

Cost and profit efficiency: the case of Bulgarian hotel industry

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Abstract

The current paper aims to analyse and estimate the Bulgarian hotel industry's efficiency, focusing on both cost and profit efficiency. We attempt to examine whether service quality, as well as tourism specialization, affect hotel industry efficiency. By using the Battese and Coelli (1995) model this study applies a Stochastic frontier analysis with 309 Bulgarian hotels analysed for the period of 10 years (2008-2017). The methodology allows to be estimated the efficiency level and influencing factors, as well as decompose the error into both, random and inefficiency error. The results show that the cost efficiency decreases when the hotel category increases and significantly fluctuates over time in a decreasing tendency. On the other hand, quality service and tourism specialization cannot unambitiously explain the profit inefficiency of Bulgarian hotels. Thus, the hotel management needs to apply strategies related to differentiating hotel products and/or better pricing, rather than tourism development of the destination.

Keywords: service quality, tourism specialization, translog function, stochastic frontier analysis, tourism industry

Introduction

Tourism is recognized in the literature as one of the economic sectors that grow rapidly worldwide and increases its importance for economic growth. In recent years, the traditional hotels are challenged to maintain and increase the level of efficiency due to high competition, new and alternative forms of accommodation (houses for guests, Airbnb, etc.) „in many destinations with a high tourism specialization” (Dapeng *et al.*, 2020, p. 1) and the increased customers' needs to be satisfied. Because of the high importance of hotel performance - product quality relation, as stated by Yang and Cai (2016), the main focus of the current study is

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exploring and measuring the influencing factors on hotel efficiency. The study focuses particularly on the quality of hotel service as it is known the hotel product is a kind of symbiosis between hotel service and tourist resources (Yanev, 2018). Hotel service quality is pointed out as a main factor of competitive advantage for firm survival in rapidly developing and competitive sectors (Arbelo-Perez *et al.*, 2017; Lukanova, 2010). On the other hand, tourism specialization is considered as an influencing factor of the hotel industry efficiency. It can be assumed that increasing the overall quality of Bulgarian hotels' services in destinations with a higher level of tourism flows will be resulting in better overall hotel efficiency.

In the specialized literature, numerous studies are assessing the hotel efficiency primarily focusing on minimizing costs of hotels (cost efficiency) (Bernini and Guizzardi, 2010; Chen, 2007; Fernandez and Becerra, 2015; Hu *et al.*, 2010; Wang *et al.*, 2007) and few focusing on overall hotel performance and maximizing hotel's profit (Arbelo *et al.*, 2018; Arbelo-Perez *et al.*, 2017; Pérez-Gómez *et al.*, 2018). However, the influence of quality of hotel service and level of tourism specialization are poorly examined as external factors of overall or/and partial efficiency.

Furthermore, the hotel service quality is considered not only a key factor but a prerequisite for better firm performance and higher competitiveness in the hotel sector. Better service quality results in higher customer's loyalty, new customer, increased hotel reputation and revenue (Saleem and Raja, 2014).

Higher tourism specialization is often linked to a higher number of tourists (Dapeng *et al.*, 2020; Dogru and Bulut, 2018; Perez-Dacal *et al.*, 2014), and it is assumed that hotels in the regions with tourism-based economy should have increased the hotel occupancy rate, therefore, increasing in revenue and profit which would lead to greater hotel industry efficiency.

The higher tourism specialization intensifies market competition and forces traditional hotels to perform different and more quality services that incur higher costs (Zervas *et al.*, 2015). In case the tourism specialization and differences in quality of hotel service are not considered in measuring hotel industry efficiency this would result in wrong efficiency estimation (Arbelo-Perez *et al.*, 2017). The errors would be linked to unmeasured differences in the hotel's service quality and level of specialization.

It is well recognized in economic literature, that higher costs do not necessarily lead to higher revenues (Enke, 1970; Johnson and Kleiner, 1993; Maudos *et al.*, 2002). Estimation of cost efficiency does not reflect the effect of both service quality and level of tourism specialization on revenue. Therefore, profit efficiency is a better concept due to captures unmeasured differences in quality service and tourism specialization and their effect on both cost and revenue. The more region is tourism specialized and the higher quality is preferred by customers, the higher revenue hotels should obtain. This paper's underlying point is to estimate the cost and profit efficiency of Bulgarian hotels for 10 years (2008-2017) and to examine whether service quality and tourism specialization have an impact on it.

The Bulgarian tourism industry directly contributed 3.11 % of the GDP of the country. The Accommodation and Food services form 12.11 % of total value added (according to SNA) in 2018. For the 10 years, there were an increase of 45 per cent in both, domestic and international tourists. The Bulgarian Government launched in 2014 and updated in 2017 the National Strategy for Sustainable development of Tourism 2014-2030, which aims to make Bulgaria a year-long destination. In the last decade, the tourism expansion boost construction of accommodation establishments in Bulgaria, particularly on a higher scale and penetration of international hotel chains. According to the Bulgarian National Statistical Institute (NSI), the four- and five-star hotels in total increased significantly by 56 per cent from 2008 to 2017. Primarily, the hotels are located in coastal and mountain resorts and the capital of Bulgaria – Sofia. However, the increased number of hotels does not result in a rapid increase in hotels' revenue. Contrariwise, the price per room and occupancy rate remains relatively low over the years.

The rest of the current paper follows the sections: Section 2 reviews hotel efficiency literature. Section 3 is specified the methodology for measuring hotel efficiency. The selection of explanatory variables and the collection of data are explained in section 4. Section 5 introduces the empirical results and discussion. Last, conclusions are discussed in section 6.

1. Literature review

From the economic literature can be summarized that primarily two methodologies dominate the estimation of efficiency and productivity – the first one is Data Envelopment Analysis (DEA), and the second – the Stochastic Frontier Analysis (SFA).

