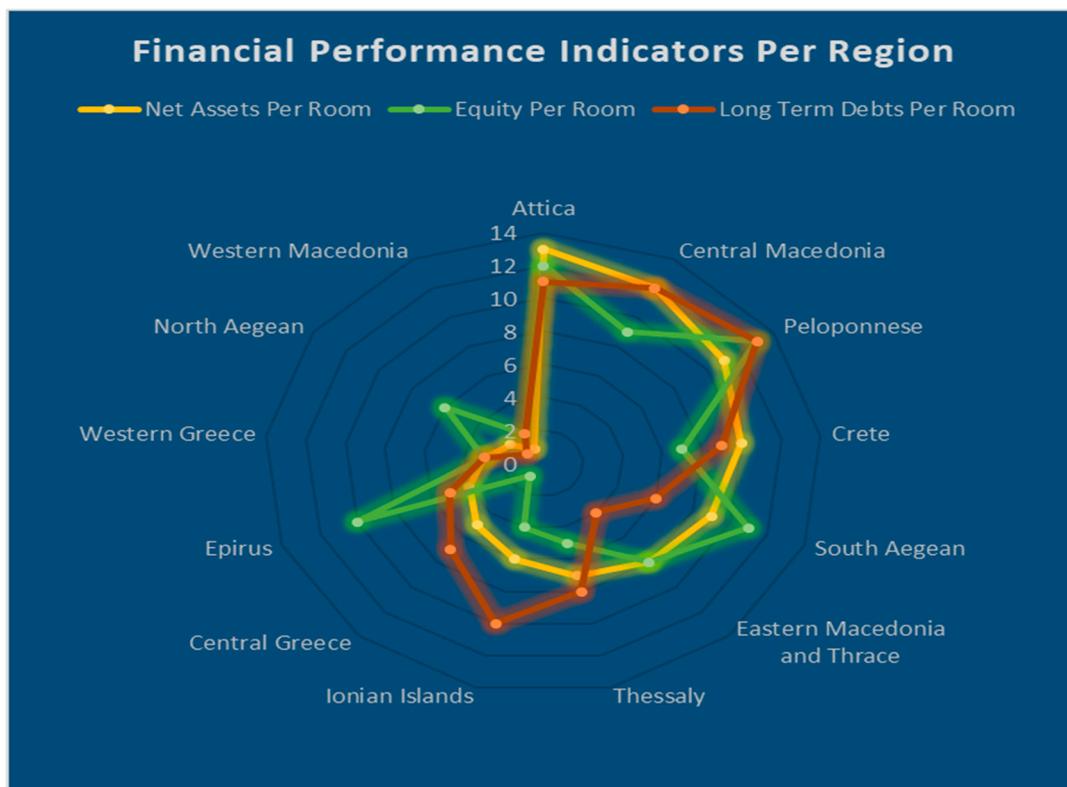


Figure 2. Financial performance indicators per region.

With the ranking process being the same, 13 is the mark for the highest performing region and 1 for the least effective one. The most interesting finding of the illustrated results has to be the ascending performance of Peloponnese on all of the financial measurements, while being just average on the previous ones. This indicates a high number of investments in the area, which however does not align with similarly high levels of performance. The findings are in accordance with previous studies in the literature, suggesting that managers should not focus exclusively on financial metrics, thus complementing the rise of key performance indicators in performance measurement systems [42].

4.2. Data Envelopment Analysis Application

For the implementation of the analysis, the regions' total number of employees and available rooms will be used as inputs, while the revenue per available room and tourists' nights spent will be used as outputs, so as to align with the previous studies in the literature [38–40]. The decision-making units will be evaluated assuming variable economies of scale, which is usually the case in production under real conditions.

Moreover, using the reference sets that will be generated in the process, it will be possible to calculate the management and strategic changes for the non-effective regions. The analysis will be output-oriented, in order to find the amount of maximum revenue and nights spent a region should achieve, based on its current capacity of beds and employees. Descriptive statistics of the variables used in the model are shown in the following Table 1.

Table 1. Descriptive statistics of the variables.

Variable	Type	Mean	Standard Deviation	Min	Max
Rooms available	Input	36,508.58	34,524.81	9.160	115.210
Employees	Input	6140.75	5036.82	878	16.490
Nights spent	Output	10,863.083	10,662.179	1270.000	29,914.000
RevPaR	Output	17,297	11,855.68	9.462	33.336

The results from data envelopment analysis were the following.

5. Findings

Based on their performance in the analysis, hotels per region could be divided into three separate categories:

- No change (effective);
- Managerial changes to be made (efficiency could be achieved with the current capacity);
- Strategic changes to be made (efficiency could be achieved by changing the current capacity).

More specifically, Attica's, Central Greece's, Epirus's, Western Greece's, South Aegean's, Central Macedonia's and Eastern Macedonia's and Thrace's hotels belong in the first category and do not need to make any changes. As for Peloponnese's, Thessaly's and the Ionian Islands' hotels, there is a need for managerial changes to be made in order to improve their operations and achieve an increase in total revenue from 28% (Peloponnese) up to 42% (Ionian Islands). They should also target an increase on the tourists' nights spent by 42% (Ionian Islands) up to 86% (Peloponnese). Finally, North Aegean and Crete belong in the last category and should make strategic changes in their current capacity in beds and employees, in order to reach an effective number of revenue and nights spent. The data analysis per Greek destination utilized an innovative mixed-methodological approach and combined quantitative data analysis with the selection of the most appropriate key performance indicators with data envelopment analysis. This framework could be used as a methodological tool for strategy formulation and decision making for destinations and in particular for the DMMOs that manage them. A similar study in the future should also take into account the short-term rental sector and provide additional results including sustainability indicators such as the carrying capacity of destinations and operational costs as inputs [43] with the concept of sustainability already being discussed in the DEA literature [44–46]. Finally, illegal accommodation services could be an area of future research, having also been the main point of interest by Greek researchers in the past, such as Tsartas et al. [47].

