Article

The Efficiency Score of Small Accommodation Businesses in Non-Coastal Rural Areas in Greece

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Abstract: Small accommodation businesses dominate the rural hospitality industry, producing simple or complex tourist products and services in order to be sustainable and competitive. In this paper, a two-stage data envelopment analysis (DEA) model was applied in a representative sample of 151 small accommodation businesses in non-coastal areas in the region of Central Macedonia in Greece. In the first stage, DEA-bootstrapping is applied to estimate point and interval efficiency ratios of accommodation businesses and identify the benchmark accommodations. The double bootstrapping truncated procedure of Simar and Wilson is implemented in the second stage to investigate the role of five business factors in terms of efficiency. The findings suggest that small accommodation businesses, although they are based in areas where tourist resources abound, are inefficient. Moreover, the results of the truncated regression method showed that the business's size, the operating days, and the variety of activities (simple/complex) affect business's inefficiency. On the contrary, the business's age and their engagement in agriculture or not do not affect business's efficiency. The results are important for rural entrepreneurs and policy makers, and they will also be useful for the adaptation of businesses to increase their efficiency.

Keywords: business variables; bootstrap truncated data envelopment analysis; efficiency factors; Greece; performance; rural tourism activities; small accommodation businesses

1. Introduction

Small accommodation businesses, especially in rural tourism destinations, dominate in terms of the hospitality industry [1–3]. They play an important role in rural revitalization, poverty relief, and employment, and also improve the economic decline in rural areas [2,4–6]. The sustainability of small accommodation businesses in rural areas effects the region's development. Therefore, their performance has high importance for local, regional, and national economies [3,7,8]. Even though business sustainability is a condition for competitiveness, efficiency is a business performance measurement, and it is also associated with business competitiveness and sustainability [4]. The characteristics of small accommodation businesses are the small size, regarding the number of bedrooms and beds; employees; and amount of capital used [9], as well as low efficiency [10]. The owners/managers of small accommodation businesses in rural areas, in order to increase their income, focus on the development of diversified activities [9,11]. The provision of various activities can boost the growth of rural tourism and all the businesses associated with it [12,13]. Most researchers have focused on the characteristics of the businesses and their owners/managers, the start-up motivations, and even the factors that affect the business performance [2,6,13–18]. Additionally, researchers seemed to be concerned with creating sustainable and resilient management models as well as measures adopted by small businesses to deal with crises and disasters [19].

Efficiency, as a performance measure, has been widely recognized in the hospitality sector [4,20–25]. However, the estimation of the efficiency of small accommodation businesses, especially those operating in rural areas, including those in non-coastal areas, is limited [1,2,10]. From the perspective of the factors that influence the efficiency of businesses in rural areas, the literature review showed that efficiency is limited [14]. Even though the variety of activities is a rural tourism success factor [13], Teodoro et al. [26] argued that, in a set of variables, the supply of services other than lodging does not influence business success.

Ten year ago, Symeonidou [27], as the subject of a thesis, assessed the technical efficiency of rural tourism enterprises in Central Macedonia in order to investigate their competitiveness and sustainability. She mentioned that the existing inefficiency in the field of hospitality and rural tourism triggers investigations regarding the impact that provided activities have on the level of businesses' efficiency.

Because discrete types of business were investigated within other research frames as efficiency factors [2,10,15], it is important to explore the types of accommodation businesses in terms of the variety of business activity, taking into account the fact that corresponding literature reviews on the issue are limited. Consequently, the main hypothesis of this research is that the variety of business activity is an environmental business factor of efficiency.

In this context, the purpose of this paper is to assess the efficiency of small accommodation businesses in rural areas using non-coastal rural areas in Central Macedonia as an exploratory example. In parallel, a set of variables (size, operating days, years of operation, and type of business), including the variety of services, as efficiency factors, are investigated in order to design and implement more effective policy measures for rural tourism revitalization and help entrepreneurs in correct decision making.

Specifically, it attempts to address the following research questions:

1. What is the level of efficiency in small accommodation business in non-coastal areas of Central Macedonia, Greece?
2. Is the variety of business's activity a factor that influences efficiency?

In order to answer the questions, a double bootstrapping truncated data envelopment analysis (DEA) method was applied. Classing performance indicators such as revenue per available room, occupancy rate, return on assets, and other similar indicators are used as tools to measure hotel success [21,28,29]. According to Oliveira, Pedro, and Marques [5], these measures do not take into account the multiple variables of the hotel industry and the interactions between them. Consequently, they were not absolutely efficiency. Today, among various methods measuring business's performance, a bootstrap DEA has been affirmed that can measure the efficiency of businesses with similar goals and objectives [30] using the relationship of inputs and outputs. This method lead to the production of more comprehensive and accurate performance measures [31] and addresses the disadvantages of the traditional techniques of DEA, making the results more robust and reliable [32]. The truncated method was used in the second step to answer the second question, investigating the variety of activities (simple or complex) as a factor that contributes to the efficiency of the accommodations in non-coastal areas. To the best of our knowledge, the application of double bootstrapping truncated DEA is one of the first attempts to use this methodology with a focus on the variety of activities of small accommodation businesses in non-coastal areas in Greece and Europe. This represents the main novelty of our study.