1.1. The hotel efficiency evaluation

DEA is a non-parametric linear programming approach that develops an efficiency frontier by optimizing the weighted output/input ratio of each DMU, subject to the condition that this ratio can equal, but never exceed, unity for any other DMU in the data set (Charnes *et al.*, 1978). However, DEA methodology is often argued to be inconsistent to measure DMU efficiency regarding estimation of possible random errors as all deviation from the frontier is considered as technical inefficiency (Berger and Humphrey, 1997).

SFA is considered a proper parametric approach as it uses econometric techniques to define an individual company's inefficiency in terms of its deviation from the estimated optimal frontier. The SFA models the frontier within a regression framework so that efficiency can be estimated. The SFA advantage compared to DEA is that it decomposes the error term into two components – a random and an

inefficiency error and is used by many authors (Arbelo-Perez *et al.*, 2017; Assaf and Magnini, 2012; Dapeng *et al.*, 2020; Oliveira *et al.*, 2013).

All these studies measure cost efficiency (and some the profit efficiency) by specifying output variables like operating revenue, number of rooms, tourists, nights spent, market share, and others; and input variables - proxies (ratios) for labour price, materials price, and price of capital. Only a small part of them uses quality or tourism specialization as additional determinants for explaining hotel efficiency. Some authors (Assaf and Magnini, 2012) use an additional output variable - customer satisfaction to examine hotel service quality and argue that the hotel efficiency rank changed based on whether customer satisfaction is included as output or not. Assaf and Aghola (2011) stated that the hotels with higher category (stars are using as a proxy for quality) and located in the city area are more technically efficient due to maintained competitive position and star rating. On the contrary, Jorge and Suarez (2014) stated that higher category hotels compete on differentiation while the lower category hotels on costs.

Few studies investigate the effect that four- and five-stars have on the hotel revenue efficiency respectively in Spain and Portugal (Arbelo-Perez *et al.*, 2017; Oliveira *et al.*, 2013). Oliveira *et al.* (2013) revealed that five-star hotels' revenue efficiency reached higher levels compared to four-star ones. At the same time, the hotel category does not appear a significant factor and the author argued the greater services differentiation attracts wealthier customers. On the contrary, studying external determinants of hotel efficiency Arbelo-Perez *et al.* (2017) pointed out that hotel category is a significant determinant. The authors stated the higher quality category of five-star hotels compared to four-star ones negatively affects the overall hotel efficiency, as well as the extra cost made for higher quality, is not offset by higher revenues. Taking into consideration the highly competitive environment and the strong hotel dependence on local regional conditions, proved by Yang and Cai (2016), the hotel managers should consider how tourism specialization impacts hotel efficiency.

Some authors (Assaf *et al.*, 2017) found the tourism growth via increasing lodging demand significantly affects hotel performance. On the contrary, Göcen *et al.* (2017) argued that increased lodging demand hardens market competition among the hotels and decreases their efficiency. Thus, the impact of tourism specialization on efficiency is ambiguous as it varies over time and among different tourism destinations. Dapeng *et al.* (2020) studying the effect of tourism specialization and market competition on Chinese hotel efficiency, found out both have a complementary effect on hotel efficiency which is not independent.

1.2. Quality and tourism specialization as determinants of hotel efficiency

Quality and hotel efficiency

Many studies discussed the quality of service as a concept difficult to be measured due to its main characteristics of „heterogeneity, the inseparability of production and consumption and intangibility” (Akbaba, 2006, p. 170). Núñez-Serrano *et al.* (2014) summarized and discussed two dominating different perspectives about service quality measurement in the literature. On the one hand, the objective perspective is based on measurable characteristics which are used as criteria in official classification systems, like the number of stars of each hotel that submit information on facilities and services providing to customers. On the other hand, the subjective perspective considers customer satisfaction and refers to their different expectations and perceptions.

In the literature related to hotel service quality and according to the UNWTO (2015) the number of stars of a hotel is appropriate and the most common indicator used for measuring the hotel services quality, although the quality of service cannot always be linearly correlated with the official hotel category. The requirements set in the classification systems for each star's category reflect the overall hotel's efforts to ensure the quality of its services to the customers. From a consumer point of view, the higher star category implies higher quality service related to more space, attention, and differentiation of the product.

Some authors (Arbelo-Perez *et al.*, 2017; Becerra *et al.*, 2013; Israeli, 2002; Silva, 2015; Yang and Cai, 2016;) investigate the main effects of hotel service quality and differentiation - vertical and/or horizontal on hotel cost efficiency and revenue. They argued that the high hotel category results in high costs for hotels to provide more and better services and that the hotels can charge their customers a higher price per room. In addition, Becerra *et al.* (2013, p. 71) stated that „the degree of local competition moderates the effect of differentiation on pricing policy” and the hotel's goal has to be achieved is limited to not be different when market competition increasing, but more effective. The above-mentioned authors have debated that a strong positive correlation is expected between hotel quality (a star-rating) and room prices because higher product quality is associated with higher costs, which pushes prices up and consequently increases revenue. Thus, when a hotel incurs some extra costs to create value for customers and offer higher quality, e.g., moving to higher star, then the hotel is vertical differentiated and may require a higher price. Silva (2015) considers hotel stars as a favourable attribute of hotel quality – that is the consumers would pay more for quality service in terms of stars. Therefore, the hotel category can reduce cost efficiency and simultaneously increase profit efficiency, due to higher revenue.

Level of tourism development and hotel efficiency

Tourism specialization as an indicator of the level of tourism destination development has a direct and indirect effect on the efficiency of the hotel. From the direct impact perspective, a tourism specialization is often linked to tourism growth that can directly improve the hotel industry development and efficiency via the higher demand for hotel accommodation and therefore increased hotel occupancy rate that will ensure higher revenue and profit. According to the tourism-led growth hypothesis (Balaguer and Cantavella-Jorda, 2002; Cortes-Jimenez and Pulina, 2010; Dogru and Bulut, 2018; Dritsakakis, 2004; Husein and Kara, 2011; Tugcu, 2014;), the tourism specialization will stimulate the economic growth of tourism destination through an increasing number of tourists and/or tourism revenue that subsequently leading to improves in the business environment.