6. Managerial and Theoretical Implications

This hybrid methodological approach could provide valuable insights to destination managers and regional policy makers. Applying both the key performance indicators and the traditional financial indicators confirmed previous studies in the literature, as some DMUs such as Peloponnese were found ineffective on the former set of measurements and effective on the latter. This indicates that industry managers should not focus exclusively on the financial metrics, in order to capture a holistic view of performance. Data envelopment analysis' application also provided a theoretical "road-map" for managers to consider, apart from the total number of changes that should be targeted by the underperforming decision-making units (either red for decrease in inputs or green for increase in outputs

in Table 2). More specifically, creating the Strategic Peer Unit weights through effective DMUs with similar inputs gives a region's decision-maker the opportunity to standardize the benchmarking process through a reliable, data-driven methodology. Consequently, a destination manager will get to know his unit's amount of reliance on its peers, in order to adjust his plans and ultimately increase performance, in a real-time strategic planning framework.

Table 2. DEA results.

Regions	Pure Technical Efficiency	Strategic Peer Units	Change in Beds/ {Peer Weight}	Change in Employees/ {Peer Weight}	Change in Nights Spent/ {Peer Weight}	Change in RevPaR/ {Peer Weight}	Economies of Scale
Attica	100%	-	-	-	-	-	Increasing
Central Greece	100%	-	-	-	-	-	Decreasing
Epirus	100%	-	-	-	-	-	Decreasing
Western Greece	100%	-	-	-	-	-	Decreasing
South Aegean	100%	-	-	-	-	-	Increasing
Central Macedonia	100%	-	-	-	-	-	Increasing
Eastern Macedonia–Thrace	100%	-	-	-	-	-	Decreasing
Crete	95.41%	Attica, South Aegean	- {7.17% + 92.83%}	-28.6% {35.38% + 64.62%}	+4.8% {15.70% + 84.3%}	+97% {17.91% + 82.09%}	Increasing
Peloponnese	78.46%	Attica, Western Greece, South Aegean	- {35.96% + 37.47% + 26.58%}	- {65.47% + 27.7% + 6.82%}	+85.5% {58.7% + 23.33% + 17.98}	+27.45% {27.88% + 64.82% + 7.29%}	Increasing
Thessaly	76.96%	Attica, Western Greece, South Aegean	- {7.58% + 63.18% + 29.24%}	- {20.3% + 68.66% + 11.04%}	+66.5% {17.32% + 55.02% + 27.67%}	+29.93% {4.77% + 88.72% + 6.51%}	Increasing
Ionian Islands	70.70%	Attica, Western Greece, Central Macedonia, South Aegean	- {6.61% + 2.44% + 53.10% + 37.85%}	- {17.74% + 2.66% + 65.29% + 14.32%}	+41.5% {10.63% + 1.5% + 62.66% + 25.21%}	+41.5% {12.68% + 10.45% + 51.19% + 25.68%}	Increasing
North Aegean	57.26%	Western Greece, Central Greece	-7.70% {71.65% + 28.35%}	- {89.47% + 10.53%}	+77.4% {83.53% + 16.47%}	+74.66% {86.94% + 13.06%}	Increasing

Red → Ideal decrease in inputs. Green → Ideal increase in outputs. Black → Strategic Peer Unit 1 percentage weight. Blue → Strategic Peer Unit 2 percentage weight. Brown → Strategic Peer Unit 3 percentage weight. Light Blue → Strategic Peer Unit 4 percentage weight.

7. Conclusions

In this current study, the combined application of key performance indicators and data envelopment analysis results in a performance assessment of the Greek hotels by region. Initially, the use of key performance indicators like the occupancy rate and average daily rate led to some early findings. Then, through the application of data envelopment analysis it became possible to spot the effective regions, as well as the multitude of changes that needed to be made from the non-effective. These changes could require actions at a managerial or a strategic level, based on the region's and DMMOs' ability to exploit its current capacity. The systematic recording of the characteristics of tourism businesses and the tourist destinations that surround them through DMMOs, in the near future, will be undertaken in a dynamic way, with real-time data and artificial intelligence (AI) tools. The aim of this paper is to provide the possibility for an accurate delineation of this, using the assessment of key performance indicators of hotels as strategic performance tools, as well as to inform and raise the awareness of stakeholders about the management needs of each destination, and the problems that arise in terms of strategic choices. In summary, this study's results could be of major importance, especially in smaller regions' strategy formulation, as in many cases tourist consumption exceeds a region's total gross domestic product. It should be stated that using a method such as data envelopment analysis contains some weaknesses, because it can only measure relative efficiency in absolute terms. In

addition, as a non-parametric technique it does not take into consideration any type of random error unlike other methodologies such as regression analysis, which implies that data collection should be dealt with extra caution.

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