Central Macedonia was chosen as a study area due to its importance in the country's economy and the need to encourage entrepreneurship in the region's non-coastal rural areas. The region of Central Macedonia is the largest of 13 regions in the country, with coastal and non-coastal areas and important tourism resources (mountains, lakes, rivers, thermal springs, archeological sites, cultural heritage, and people with a sense of hospitality). The region of Central Macedonia, compared with the others 12 regions, presents

the lowest efficiency score and significant fluctuations in technical efficiency over the years 2002–2013, because of the inability of regional tourism managers to adjust the inputs efficiently [25].

This paper contributes to three different strands of literature:

(a) The evaluation of efficiency score using the bootstrapping truncated DEA method in small accommodation businesses;
(b) The evaluation of the efficiency score of small accommodation businesses that are located in non-coastal areas;
(c) The investigation of variety of business activity as a factor of small accommodation business inefficiency, among other factors such as size, age, operating days, and type of business (engaged in agriculture or not).

This paper is organized as follows. In the next section, a literature review is presented, followed by a section providing the data and methodology. The next section presents the study's results and discussion, and the paper finally concludes with the limitations and directions for further research.

2. Literature Review

Previous empirical studies that deal with small accommodation businesses in rural areas have focused on the issues of contributing to local development, presenting the profile of entrepreneurs and businesses as well as business success factors [2,5,9,10,17,33]. Studies in rural tourism have shown that entrepreneurs start their businesses mostly centered on their family's quality of life and a passion for the countryside and the rural way of life, as well as the possibility to work autonomously [6,34,35]. Even though the motivation for entrepreneurs to enter the rural tourism business are also based on economic reasons [18], limited studies, so far, have dealt with their economic and technical efficiency. The literature review showed that the informal form of small business in rural area, which, in many cases, take the form of owners' hobbies, did not push researchers to use the concept of and the need for their efficiency to be assessed. This may happen due to efficiency [36], which is linked with the management style of a typical business structure.

Researchers determined the businesses' efficiency as the optimal formula between inputs and outputs (revenues/expenses ratio) [15] and the optimal allocation of resources [37]. According to Luo, Yang, and Law (p. 1141) [22], "*Efficiency represents the relationship between inputs and outputs during operation*". Technical efficiency was determined as "*the reflection of how a firm can obtain maximum output from a given set of inputs*" [38]. Moreover, "*the measure of the ability of a firm to obtain the best production from a given set of inputs or a measure of the ability to use the minimum feasible amount of inputs given a certain output level*" [10]. Business efficiency is closely related to sustainability and competitiveness [39] as a measure that analyzes whether it is possible to achieve a sustainability objective in business [32]. The efficiency measurement has been widely recognized in the hospitality sector [20–24]. However, the estimation of efficiency in rural tourism is limited [4,10,14,39].

Recently, Parte and Alberca [4] analyzed business performance through efficiency scores in Spanish firms in order to investigate the efficiency of cultural and rural tourism destinations. This study showed that the diversification of tourist destinations is a strategy that affect the positive performance of tourism businesses. Additionally, the study showed that the average efficiency score is higher for very small businesses compared to other business sizes. In 2020, Alberca and Parte [39] carried out a study that examined efficiency in tourist apartments and hostels in Spain, using DEA models. Additionally, they examined a variety of efficiency drivers, such as the business size, using the Mann–Whitney U-test and the Kruskal–Wallis test. They concluded that the business size is negatively associated with efficiency score, and the diversification of the tourist destination is a useful strategy that improves business performance and competitiveness. In Greece, Koutsouris et al. [15] explored the influence of owners' socioeconomic characteristics and their businesses on business efficiency using Categorical Regression Analysis. They

showed that the number of beds and rooms, classification of units, and financial support are the most influential factors of businesses' efficiency. They also highlighted that businesses whose owners are primarily occupied in farming are more efficient. Fotiadis et al. [13] proposed the Destination Management and Business Effectiveness model, utilizing data collected from 174 Greek rural tourism enterprises. They used Factor Analysis and noted that, by providing a variety of activities, the growth of rural tourism and all the associated businesses could be increased. Arru et al. [10], using the DEA method and based on a sample of 37 farms in Sardinia, investigated technical efficiency related to agritourism and recreational functions. They noted that this was one of the first attempts in Europe to use efficiency analysis in agritourism. They concluded that the surveyed businesses were inefficient and that an adequate use of inputs improved efficiency. Moreover, in businesses that combined accommodation and meal services, the accommodation services were used more efficiently than those for the provision of meals.