From the indirect impact perspective, according to the conservation hypothesis (Aslan, 2013; Payne and Mervar, 2010), economic growth of tourism destination causes the tourism specialization or in other words, the improvement of business environment and growth in the overall economy will increase tourism demand and indirectly will boost revenue and profit of hotel's establishment.

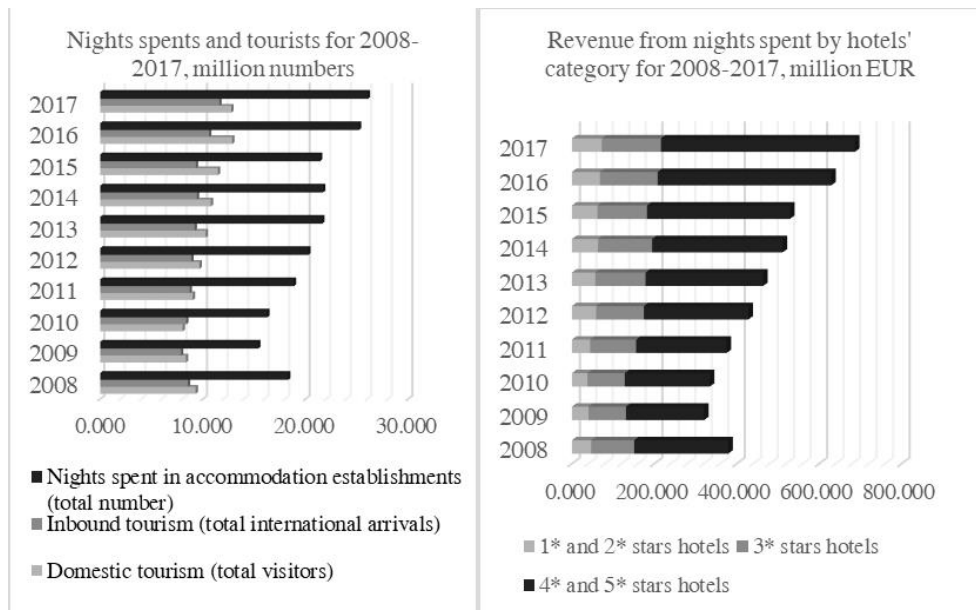
Nevertheless, the high developed destinations in terms of tourism strengthen competitiveness in the market and serve as a prerequisite for differentiation in hotel services and consumers' demand. On the one hand, tourism specialization intensifies the rivalry among the market players and attracting new entrance which offers alternative forms of accommodation and services (Zervas *et al.*, 2015) and eventually will result in loss of market share and efficiency of traditional tourism hotels. Pham *et al.* (2015) explained the negative effect of tourism specialization with the crowding-out effect that arose from expanding tourism beyond a certain level. Hence, the tourism specialization may have a bilateral effect on the hotel industry development, and it is not a guarantee for a higher hotel efficiency.

1.3. Performance and structure of Bulgarian hotel industry

Tourism, respectively hotel industry become one of the rapid growth and key sectors in the Bulgarian economy. According to National Statistical Agency, the Accommodation and Food services form about 12 per cent of total value added in 2017. The hotel industry generated 687 million euros (see Figure 1) revenue from the nights spent which is an 80 per cent increase compared to 2008 (380 million euros). The main part of the revenue is generated by four- and five-star hotels (more than 68 per cent in 2017) and 3-star ones (21 per cent). Considering 10 years (especially after the accession of Bulgaria to the European Union and the opening of boundaries) the total volume of domestic and international tourists recorded an increase of 45 per cent.

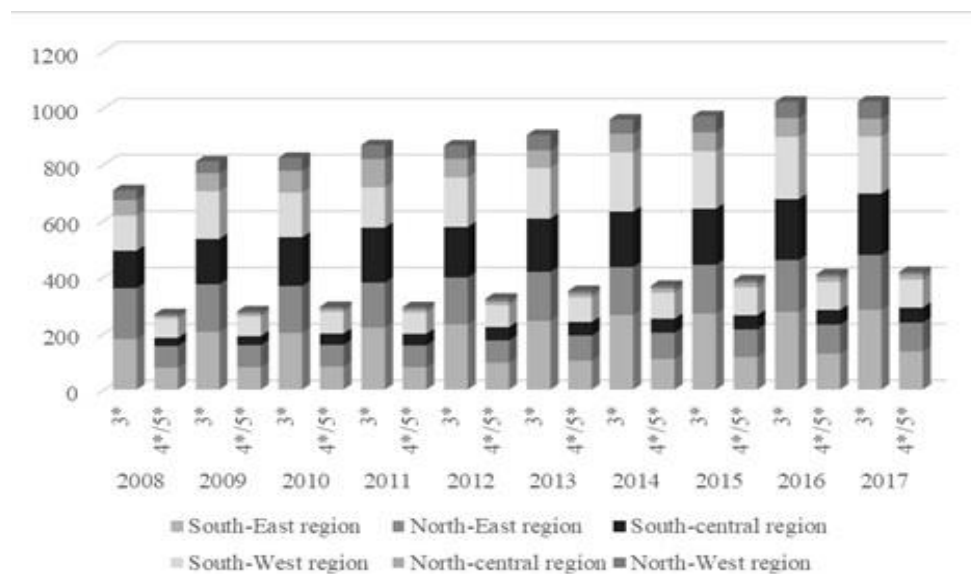
Nowadays Bulgarian hotel industry development follows the global trend toward a notable excess of supply over demand. Resulting from this the accommodation establishments run their businesses under strong competition. The tourism expansion boost construction of accommodation establishment in Bulgaria, particularly in higher scale and penetration of international hotel chains. According to the NSI, the total number of four- and five-star hotels has increased significantly by 56 per cent (from 268 in 2008 to 418 in 2017, see Figure 2). The three-star hotels increased by 45 per cent between 2008 and 2017. This growth was achieved despite the global economic crisis (Kadieva, 2016) and shows a comparatively qualitative superstructure (Dabeva, 2010). More than 50 per cent of all Bulgarian hotels are concentrated around coastal and mountain resorts (situated in South-East, part of North-East and South-Central regions of Bulgaria) and near the capital of Bulgaria (North-West region).

