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Total factor productivity of the Slovenian hotel companies

Jan Frančeškin and Štefan Bojnec

Faculty of Management, University of Primorska, Koper, Slovenia

ABSTRACT

The article focuses on the study of performance factors of Slovenian hotel companies through Data Envelopment Analysis between 2001 and 2018. For this purpose, we introduced a balanced panel data of 20 hotel companies which differ by their size, type, the number of hotels within the company, and location. To determine efficiency factors, we used the Malmquist index, which can be broken down into a change in efficiency and technological change. The change in efficiency was further broken down into a change in pure technical efficiency and a change in scalar efficiency. Between 2001 and 2018, hotel companies recorded decline in total factor productivity index which was mainly due to the inability to implement new production technologies. One of the key reasons for deterioration in technological change was the 2008 economic crisis.

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1. Introduction

Efficiency and productivity can be important for competitiveness that can be measured at different levels from a company to a country level to evaluate their performances. At the micro level, the performance is reflected through the market share of the company (Barros & José Mascarenhas, 2005). The company performance can be measured in two ways: through efficiency, and through productivity which is the focus of our study.

The tourism industry, especially the hotel sector, is also becoming increasingly competitive and dynamic, mainly due to increasing pressures from global supply and demand (Oliveira et al., 2013). Over the past 20 years, the measurement of hotel efficiency has been mainly in the domain of frontier analysis, specifically Data Envelopment Analysis (DEA) (Oukil et al., 2016). The method is widespread among researchers in the study of efficiency and productivity a wide range of fields such as regional development, agriculture, telecommunications, public transport, banking, higher education, and tourism (Frančeškin & Bojnec, 2021; Zhou et al., 2008).

CONTACT Jan Frančeškin jan.franceskin@fm-kp.si

Slovenia as a small, open economy is mainly a boutique tourist destination. In its relatively small, but diversified geographic areas offer a holiday in the mountains, the karst world, the Pannonian plain and the Adriatic Sea. Since its independence in 1991, the number of tourists and overnight stays have increased in association to specific development factors in different periods. Up to 2000, the hotel industry experienced transformation processes through privatisation or semi-privatisation, which led to mixed ownership and operational structures of hotel companies from a few private to still state-owned hotel company chains that have been maintained up to now. Between 2000 and 2018, more than 50% of overnight stays were carried out in hotel companies. This is an additional reason why it important to focus our research on them. Throughout the period the most overnight stays in Slovenia were carried out by domestic, Italian, German and Austrian guests. According to type of accommodation and geographically, Austrian guests made the most overnight stays in health(s) accommodation, German in mountain areas of Slovenia, while Italian guests dispersed their overnight stays throughout Slovenia with a major in coastal accommodation. The record years regarding overnight stays in Slovenian tourism were recorded in the period from 2014 to 2018 during which the number of overnight stays increased by a 64%. In each year during this period the number of overnight stays increased and peaked in 2017 (13% growth) and in 2018 (25% growth).

The novelty and contribution of this article are threefold. First, the article explores in depth analysis of total factor productivity of the Slovenian hotel companies applying the Malmquist Productivity Index and using the balanced panel dataset for the years 2000–2018. Second, the estimated empirical results of the total factor productivity are further broken down into a part relating to technological changes and the part relating to the change in technical efficiency. Finally, these empirical results are of broader scientific, policy and practical relevance. The study takes into account the nineteen-year panel data set period at the level of the hotel company. Such long-term analysed period is a rarity in the literature, as most of the research is based only on few-year periods. The article does not translate to maximising output, which is a typical approach of most research within the DEA analysis, but we study efficiency through minimising the input. The reasons for such a decision can be based on a seasonality within a year and cyclicity in economic growth over the studied periods that have policy, destination and managerial implications.

The rest of the article is organised in the following sections. First, the second section presents literature review. The third section describes methodology and the fourth one data used. In the fifth section are presented results and the sixth one derives implication based on the discussion of the results. The final seventh section concludes with the issues for the research in the future.

2. Literature review

During the last decade, studies of efficiency are mainly in the domain of two methods, non-parametric DEA, and parametric Stochastic Frontier Analysis (SFA). Weerathunga et al. (2020) examine the effects of economic, industrial and hotel specific factors on the hotel's operations. They analysed 29 hotels between 2012 and