A survey, as a thesis, conducted on 145 agritourism businesses, in order to examine their competitiveness and sustainability, showed that agritourism businesses operate under low efficiency. The researcher pointed out that a study should be conducted regarding the effect of other services' provision, beyond just the accommodation, on the enterprise's efficiency [27].

According to the variety of activity, tourism businesses are divided into simple and complex activity. The first category includes businesses that provide only one type of tourism product (accommodation). The second one includes enterprises that provide more than one type of tourism products (accommodation with catering or other activities) [40]. The literature review showed that research on the impact of services provided is limited. In terms of small accommodation businesses' efficiency in rural areas, it seems that there are no researchers occupied with conducting surveys on financial results as a measure of success or failure, while research on the variety of activities' impact on business efficiency seems to be completely absent.

Khanal and Mishra [41] investigated the effect of agritourism as a strategy of income diversification and empowerment. They concluded that small farms achieve higher incomes by pursuing a strategy of diversifying their activities.

Mura and Kljucnikov [3], in a study of 142 small rural tourism businesses in Slovakia, concluded that the benefits from agricultural tourism activities contribute to the success of businesses and the minimization of business risk.

Research on small agritourism farms in Michigan was conducted to determine the success factors. The sales were taken as a measure of success and indicated that the most successful farms provided a thematic catalog in addition to a differential mix of services and products [12].

While the literature of small accommodation businesses and, especially, rural tourism lacks research regarding the concept of efficiency and application of DEA models, the relevant literature in the hotel sector is more fruitful, [20,25,42]. The use of the DEA method in conventional hotels showed that they perform better in focused strategy than in diversification strategy [43]   and the provision of additional leisure services affects their efficiency in a negative way [5]. As well as the size, the location, seasonality, number of employees, and allocation of resources are all factors that cause inefficiency [21,42,44]. Researchers have argued that the improvement of efficiency can be achieved by modifying the inputs and outputs and reducing the size of the hotel units [25,43].

3. Materials and Methods

3.1. Methodology

In the operating research, there are both parametric and nonparametric techniques dealing with the measurement of efficiency. Data envelopment analysis is a widely accepted nonparametric method of documenting production efficiency [45,46].

This paper assesses the efficiency score of small accommodation businesses in non-coastal areas and examines the relationship between efficiency and a set of business variables. A two-stage methodology is adopted where, in the first stage, the degree of efficiency of the studied units is evaluated with the help of DEA models, CCR, and BCC. The selection of variable inputs and outputs is carried out with the help of correlation analysis. Taking the method's sensitivity in outliers into account [21,47], an appropriate test was applied to the input and output variables using the Mahalanobis distance method [21] with SPSS V23.

Simar and Wilson's [48] model is also applied to eliminate bias and calculate the corrected efficiency score of the studied units. The use of the Mann–Whitney test checks the existence of a statistically significant difference between the initial and corrected efficiency score.

The second stage focuses on controlling the effect of a set of factors on the efficiency score. A bootstrapped truncated regression model is applied to find the effect.

Because the results of the DEA model range from 0 to 1, a Tobit and truncated regression model is used to evaluate the factors that affect efficiency [49,50]. However, Simar and Wilson found that there are two reasons why using the Tobit model or truncated regression is not considered as the ideal choice. First, it is considered that the degrees of efficiency assessed by the DEA can be corrected with each other. Second, in small samples, the variables used in the regression analysis can be linked to the variables used to calculate the degree of efficiency in the DEA, thus creating an association between errors and variables. To avoid these problems, bootstrapping truncated regression was adopted to investigate the factors that affect the efficiency of tourism businesses [51]. All of the above are performed in the R programming environment using the dea.boot command of the Benchmarking package with 2000 repetitions, $B_1 = B_2 = 2000$, to estimate the corrected efficiency [52].

3.2. The Data Envelopment Analysis Model

Suppose there are tourism businesses that each have N inputs (x) and M outputs (y). Every tourism business is fully defined if the variables x_{ik} and y_{ik} are known, where $i = 1, ..., N$ and $j = 1, ..., M$. To calculate the efficiency, θ_h, of the accommodation (x_h, y_h) and in order to set goals for the improvement of the inefficient ones, the following CCR model, output-oriented, is applied:

$$Max_{\theta_i \lambda_j} \theta_i \tag{1}$$

Subject to

$$\sum_{j=1}^{n} \lambda_j y_j - \theta_i y_i \geq 0 \tag{2}$$

$$\sum_{j=1}^{n} \lambda_j x_{kj} \leq x_{ki} \tag{3}$$

$$\lambda_j \geq 0, \tag{4}$$

where $k = 1, ..., m$: $inputs$ $j = 1, ..., n$: tourism enterprises.