Figure 1. Number of nights spent, tourists and revenue by hotels' category for the period 2008-2017



Source: Authors' representation based on data from OECD. stat; NSI, Infostat; the World Bank

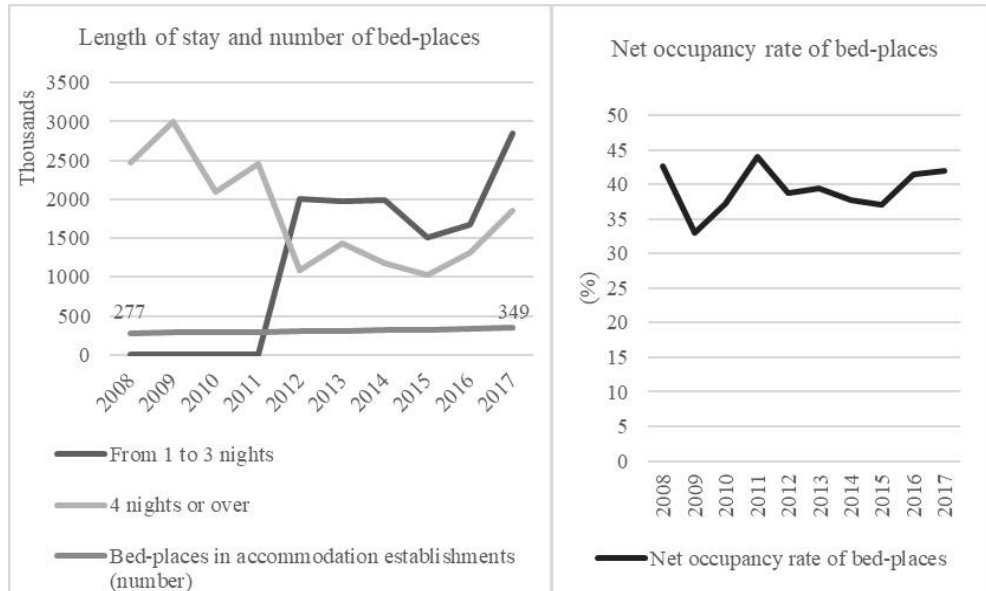
Figure 2. Number of 3-, 4- and 5-stars hotels in Bulgaria by NUT 2 regions for the period 2008-2017



Source: Authors' representation based on data from NSI, Bulgaria

The specialization of these areas leads to a problem of over construction, overdevelopment of some tourist areas (Yanev, 2019), destroying valuable natural and anthropogenic resources, deterioration of quality of hotel products, and seasonality. These problems resulted in reducing of a tourist stay (see Figure 3); the high category of hotels becomes pointless; deterioration of management; recruitment of qualified staff; the efficiency of investments decreases (Dabeva, 2010). Another reflection of these problems is that many higher category hotels offered their services and products at lower prices in comparison to the level of prices of the same services in foreign competitive destinations to Bulgaria. The price per room varies in range on average between 20-31 euros in different regions and low occupancy rate at about 35 per cent over the years. Despite the relatively high share of three-, four- and five-stars hotels the main reasons for their low average income are the image of Bulgaria as a cheap tourist destination attracting low-income tourists through foreign tour operators by the formula 'all inclusive' and significant discounts for pre-and post-season in the country seaside and mountain resorts (Kadieva, 2016). Seraphin and Ivanov (2020, p. 148) pointed out the low pricing strategies in the tourism industry „obviously have harmful than the beneficiary impact on revenue efficiency”. All these problems lead to lower revenue, hence lower hotel efficiency.

Figure 3. Length of stay, number of bed-places and net occupancy for the period 2008-2017



Source: Eurostat and Authors' representation based on Eurostat database

In summary, the Bulgarian hotel industry faces many problems that affect the overall efficiency of the industry. In current Bulgarian literature about hotel efficiency, few studies are estimating and measuring hotel service quality and tourism specialization and their impact on hotel cost and profit efficiency. Moreover, there is not a study using SFA methodology for evaluation of the impact of the quality and specialization as an external factor affecting efficiency.

In the current conditions of strong competition within the hotel industry, the great expansion of high-end hotels, the rapid development in many tourist destinations, and increased customer's needs for higher service quality it is important the hotel efficiency and it's the most influencing internal and external factors to be examined.

2. Methodology for measuring efficiency

Stochastic Frontier Analysis (SFA) adapted by Battese and Coelli (1995), is applied to estimates the cost and profit frontiers of the Bulgarian hotel industry and the relative efficiency. The current study uses the SFA methodology following Aigner *et al.* (1977) and Meeusen and Broeck (1977). According to their assumptions, the error can be decomposed into two components – one is a random error, and the second, inefficiency error.

The main SFA model advantage is that tolerates the inclusion of entity inherent characteristics (inefficiency), implied as a set of explanatory variables that vary both during the years and among the entities (hotels).

Cost efficiency in its common sense shows the excess of minimum production cost over the total cost of production. More precisely, it is defined as “the ratio between the minimum costs that can be achieved for a given level of production and the cost of current production” (Arbelo *et al.*, 2017, p. 202). Second, cost inefficiency refers to the entity-specific error, i.e., unobserved heterogeneity, unexplained by the random error. We follow the expression:

$$C_{it} = f(y_{it}, w_{it}) \exp(v_{it}) \exp(u_{it}) \quad (1)$$

$i = 1, \dots, N \text{ hotels}; t = 1, \dots, T \text{ periods}$

where the notations follow Arbelo *et al.* (2017):

C_{it} – total operating cost of i^{th} hotel for t period; f – functional form; y_{it} – the output vector w_{it} – the input prices vector; v_{it} – the random error; u_{it} – the inefficiencies found; and v and u - respectively stand for the random error and inefficiency.