2018. To determine efficacy, they used an input-oriented DEA CCR model developed by Charnes et al. (1978). The results showed that the hotel performance was strongly influenced by inflation and the growth of demand in the tourism industry. The hotel performance is also positively affected by efficiency, location and affiliation with a particular hotel. Lado–Sestayo and Fernandez–Castro (2019) focussed their attention on the impact of the location on the efficiency of hotels. Efficiency obtained through DEA analysis was divided into the part attributable to the tourist destination location and to the part that can be attributed to the hotel specific factors with its location. For this purpose, four-staged DEA analysis was used in their study. The survey included 400 Spanish hotels located at 97 tourist destinations in 2011 to confirm the importance of the location on hotel efficiency. The average efficiency was calculated at the city level. The results showed that the average efficiencies of individual cities also differ within the region. Barcelona and Lloret de Mar were used as examples. Kularatne et al. (2019) analysed the technical efficiency of hotels in Sri Lanka and the impact of other external variables on this. DEA analysis with constant returns of scale (CRS) and variable returns to scale (VRS) models were used to analyse the technical efficiency. The sample selected 24 hotels (representing half the population of the group of hotels) in Sri Lanka between 2010 and 2014. The results showed that the efficiency of hotels varied in the period under review, increasing from 2010 to 2012 (the efficiency score from 55% to 68%), declining in 2013 and rising slowly again in 2014 to 65%. Sellers-Rubio and Casado-Díaz (2018) analysed the impact of external variables on the efficiency of Spanish hotels from 17 regions in the period between 2008 and 2016. The efficiency of the hotels was calculated not at the level of the hotels but at the level of each region. To determine efficiency, they used the double bootstrap method proposed by Simar and Wilson (2007). During the period, the efficiency score is fairly even with minimal variation. The lowest average efficiency score level was recorded in 2013. Parte–Esteban and Alberca–Oliver (2015) in the DEA analysis included a larger sample of 1385 Spanish hotels and a ten-year period between 2001 and 2010. The period considered covered two economic cycles, namely the prosperity period 2001–2006 and the recession period 2007–2010. Both the BCC model developed by Banker et al. (1984) and CCR model were used within the DEA analysis. The results showed that technical efficiency scores varied within the period under review, increasing until the beginning of the financial crisis (0.488 in 2001 and 0.52 in 2006) and decreasing thereafter (0.52 in 2006 and 0.50 in 2010). As we can see, the DEA method is very popular among researchers.

On the other hand, SFA is experiencing a rapid growth in its application only in the last decade. Shang et al. (2010) applied the Stochastic DEA (SDEA) as they looked at the effectiveness of Taiwanese hotels. The survey included 57 international hotels from 2005, 49 of which were located in cities and 8 in resorts. The results showed that hotels in Taiwan were generally not efficient according to the traditional DEA model and according to the SDEA model. Assaf and Tsionas (2018) have conducted one major survey in the field of SFA application. The survey included 613 hotels from the United States, Europe, the Middle East, and Asia between 2012 and 2016. In total, there were 3,065 observations. Their results showed that luxury hotels have outperformed all other hotel classes. They are operating at an average efficiency score of

97.64%. Second, hotels in the United States and Europe have the highest efficiency scores. Third, recognition was that resort hotels have the highest efficiency scores in the sample (average of 92.90%) and that full-service hotels have significantly higher efficiency scores (average of 92.36%) than limited-service hotels (average of 85.13%). Chatzimichael and Liasidou (2019) applied SFA and decomposed the total factor productivity in the hotel sector into components that can be attributed to changes in technical efficiency, scalar efficiency, and technological change. The survey used Eurostat data on 25 European countries between 2008 and 2015, which were divided into four geographical groups. The results showed that the Mediterranean and North-Western countries have the highest estimates of the efficiency scores of the hotel industry on average with 68.10% and 67.06%, respectively. They are followed by Scandinavia with 60.84% and the Central-Eastern geographical region with 48.07%. The latter performed the worst.

Over the years, both methods have had some extensions. One of the extensions of DEA is also the Malmquist Productivity Index, which is relatively under-represented in the literature. One of the first article with the application of this type of model is a study by Barros (2005). Using this method, he analysed the Portuguese hotel chain Enatur between 1999 and 2001. The results showed that most of the hotels recorded a decrease in the total factor productivity within the considered period. After breaking down the total factor productivity into the change in technical efficiency and the technological change, they concluded that the hotels recorded an efficient technical change and an inefficient technological change. With a slightly different Malmquist Productivity Index with bias correction, the productivity of hotel chains in the United Arabic Emirates, Saudi Arabia and Oman was studied by Assaf and Barros (2011). 31 hotel chains were included in their study between 2006 and 2008. The result showed that that a large proportion of Gulf hotel chains have experienced a decrease in total factor productivity over the period analysed. Amado et al. (2017) used the Malmquist Productivity Index to study 26 hotels belonging to the *Pousadas de Portugal hotel chain*. It is a balanced panel of 260 observations (26×10 years). The results showed that hotels were, on average, slightly more efficient in the post-privatisation period. The rate of technological change has also increased in the post-privatisation period. Walheer and Zhang (2018) applied a slightly different version of the Malmquist Productivity Index called Malmquist–Lanberger Index. They included 30 provinces in the period between 2005 and 2015. Their results showed an increase of the Lanberger Index for the analysed period. Only exceptions were the periods 2008–2010 and 2013–2015.