Calculating the θ_h of an accommodation (x_h, y_h) essentially shows how much the outputs must be increased to achieve efficiency given the inputs. Vector λ is the weight factor of the outputs of each accommodation (x_h, y_h). The relationships that appear are linear combinations that must apply to the inputs and outputs of each business (x_h, y_h).

The BCC model works with the same logic; however, their difference appears in the weight factor where it should apply:

$$\sum_{j=1}^{n} \lambda_j = 1 \qquad (5)$$

Many researchers argue that the most appropriate model for assessing the effectiveness of hosting units is the input-oriented model [27,38], because inputs can be controlled by owners/managers, while outputs are regulated mainly by market factors. However, researchers choose the VRS output–oriented model because enterprises in the hospitality industry have high requirements regarding initial capital and show a great dispersion in the variables of their inputs and outputs [53,54].

Technical efficiency takes values from zero to one. When the price is 1, then the tourism business is fully technically efficient, as the unit is the upper limit of production. Any other price the technical efficiency receives, i.e., TE_i < 1, then the ith enterprise is not considered technically efficient.

During the application of the DEA model, the selection of inputs and outputs is the second most important decision that has to be made after the one regarding the choice of the model, which is of vital significance [38]. In this survey, the selection was done on the basis of the literature review and key research questions [37,55–60]. The inputs considered are: (1) the surface of the building facilities in m², (2) the total operating expenses in EUR, including accommodation, F&B and recreational services costs, (3) the total capital investment in EUR, (4) the total labor hours, and (5) the family labor hours. As far as outputs were concerned, there were selected: (1) the total number of nights spent and (2) the total revenues that included accommodation revenue, F&B revenue, and other revenues, in EUR. A co-linearity test was applied through the correlation application in SPSS v. 23. Simultaneously, a correlation test was applied to output and input variables. In the specific case, there is no co-linearity to variables.

3.3. Truncated Regression Procedure

As mentioned previously, Algorithm II from Simar and Wilson (2007) [48] was applied, which was developed to find the environmental factors that affect the levels of efficiency, known as the truncated regression model.

The regression model on which the whole algorithm is based is:

$$\hat{\hat{\varphi}}_i = \beta Z_i + \varepsilon_i \,, i = 1,2,\ldots.,n \qquad (6)$$

where $\hat{\hat{\varphi}}_i$ is the dependent variable, the bias-corrected efficiency results, Z_i is the vector of environmental factors that helps to interpret the efficiencies, β is the coefficient to be estimated from the above relation and shows the connection between independent variable and efficiency, and ε_i is an independent term that indicates the possible error that may exist in the results of the relationship and follows a normal distribution, $N(0,\sigma_\varepsilon^2)$, with left-tail truncation, $(1 - \hat{\beta}Z_i)$.

Algorithm II from Simar and Wilson [48] is applied to the estimation of the regression model using the double bootstrap procedure. The algorithm's steps are presented in detail by Lopez–Penabad et al. [32]; Oukil et al. [20], and Simar and Wilson [48].

3.4. Research Area

This survey was carried out in 52 non-costal settlements with less than 5000 habitants in region of Central Macedonia (Figure 1), the largest administrative district in Greece (18,811 km² and 1,883,277 habitants), and accommodations with a capacity of less than 40 beds were selected. The choice of the area and enterprises was based on recent legislation concerning rural tourism in Greece. Non-coastal settlements in Central Macedonia were selected as the research area because rural tourism can still be developed, whereas, in

coastal areas, mass tourism is usually predominant. Non-coastal areas are less favored areas, and within period of crisis, such as the recent crisis in Greece, these areas account more losses than do urban or coastal areas[61]. An investigation of small accommodation businesses in such areas with small-scale tourism as their resources, may lead to adjusting businesses' inputs, type of supplied product (simple or complex), and efficiency degree.
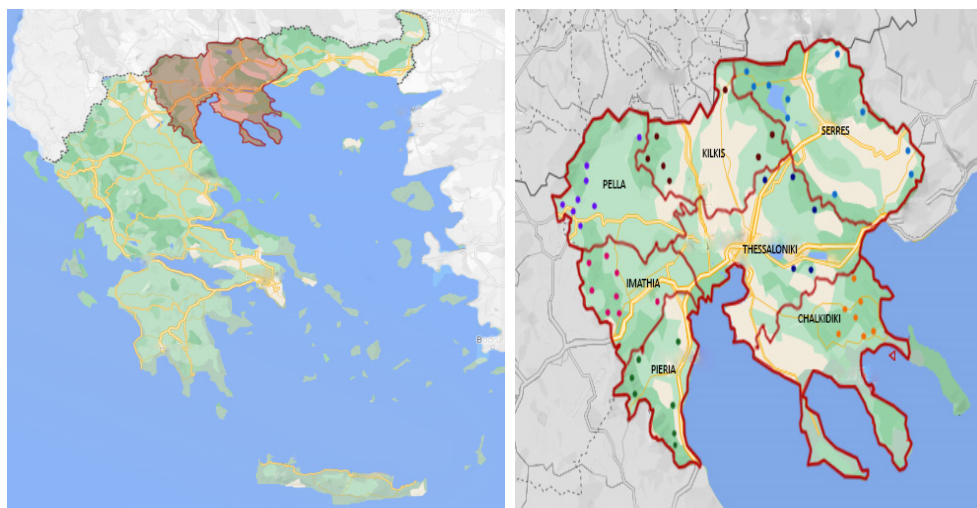