For the cost efficiency (CE) for each hotel we follow Arbelo *et al.* (2017):

$$CE_{it} = \frac{C_{min}}{C_{it}} = \frac{f(y_{it}, w_{it}) \exp(v_{it})}{f(y_{it}, w_{it}) \exp(v_{it}) \exp(u_{it})} = \frac{1}{\exp(u_{it})} \quad (2)$$

The selected functional form used in the paper is the translog proposed by (Christensen *et al.*, 1973). For the need of current study, the applied translog function include one output and three inputs and have the following expression:

$$\ln\left(\frac{C_{it}}{w_{3,it}}\right) = \alpha_0 + \sum_{j=1}^1 \alpha_j \ln y_{j,it} + \sum_{s=1}^2 \beta_s \ln\left(\frac{w_{s,it}}{w_{3,it}}\right) + \frac{1}{2} \sum_{j=1}^1 \sum_{k=1}^1 \alpha_{j,k} \ln y_{j,it} \ln y_{k,it} + \frac{1}{2} \sum_{s=1}^2 \sum_{r=1}^2 \beta_{s,r} \ln\left(\frac{w_{s,it}}{w_{3,it}}\right) \ln\left(\frac{w_{r,it}}{w_{3,it}}\right) + \sum_{j=1}^1 \sum_{s=1}^2 \rho_{j,s} \ln y_{j,it} \ln\left(\frac{w_{s,it}}{w_{3,it}}\right) + v_{c,it} + u_{c,it} \quad (3)$$

The following conditions for symmetry and homogeneity of prices are imposed:

- $\alpha_{j,k} = \alpha_{k,j} \forall k, j$ $\beta_{s,r} = \beta_{r,s} \forall s, r$ (symmetry).
- $\sum_s \beta_s = 1; \sum_s^r \beta_{s,r} = \sum_j^s \rho_{j,s} = 0$ (homogeneity of prices).

Next, the inefficiency function applied includes four variables and have the following form:

$$u_c = \sum_k^4 \delta_k Z_k + \varepsilon \quad (4)$$

where

Z_k – denotes the k^{th} explanatory variables of the inefficiency;
 δ – the parameter vector; ε – random error.

To analyse and evaluate the profit efficiency of tourism hotels the study applies an alternative profit function. Following Berger and Mester's (1997) study our dependent variable is profit and for independent variables, we use the same output quantities and input prices as used in the cost function. Alternative profit function considers the output remains constant and the input prices are influencing variables that fluctuate. The following expression of profit function is applied:

$$\pi_{it} = f(y_{it}, w_{it}) \exp(v_{it}) \exp(-u_{it}) \quad (5)$$

$i = 1, \dots, N \text{ hotels}; t = 1, \dots, T \text{ periods}$

where π_{it} denotes the profit of i^{th} hotel in t period.

Each hotel's profit efficiency (PE) at time t can be estimated (from expression (5)) as of current profit to maximum hotel profit ratio, considering the same output quantities and input prices:

$$PE_{it} = \frac{\pi_{it}}{\pi_{it}^{max}} = \frac{f(y_{it}, w_{it}) \exp(v_{it}) \exp(-u_{it})}{f(y_{it}, w_{it}) \exp(v_{it})} = \exp(-u_{it}) \quad (6)$$

To include both positive and negative hotels' profit in the model an additional independent variable is created - a negative profit indicator (NPI), proposed by Bos and Koetter (2011). NPI takes the value of 1 for the hotels generating profit ($\pi > 0$) and when the hotel's financial result is negative, i.e., loss ($\pi < 0$) the NPI takes its absolute value. Simultaneously, the profit variable (π) takes values of 1 when the result is negative and the value of profit when it is positive.

Applied translog profit function includes one output and three inputs with same conditions for symmetry and homogeneity of prices as the cost function have the following expression:

$$\ln \left(\frac{\pi_{it}}{w_{3,it}} \right) = \alpha_0 + \sum_{j=1}^1 \alpha_j \ln y_{j,it} + \sum_{s=1}^2 \beta_s \ln \left(\frac{w_{s,it}}{w_{3,it}} \right) + \frac{1}{2} \sum_{j=1}^1 \sum_{k=1}^1 \alpha_{j,k} \ln y_{j,it} \ln y_{k,it} + \frac{1}{2} \sum_{s=1}^2 \sum_{r=1}^2 \beta_{s,r} \ln \left(\frac{w_{s,it}}{w_{3,it}} \right) \ln \left(\frac{w_{r,it}}{w_{3,it}} \right) + \sum_{j=1}^1 \sum_{s=1}^2 \rho_{j,s} \ln y_{j,it} \ln \left(\frac{w_{s,it}}{w_{3,it}} \right) + \theta \ln NPI_{it} + v_{\pi,it} - u_{\pi,it} \quad (7)$$

Inefficiency effects' function applied includes four variables and can be expressed as:

$$u_{\pi} = \sum_k^4 \delta_k Z_k + \varepsilon \quad (8)$$

3. Data and selection of variables

Three databases were used in this study to obtain the necessary data. Firstly, financial and accounting data were obtained from the Ciela-Norma AD, selecting a stratified sample of all companies operating in Bulgaria belonging to category 5510: „Hotels and similar accommodation” according to the classification of the economic activities (NACE-2008) for the analysed period (2008-2017). Secondly, the register of the Ministry of Economy of the Republic of Bulgaria for categorization of accommodation and catering establishments, which contains a category of each hotel, was used. Thirdly, the National statistical institute databases were used to be obtained the regional data. Lastly, the final sample was composed of balanced panel data of 309 hotel establishments from all regions of Bulgaria in the period 2008-2017 (10 years x 309 establishments = 3090 observations – the missing data are not excluded). Three-star hotels represented 50.16% of the sample, 44.34% were four-star hotels and 5.50% were five-star hotels. Due to the aim of homogenizing the sample, one- and two-stars hotels were eliminated from this study.

Model variables both input and output for estimating the frontiers of cost and profit were selected based on the available data and the current literature. Most studies on hotel efficiency considered operating revenue as the output that measures the goals and objectives achieved by each company (Arbelo-Perez *et al.*, 2017; Croes *et al.*, 2018; Dapeng *et al.*, 2020). Thus, the output variable, y is the operating revenue, which includes the net revenues of each hotel obtained from its main activities.

The most frequently used proxy variables for hotel efficiency inputs in economic literature are prices of resources: employees, materials, and physical capital. The prices of inputs variables were estimated approximately based on the available information as follow:

- w_1 – the price of labour, which is the ratio between personnel costs and the full-time employees;
- w_2 – the price of materials, which is the ratio between material costs and the operating revenue;
- w_3 – the price of physical capital (depreciation of fixed assets to total fixed assets).

Total operating costs (C) - the cost frontier dependent variable, is the sum of the costs of personnel, materials, external services, and depreciation of fixed assets.

Likewise, earnings before interest and taxes (EBIT) is a proxy for the profit frontier variable (π).

Inefficiency factor variables used in the study are:

- z_1 - 4-star category is a dummy variable taking the value of 1 for a four-star hotel and 0 in all other cases;
- z_2 - 5-star category is a dummy variable taking the value of 1 for a five-star hotel and 0 in all other cases;
- z_3 - Tourism specialization is estimated as the total regional tourism revenue to regional GDP ratio;
- Time trend, taking the value of 1 in 2008, 2 in 2009, 3 in 2010, ..., up to 10 in 2017, which shows whether the inefficiency varies throughout the period or not.

4. Empirical results

Descriptive statistics of the total cost, profits, output variable, input prices, and explanatory factors of inefficiency are shown in Table 1.

Table 1. Descriptive statistics (2008-2017)

Variable	Obs.	Mean	Std. Dev.	Min	Max
<i>Dependent variables</i>					
EBIT ^a	3,080	376.1138	1539.577	-7062.304	48681.64
Operating costs ^a	3,084	1117.057	1799.356	1.53351	20227.96
<i>Output</i>					
Operating revenue ^a	3,082	1437.012	2509.257	0.51117	49721.36
<i>Input prices</i>					
Price of labour ^a	3,074	3.9026	5.92349	0.79128	140.3051
Price of materials ^a	3,033	0.13047	0.10874	0.002734	2.9824
Price of physical capital ^a	2,986	0.05797	0.12084	0.00281	3.57818
<i>Inefficiency determinants</i>					
4-star category	3,090	0.446602	0.497221	0	1
5-star category	3,090	0.055016	0.228049	0	1
Tourism specialization ^a	3,090	0.024805	0.029493	0.000536	0.092902

^aIn thousands of euros

Source: Authors' calculations

We used Stata 15 to estimate stochastic cost and profit frontier and their functions of inefficiency effects.

Cost function estimations results, including the inefficiency effects, are listed in Table 2.

Table 2. Translog Cost function estimation

Inefficiency effects model (truncated-normal)

Group variable: id_firm

Time variable: Year

Log likelihood = -462.1078		Prob > chi2 = 0.0000 Wald chi2(9) = 72920.55					
Variables	Parameters	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
Frontier							
ln y	α_1	0.59662	0.047248	12.63	0.000	0.504016	0.689225
½ ln y ²	α_{11}	0.0806	0.006433	12.53	0.000	0.067991	0.093209
ln w ₁ /w ₃	β_1	1.142405	0.045318	25.21	0.000	1.053584	1.231226
ln w ₂ /w ₃	β_2	0.156555	0.043448	3.60	0.000	0.071399	0.241712
½ ln (w ₁ /w ₃) ²	β_{11}	0.027478	0.013536	2.03	0.042	0.000948	0.054007
½ ln (w ₂ /w ₃) ²	β_{22}	0.101863	0.010364	9.83	0.000	0.081549	0.122176
ln (w ₁ /w ₃) ln (w ₂ /w ₃)	β_{12}	-0.08567	0.011002	-7.79	0.000	-0.10723	-0.06411
ln y ln (w ₁ /w ₃)	ρ_1	-0.09524	0.00794	-12.00	0.000	-0.1108	-0.07968
ln y ln (w ₂ /w ₃)	ρ_2	0.080112	0.005892	13.60	0.000	0.068564	0.09166
_cons	α_0	0.17776	0.193539	0.92	0.358	-0.20157	0.55709
Mu							
	μ						
z ₁	δ_1	0.507587	0.356954	1.42	0.155	-0.19203	1.207204
z ₂	δ_2	2.160625	1.19953	1.80	0.072	-0.19041	4.511661
z ₃	δ_3	1.394581	4.143082	0.34	0.736	-6.72571	9.514871
Time trend	δ_4	-0.49731	0.292002	-1.70	0.089	-1.06963	0.074999
_cons	δ_0	-2.09411	1.773895	-1.18	0.238	-5.57088	1.382657
Usigma							
_cons	u _c	0.121355	0.60115	0.20	0.840	-1.05688	1.299587
Vsigma							
_cons	v _c	-3.3888	0.079287	-42.74	0.000	-3.5442	-3.2334
sigma_u	σ_u	1.062556	0.319378	3.33	0.001	0.589525	1.915145
sigma_v	σ_v	0.18371	0.007283	25.22	0.000	0.169976	0.198553
lambda	λ	5.783882	0.31656	18.27	0.000	5.163436	6.404328

Source: Authors' calculations

Estimation results of the cost frontier parameters showed a proper choice of both output and input variables as 9 of 10 variables parameters appear statistically significant.

The additional estimated parameter γ ($\gamma = \sigma_u^2 / (\sigma_v^2 + \sigma_u^2)$) calculated as a ratio between variances of inefficiency and composite error, is 0.970975. The value is close to 1 and demonstrates that the deviation of hotels from their frontier of efficiency is primarily due to the inefficiency error. Similarly, the likelihood-ratio test (LR test)¹ was performed. The value of LR test of 1540.11 provided evidence that the model is correctly specified and the null hypothesis ($H_0: \gamma = \delta_0 = \dots = \delta_4 = 0$) is rejected.