Figure 1. Map of the research area and research settlements. Source: Edited Google Maps (2021).

The total number of 368 entities was calculated through the database (Greek Ministry of Tourism). Only 160 businesses (45% of 368 businesses) demonstrated a willingness to participate in the present research. The procedure for the collection of information, which was accomplished through personal questionnaire-based interviews, began in November 2018 and ended in May 2019. Additionally, the technical and economic data of business inputs and outputs were collected, ensuring an in-depth empirical analysis. Data on the characteristics of owners and businesses, as explanatory variables of efficiency, were also collected.

4. Research Findings

4.1. Characteristics of Small Family-Owned Accommodations in Non-Coastal Rural Areas of Central Macedonia

The input and output variables, as well as the explanatory variables, are presented in Tables 1 and 2.

The summary statistics indicate a large variability of revenue among the accommodations studied. More than 65% of businesses had less than average revenue (EUR 63,226). The annual operating expenses, with an average of EUR 29,485, were similar to other surveys in other regions in Greece [15]. The average capital investment, which is EUR 564,736, is associated with special aesthetics and facilities of high standards. This fact is contrary to the literature, which indicates that the requirements for starting a small accommodation business in a rural area are low [9,62]. Eleven percent (16 businesses), which operate under rental, invested less than EUR 15,000, and 70% of them (11 businesses) are owned by the Municipality and rented to those who are interested in them for little or zero rent for a few years, obligating the tenants to equip them appropriately and/or work for their renovation and reopening. The average building area is 500 m².

Regarding the operation of these small family-owned accommodations, given that they are part of the tourism industry, they demand hard work on behalf of the employees [63]: on average, 4800 h. Family members are the main employees at these businesses, while seasonal staff is hired during peak periods. The results of this research coincide with those of previous one [10,12,29].

The statistics, regarding the business characteristics, indicated that the average age of the accommodations studied was 13 years old, and the average size was 9 rooms. The size and the age of accommodations have previously been investigated as business success factors [2,14,15,21].

The majority of owners (67%) stated that their businesses are open 360–365 days throughout the year, with an average of 309 days and a standard deviation of 90 days. However, according to the statements of all participants in this survey, the attendance is focused on the weekends and days during holidays and celebrations, which is in line with other research [15,35].

Table 1. Summary Statistics.

Variables		Mean	Stdev	Max	Min
OUTPUTS					
Overnight stays	Number	746	737	3650	0
Total revenue	EUR	63,226	66,053	360,000	900
INPUTS					
Surface of building	m²	500	313	1500	55
Operating expenses	EUR	29,485	27,268	173,207	640
Capital investment	EUR	564,736	472,779	2,200,000	15,000
Total labor	Hours	4800	4444	22,020	110
Family labor	Hours	3587	3260	15,000	60
BUSINESS SPECIFIC VARIABLES					
Age of the business	Years	13	7	51	1
Rooms	Number	9	4	20	2
Operating days	Number	309	92	365	40

The study concerned a rural area, and the minority of entrepreneurs (40.39%) were also farmers (registered in the farmers' register). As Ye et al. [2] mentioned, when the initial rural home becomes a profit-oriented organization fully devoted to satisfying market needs, business development and associated commercialization may deteriorate the authenticity of rural lifestyle and host-guest relationship. Additionally, a commercialized service provider is more efficient than their family-based counterparts.

With regard to the variables concerning the distinction of accommodation businesses based on the variety of activities, it was made clear that 79 (52.32%) out of the 151 businesses in this study provide only accommodation, with or without breakfast (simple activity). The remainder, 72 enterprises (47.68%), also combine other services, such as restaurants, cafes, leisure services, etc. (complex activity). As Fotiadis et al. [13] mentioned, the variety of activities that rural tourism enterprises provide is an important factor for their success.

Table 2. Frequency table in terms of business's type.

(a)		
Type of Business	**Number of Businesses**	**Percentage %**
Engaged in agriculture	61	40.39
Non engaged in agriculture	90	59.61
Total	151	100.00
(b)		
Type of Business	**Number of Businesses**	**Percentage %**
Simple activity	79	52.32
Complex activity	72	47.68
Total	151	100.00

Continuing with the analysis, in Table 3 the correlation between inputs and outputs are positive, which means that an output does not decrease when an input increases. The correlations range from 0.3755 to 0.7687, and between the outputs is only 0.6853. Regarding the correlations within inputs, the minimum is 0.2985 and the maximum is 0.9060. All the above emerged at the level of statistical significance, $\alpha = 0.01$.

Table 3. Correlations of inputs and outputs.

Spearman Correlation Matrix	Surface of Building	Operating Expenses	Capital Investment	Total Labor	Family Labor	Overnight Stays	Total Revenue
Surface of building	1	0.4765 ***	0.6835 ***	0.4822 ***	0.4106 ***	0.4309 ***	0.4390 ***
Operating expenses	0.4765 ***	1	0.4368 ***	0.6524 ***	0.4988 ***	0.4102 ***	0.7687 ***
Capital investment	0.6835 ***	0.4368 ***	1	0.2993 ***	0.2985 ***	0.3755 ***	0.4238 ***
Total labor	0.4822 ***	0.6524 ***	0.2993 ***	1	0.9060 ***	0.3912 ***	0.5610 ***
Family labor	0.4106 ***	0.4988 ***	0.2985 ***	0.9060 ***	1	0.4085 ***	0.4469 ***
Overnight stays	0.4309 ***	0.4102 ***	0.3755 ***	0.3912 ***	0.4085 ***	1	0.6853 ***
Total revenue	0.4390 ***	0.7687 ***	0.4238 ***	0.5610 ***	0.4469 ***	0.6853 ***	1

Note: "***" show that there is correlation between variables.

4.2. Efficiency Results

The constant returns to scale (CRS) and variable returns to scale (VRS) output-oriented DEA model was applied using R programming, after the detection of outliers. To detect outliers, the Mahalanobis distance was applied [21]. Nine (9) outliers were detected and excluded from further analysis.

The collected efficiency results of the two models are presented in Table 4 and Figure 2.

Table 4. Estimated Efficiency by CRS and VRS output oriented DEA model.

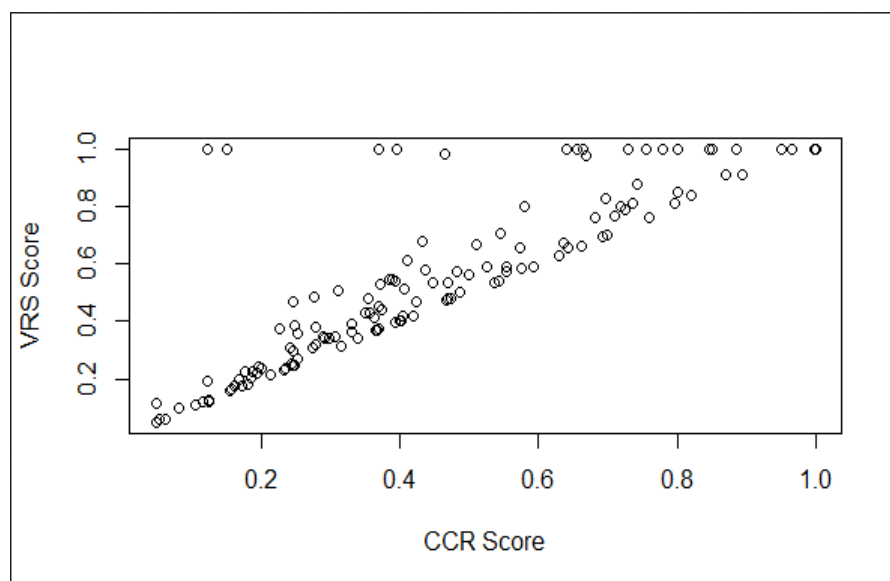| Total Units ($n = 151$)	CRS	VRS
Mean	0.528	0.580
Standard Deviation	0.312	0.309
Min	0.047	0.049
Max	1.000	1.000

Figure 2. Technical Efficiency scores by CRS and VRS model.

It is obvious that the efficiency scores of the VRS model are higher. Based on this finding, the analysis continues with only with the VRS model [32].

Under the DEA model, 36 out of 151 units (23.84%) of the total sample were fully efficient, while the level of efficiency of the 88 businesses (58.28%) of the total sample was under 60.00%. In Table 5, the distribution of the efficiency's frequency estimates is presented. The results indicate variation regarding the level of efficiency among accommodation businesses. The efficiency of sampled businesses was 0.580, indicating inefficiency in the largest percentage (76.16%) of the total sample.

Table 5. Frequency distribution of DEA scores.