¹ The LR test is equal to $\lambda = -2\{(\log(\text{Likelihood}(H_0)) - \log(\text{Likelihood}(H_1)))\}$.

Frequency distribution of cost hotel efficiency, the mean efficiency of studied hotels in each year, and overall cost efficiency are indicated in Table 3. Overall mean efficiency of the hotels' costs is 79.36 % and, in accordance with the results of Arbelo *et al.* (2018), Chen (2007), Hu *et al.* (2010), among others, indicates that the hotels could maintain the same level of services and at the same time could save 20.64% of their average costs.

Table 3. Frequency distribution and mean cost efficiency

Efficiency bands	Year									
	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17
0-24 %	4	1	2	0	0	1	2	3	1	1
25-49 %	23	25	24	15	7	7	5	5	3	5
50-74 %	128	127	115	74	53	49	50	40	28	22
75-100 %	141	145	157	210	239	242	242	245	255	254
Mean Efficiency (%)	71.4	71.7	72.9	77.7	81.3	82.3	82.3	83.1	85.7	85.7
Mean Efficiency 2008-2017					79.36%					

Source: Authors' calculations

The estimation of the inefficiency effects function reveals that the coefficients of the 5-star category and time trend are statistically significant at the 10% level. The positive sign of the 5-star category indicates that the cost efficiency decreases when the hotel category increases. This was an expected effect, as moving from 4 to 5 stars category implies that hotel management has to incur extra costs related to quality improvement. The result is confirmed by the positive difference between the 4- and 5- stars category coefficients. At the same time, the negative sign of the time trend variable is consistent with the findings in previous studies (Arbelo-Perez *et al.*, 2017) suggesting that the cost inefficiencies fluctuate over time in a decreasing tendency. Our results reveal that the tourism specialization variable has a positive sign confirming prior findings (Dapeng *et al.*, 2020) that the higher the tourism growth, the more cost efficiency decreases. Nevertheless, such a relation cannot be stated unambiguously as the variables appeared statistically insignificant. In general, the estimated inefficiency function is statistically insignificant suggesting that the selected explanatory variables cannot explain the existing technical inefficiency of the surveyed hotels.

Table 4 shows the results of profit function estimations and the inefficiency effects function.

Table 4. Translog Profit function estimation

Inefficiency effects model (truncated-normal)

Group variable: id_firm

Time variable: Year

Log likelihood = - 4327.9285		Prob > chi2 = 0.0000					
		Wald chi2(9) = 17157.16					
Variables	Parameters	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
Frontier							
ln y	α_1	0.476449	0.12829	3.71	0.000	0.225005	0.727892
$\frac{1}{2} \ln y^2$	α_{11}	0.047667	0.020996	2.27	0.023	0.006516	0.088818
ln w_1/w_3	β_1	1.261425	0.170176	7.41	0.000	0.927887	1.594963
ln w_2/w_3	β_2	0.754361	0.140629	5.36	0.000	0.478734	1.029988
$\frac{1}{2} \ln (w_1/w_3)^2$	β_{11}	-0.19307	0.050426	-3.83	0.000	-0.2919	-0.09424
$\frac{1}{2} \ln (w_2/w_3)^2$	β_{22}	0.131989	0.038096	3.46	0.001	0.057322	0.206656
ln $(w_1/w_3) \ln (w_2/w_3)$	β_{12}	0.007071	0.038159	0.19	0.853	-0.06772	0.081861
ln y ln (w_1/w_3)	ρ_1	0.038035	0.027006	1.41	0.159	-0.0149	0.090966
ln y ln (w_2/w_3)	ρ_2	-0.11422	0.021214	-5.38	0.000	-0.1558	-0.07264
ln NPI	θ	-0.98587	0.010488	-94	0.000	-1.00643	-0.96531
_cons	α_0	-0.48851	0.529725	-0.92	0.356	-1.52676	0.549728
Mu							
	μ						
z1	δ_1	-1.42646	1.959843	-0.73	0.467	-5.26768	2.41476
z2	δ_2	5.462565	5.578003	0.98	0.327	-5.47012	16.39525
z3	δ_3	-130.007	121.3791	-1.07	0.284	-367.905	107.8918
Time trend	δ_4	1.05011	0.972359	1.08	0.280	-0.85568	2.955899
_cons	δ_0	-32.3308	32.69249	-0.99	0.323	-96.4069	31.74526
Usigma							
_cons	u_π	3.431785	0.937969	3.66	0.000	1.593401	5.27017
Vsigma							
_cons	v_π	-0.96425	0.065868	-14.64	0.000	-1.09335	-0.83515
sigma_u	σ_u	5.561638	2.608321	2.13	0.033	2.218209	13.9445
sigma_v	σ_v	0.61747	0.020336	30.36	0.000	0.578872	0.658641
lambda	λ	9.007141	2.601673	3.46	0.001	3.907956	14.10633

Source: Authors' calculations

Results from stochastic cost frontier parameters estimation confirm a good choice of output and input variables - 8 parameters from all 11 are significant.

The estimated parameter γ is 0.987824 which is close to 1 and shows the deviation of hotels from their optimal frontier of profit efficiency is primarily due to inefficiency. The value of LR test is 4128.14 and verifies the correctness of the applied model – the null hypothesis is not accepted ($H_0: \gamma = \delta_0 = \dots = \delta_4 = 0$).

In Table 5 we display the results for frequency distribution with respect to the profit efficiency, as well the mean efficiency of all hotels in each year and the overall profit efficiency.