DEA Score Range	Number of Units	%	Mean of DEA Score
<0.60	88	58.28	0.350
0.60–0.80	15	9.93	0.695
0.80–1.00	12	7.95	0.868
=1.00	36	23.84	1.000
Total	151	100.00	0.580

Table 6 presents the statistical results of efficiency before and after the application of the above algorithm, and it is important that the corrected efficiency is lower than the original. More specifically, the improved efficiency is, on average, at 0.4535, which means that, for the inputs that are at the same level, the outputs need to be increased by 54.65% in order to maximize the efficiency. It is also observed that, after the application of bootstrap, the maximum value became 0.8587, compared to 1 before.

Table 6. Descriptive statistics BBC bootstrapping DEA model.

	Original Efficiency	Corrected Efficiency
Min	0.0499	0.0395
Max	1	0.8587
Mean	0.5802	0.4535
Std. dev	0.3094	0.2261

The Mann–Whitney non-parametric test was performed to examine whether there were differences in efficiency before and after the bias correction. In this way, it can be seen whether the process followed contributed to the improvement of the results. The results showed the statistic Z = 13,939, with *p*-value = 0.0008, which means the null hypothesis of equality between efficiencies is rejected. It also transpires that efficiency without bias is always less than the original. The conclusion to be drawn from this is that the DEA model, which does not take environmental factors into account, can lead to erroneous results.

4.3. Truncated Regression Analysis Results

In order to analyze the effect of explanatory variables on efficiency levels, the bootstrapped truncated regression algorithm is performed with 2000 repetitions.

The model on which the whole process was based is as follows:

$$\hat{\hat{\varphi}}_i = \beta_0 + \beta_1(activities)_i + \beta_2(rooms)_i + \beta_3(operating\ days)_i + \beta_4(type\ of\ accommodation\ business)_i + \beta_5(age)_i + \varepsilon_i \tag{7}$$

where $\hat{\hat{\varphi}}_i$ is the value of the corrected technical efficiency, β_0, β_1, β_2, β_3, β_4, β_5 are parameters that must be calculated, and ε_i is the term that expresses the error. The other parts of the model are environmental variables that affect the efficiency levels. The

dea.env.robust command of the rDEA package of the R programming language was used to implement the bootstrapped truncated regression.

Table 7 shows the results of the procedure described previously. The parameters whose values are negative show a possible improvement and, as a result, the corresponding factors are a source of efficiency. The "activities" variable shows a negative factor, which means that the fewer activities there are, the more efficient is the business. This result becomes more powerful as it is also statistically significant for $\alpha = 0.1$.

Table 7. Results of bootstrap truncated regression.

Variables			
Alpha = 0.1/0.05	Beta	LL	UL
Intercept	−18.943	−58.035	8.837
Activities	−9.448 *	−14.121	−4.605
Size	6.900 **	5.443	8.673
Operating days	0.099 **	0.029	0.179
Type of accommodation business	6.371	−6.505	20.531
Age	−0.381	−1.224	0.697
Sigma	31.610 *	26.017	3 8.008

* Significance level $\alpha = 0.1$; ** Significance level $\alpha = 0.05$; LL: Lower Level; UL: Upper Level.

5. Discussion

The "rooms" variable in a tourist unit has a positive and statistically significant coefficient of $\alpha = 0.05$. The continuous "operating days" variable contributes to inefficiency as it presents a positive coefficient that is statistically significant for $\alpha = 0.05$. The other factors used in this model do not have statistically significant results. However, the "age" variable influences the efficiency and, in particular, the newer accommodations are more efficient because, according to Pikkemaat and Zehrer [64], the traditional small family-run businesses have a lack of innovation. On the other hand, the "type of business" variable shows that engaging in agricultural activities at the same time does not enhance the effectiveness of tourism businesses (Table7).

The results indicate that accommodation businesses in non-coastal areas operate at a low level of efficiency. The results indicate that accommodation businesses in non-coastal areas operate at a low level of efficiency. Comparing the results with previous research focusing on rural businesses, there are similarities and differences.

The efficiency results show that the majority of accommodation businesses in non-coastal areas of Central Macedonia are characterized by inefficiency (58%), which is something that coincides with the results of similar studies that have been conducted, not only in Greece [15,27], but also in Europe [4,10,14].

The novelty of this study is that it expands the efficiency results by the variety of activities, including the tourist product, which indicates that the type of accommodation is associated with the type of service provision (simple–complex). The efficiency results by accommodation type indicate that simple accommodations achieve higher efficiency levels than complex ones, in contrast with revenues and overnight stays. This finding is in contrast with previous research [13], which noted the attracting power of having a variety of activities in rural tourism. In contrast to expectations, the variety of activities has a negative and significant influence on the efficiency of small accommodations.

Simple activity drives the efficiency of businesses. This particular finding is similar to the results of corresponding studies, which were conducted on hotels for mass-tourism [5]. In rural tourism, research has shown that the supply of other services besides housing promotes the increase in net occupancy rates [26]. Complex activity is associated with lower efficiency due to higher operating costs or the lack of occupational training, entrepreneurship capabilities, and management skills, as well as innovation [15,64]. This result is probably related to the owners/managers' skills and abilities. Therefore, they must be

encouraged to improve their occupational and entrepreneurship capabilities by training and education, while maintaining the authenticity of offerings. It is apparently not enough to provide a variety of activities; these must also be efficiently managed so that additional investments and costs pay off.

Efficiency and sustainability are closely related [39]. Inefficient businesses can improve their efficiency with the lowest consumption of resources. As expected, the more rooms there are, the more difficult they are to be managed, and therefore the efficiency is decreased. This finding is similar to previous studies [4,27,64] because small accommodation businesses are more flexible and can be more effectively adapted to the various conditions that may occur [3]. Along the same lines, the impact of accommodating capacity showed a limited effect of economy of scale. Smaller units are more efficient due to lower operating costs and rental labor as family labor tends to be the main resource utilized in the examined accommodations. Additionally, they have the ability to be more informal with the customers, providing them with a more authentic experience, which, in turn, enhances tourist loyalty [2,11,65]. Researchers have argued that small accommodation businesses in rural areas attract tourists that seek involvement in the rural experience, which can be provided more easily by the smaller units [26]. The findings showed that the majority of examined accommodation businesses were created within a period of increasing tourist demand. Today, after a long-term financial crisis, they may be considered as oversized, and it would be more effective to minimize their size so as to improve their efficiency. In case of increasing demand, collaboration among small accommodation businesses located in one particular area is suggested in order to deal with the problem of their small size [64,66].

The relationship between the number of "operating days" through the year to business efficiency was also explored. The result is in the line with other studies, which show that equivalent accommodation businesses in rural areas are open throughout the year, but they often receive customers during the weekends and religious holidays (Easter, Christmas etc.) [7,10,12,15]. However, the continual operation of accommodation businesses leads to the increase of operational costs, which are not able to be defrayed by the equivalent income that is gained.

In contrast to the literature "age" does not influence the efficiency. According to Pikkemaat and Zehrer [64], newer accommodations are more efficient because the traditional small family-run businesses have a lack of innovation. On the other hand, Teodoro [26] argued that the older rural tourism units are better established in the market and have some loyal clients. Finally, the engagement in agricultural activities is not confirmed as a relevant business efficiency factor, even though Koutsouris et al. [15] mentioned that the combination of tourism and farming is able to support farming households.

6. Conclusions

This paper analyses business efficiency in small accommodation businesses in non-coastal rural areas in Greece. Applying the double bootstrap truncated DEA method estimated the efficiency score of small accommodation businesses in the research area and the influence of the variety of activities in a set of business variables. Simar and Wilson's model [48], which produces more robust and reliable results than the techniques traditionally used in this line of research [32], was adopted. As a research area, Central Macedonia was selected because of the region's geographical and economic position in Greece and Europe.

The efficiency results confirm that the majority of accommodation businesses in non-coastal areas of Central Macedonia are characterized by inefficiency (58%), which is something that coincides with the results of similar studies that have been conducted, not only in Greece [15], but also in Europe [10]. The influence of some business variables on firm efficiency was confirmed, specifically revealing the significant, negative effect of activities, size, and operating days on the efficiency score. The results expand the strategy in the

hospitality field by linking two key constructs: efficiency and business strategy. Understanding the influence of the factors (variety of activities, size, and operating days) on small accommodations' efficiency can assist entrepreneurs, owners/managers, hospitality executives, and educators in defining their business strategy and can also contribute to increasing businesses' success and efficiency. It would be very interesting if future research was conducted to validate the current findings and compare them with new ones, based on companies located in coastal areas or across the country.

To conclude, some variables with contradictory results (namely age of business and combined farming–hospitality businesses) may deserve additional, eventually qualitative, research for clarification, and they would also be interesting for the variable "variety of activities", where a distinction between activity types and corresponding resources required may add to an understanding of the here presented results. Furthermore, the present research was carried out at the end of the financial crisis and at the beginning of the COVID-19 pandemic. This is something that stimulates the researchers of this particular study to repeat it after some years, focusing on the same accommodation businesses, so as to find out which remain active despite these challenges, as well as the latter's impact on their efficiency score.

The aims of sustainability and resilience of small businesses are the reduction of disaster losses, the maintenance of sustainable resource management, and the implementation of sustainable systems [67–69]. It would be interesting to research measures to develop the resilience of small accommodation businesses, regardless of their efficiency score, which would, however, probably add to their resilience.

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