Table 5. Frequency distribution and mean efficiency of hotels' profit

Efficiency bands	Year									
	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17
0-24 %	32	56	63	57	60	67	62	78	67	70
25-49 %	63	80	73	72	85	77	93	78	79	88
50-74 %	152	134	138	154	146	143	137	129	134	113
75-100 %	49	28	24	16	8	11	7	7	7	9
Mean Efficiency (%)	56.1	48.3	47.7	48.6	46.0	45.9	45.0	42.9	44.0	42.8
Mean Efficiency 2008-2017	46.76%									

Source: Authors' calculations

Overall mean efficiency of hotels' profit in the sample is 46.76%. This shows that if the hotels operate at the efficient frontier, they could increase their profit by 53.24%. Therefore, the average maximum profit² of the surveyed hotels is approximately 804.3 thousand euros and on average they lose profit at about 428 thousand euros³.

According to our findings, the level of profit efficiency (46.76%) is lower than the one of cost efficiency (79.36%) and proves the existence of revenue inefficiency. Besides the studied variables, other possible reasons for the deteriorating revenue efficiency of the Bulgarian hotel industry are: the strong dependence on seasonality, leading to higher cost of the hotel product; the mismatch between the hotels' star category and customer expectations resulting in a shorter tourist stay; lower prices per room due to weak demand (Dabeva, 2010; Velikova, 2018; Yanev, 2018).

Estimation of inefficiency effects function reveals that the coefficient of the 4-star hotel category is negative in sign, indicating that moving from 3 to 4-stars category will increase the level of profit efficiency. This result is consistent with ones stated by Silva (2015) and Fernandez and Becerra (2015) proving that moving from 3- to 4-stars decreases cost efficiency but increases profit efficiency. Considering 5-stars hotels, in consistence with Arbelo-Perez *et al.* (2017) our findings reveal a negative relationship between high-end hotels and profit efficiency. The positive difference between 4- and 5- stars category coefficients confirm that moving from the 4- to 5-star category decreases profit efficiency as the hotel management needs to invest more for quality improvements.

The study also reveals a positive relationship between tourism specialization and profit efficiency that indicates the increases in tourism specialization will lead

² Calculated as the ratio between the average current profit (376 thousand euros, see Table 1) and the overall profit efficiency (46.76%, see Table 5) (Arbelo-Perez *et al.*, 2017).

³ Multiplying the maximum profit by the profit inefficiency (Arbelo-Perez *et al.*, 2017).

to a higher level of profit efficiency. This result is partly consistent with the results found by Dapeng *et al.* (2020), which states that tourism specialization has a positive relationship with profit efficiency until reaching a turning point that reverses the tourism specialization effect. The results obtained from the analysis also supported the growth-led tourism hypothesis and confirmed the indirect causal relationship between economic growth and tourism development for Bulgaria and some other Central and Western European countries found by Aslan (2013).

The positive sign of the time trend variable indicates that the profit inefficiencies fluctuate over time in an increasing tendency.

However, the estimated inefficiency function is statistically insignificant, which means that the selected explanatory variables cannot explain the existing technical inefficiency in hotels in the sample.

A Pearson's correlation was run to assess the cost and profit efficiency relationship. There was a small positive correlation between cost and profit efficiency, $r = 0.1947$, $p < 0.001$, with a change of cost efficiency explaining only 3.79 %⁴ of profit efficiency variation.

Conclusions

A review of economic efficiency literature in the hotel industry shows that have many studies concentrated their efforts on examining cost efficiency and only a few focusing their analysis on the efficiency of profit. But the concept of profit efficiency has an advantage compared to the cost efficiency concept as it allows unmeasured differences in quality service and tourism specialization and their effect on both cost and revenue to be captured (Arbelo-Perez *et al.*, 2017).

Since the hotels are strongly related to local regional conditions and are exposed to strong competition, the hotel industry must run their business considering the impact of tourism specialization on efficiency. The destinations with a higher level of tourism specialization forced the hotels to offer more differentiated services. Hence, service quality is a key to sustainable advantage and a prerequisite for success and survival in such a competitive environment as in the hotel sector (Akbaba, 2006).

From this perspective, the current research evaluated both efficiencies - cost and profit of 309 Bulgarian hotels for the period of 2008-2017 and tried to examine whether the service quality and tourism specialization have a significant impact applying both stochastic frontier approach and Battese and Coelli (1995) model.

The study contributes to deepening the understanding of the relationship between the inefficiency of Bulgarian hotels and quality and tourism specialization. We consider a simultaneous effect of both quality and tourism specialization, keeping them external explanatory factors on hotels' cost and profit inefficiencies. While most of the prior studies about the efficiency of Bulgarian hotels focus on the

⁴ Calculated as the square of the Pearson's correlation coefficient (r^2).

determinants of revenue efficiency, we widen the analysis to explain ones that affect both cost and profit inefficiencies.

Our findings show the existence of significant revenue inefficiency of Bulgarian hotels result from reported medium cost efficiency (79.36%) and relatively low profit efficiency (46.76%). The result is important and relevant to the process of hotel management decision-making.

In addition, the results reveal that the more tourism specialized are destinations, the more extra cost the hotels should incur. It is primarily relevant to five-star hotels as it leads to a decrease in cost efficiency. However, four-star hotels' profit efficiency is positively affected and increased by tourism specialization. It can be concluded that higher quality performed by five-star hotels compared to four-star ones has a negative impact on both cost and profit efficiency due to extra costs needed for service quality supported and not covered by higher revenue.

However, our finding shows that technical inefficiency contained in the hotel's cost and profit efficiency function is not fully determined by service quality and tourism specialization. It cannot be stated with certainty that service quality and tourism specialization explain the technical inefficiency. It is obvious that these two variables have an impact on cost and profit hotel efficiency but other factors that better explain the inefficiency must be examined.

Nevertheless, with growing market competition in the hotel industry and the overdevelopment in some tourist areas, the hotel managers should be aware of the local and regional level of tourism specialization to apply an appropriate strategy for improving the quality of their services. The findings of the current study reveal that in terms to boost hotel revenue and overall efficiency, the hotel management needs to implement strategies for higher quality services; to extend the average length of tourist stay; and to apply better pricing.

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