3. Methodology

Our research is based on a longer balanced panel data period applying the Malmquist Productivity Index. As in the case of DEA, we can choose between input or output orientation. In our case, we adopted input-oriented Malmquist Productivity Index. The first reason of this is that hotel companies have a greater opportunity for supervision and managerial decision-making processes on inputs. There were also several crisis periods with instabilities in tourist arrivals and overnight stays and the structure

between domestic and foreign tourists in Slovenia between 2000 and 2018. Therefore, in such periods of instabilities in tourist demand it makes sense to pay more attention to the minimisation in use of inputs. Most of the research in the literature for world branded tourist destinations has examined the hotel industry mainly from the point of profit maximisation (or output oriented) but only a minority through input minimisation, which is an additional reason why we chose the latter approach. In doing so, input oriented model indicates how much a firm can decrease its inputs for a given level of output. Unlike the DEA model, we do not need to predefine returns on scale in the method under consideration, since both VRS and CRS are necessary to define the Malmquist Productivity Index.

The Malmquist Productivity Index is calculated based on four distances for each individual hotel company in each year (Coelli et al., 2005). The distances refer to: first, the previous period CRS DEA frontier; second, the current period of the CRS DEA frontier; third, the next periods of the CRS DEA frontier; and finally, the current periods of the VRS DEA frontier. The Malmquist Productivity Index result is given in the form of a change in total factor productivity, which can be broken down into four components: first, Effch that refers to a change in technical efficiency (according to CRS technology), second, Techch that refers to technological change, third, Pech that refers to the change in pure technical efficiency (according to VRS technology), and finally, Sech that refers to the change in scalar efficiency.

In interpreting the results, it should also be noted that if the value in a given year is greater than 1 for an individual hotel company, it means that the hotel company is growing and, on the other side (result less than 1), it means that the hotel company is declining in total factor productivity. However, if the result is equal to 1, it means that total factor productivity is stagnant. In determining inputs and outputs, we are mainly following the literature. We selected the ones that appeared most often in the research and adapted them to our needs. Inputs that were included: labour costs (labour), costs of goods, materials and services (material input), other operating expenses and property, plant and equipment (capital). However, the only output that was identified: Net revenue from sales and other operating income. All data are recalculated at an annual level.

4. Data

For the purposes of this article, we use the hotel company level data that were obtained from the GVIN portal relating to the secondary financial statements already processed (balance sheets and profit and loss accounts). We have conducted our study using a balanced panel data that includes 20 hotel companies within a nineteen-year period ($20 \times 19 = 380$ observations) (Table 1). Malmquist Productivity Index calculates the change in total factor productivity so the first year (year 2000) is lost as an observation in a further analysis. Total calculated observations are $20 \times 18 = 360$. The selected hotel companies had to operate continuously throughout the whole period, which took a large number of them from the outset. In the final phase of cleaning the database, we decided to find out the outliers. To this end, we derived from certain assumptions that applied to both inputs and outputs:

Table 1. Presentation of the data sample of the hotel companies.

Company	Company size
1	Small
2	Small
3	Medium
4	Medium
5	Medium
6	Medium
7	Medium
8	Small
9	Large
10	Large
11	Medium
12	Large
13	Large
14	Medium
15	Large
16	Small
17	Medium
18	Large
19	Large
20	Micro

Source: Compiled by authors.

- First, regarding labour costs, they can be null and void from a regular employment as a hotel company can only hire seasonal workers who would not be misled by the labour costs section.
- Second, regarding costs of goods, materials and services, they should not or cannot be equal to zero as hotel companies purchase food, drink, materials for renovation/repair and other things they need to carry out their business activities. The hotel company cannot also have imbalances between the costs of materials, goods and services and revenues.
- Third, regarding property, plant and equipment they can be void in the event that a hotel company rents a building. Finally, regarding output as proceeds from sales and other sources, it cannot be equal to null and void as the hotel company would not operate in this case.

In view of these assumptions related to output and inputs, we have thus excluded from the database all hotel companies that did not show revenues (either from sales or other sources) on output side or did not show the cost of goods, materials and services on input side. In addition, we also excluded from the analysis all hotel companies that showed an excessive disproportion between revenues and costs of goods, materials and services, as in this case there is a reasonable suspicion that the hotel company obtains its revenues from other sources (e.g., sale of fixed assets) and not from the primary hotel business activities.

Based on the set assumption criteria from the company accounts we selected 20 hotel companies. The balanced panel dataset contains both micro and small, medium and large hotel companies. Before the analysis, the data had to be deflated. For this purpose, we selected the Consumer Price Index or the CPI for the group of restaurants and hotels with the base year 2015 (2015 = 100). The source of CPI data is the

Statistical Office of the Republic of Slovenia. This data deflation procedure is necessary in the panel data over time to eliminate the impact of inflation or price growth.

In the second column there is the classification of the hotel company size. The classification is used from portal of the *Agency of the Republic of Slovenia for Public Legal Records and Related Services* (AJPES). In order that a company belongs to a certain classification, it must meet (at least) two of the following criteria:

- Micro: the average number of employees in the financial year does not exceed ten, net sales revenues do not exceed 700,000 euros, or the value of assets does not exceed 350,000 euros.
- Small: the average number of employees in the financial year does not exceed 50, net sales revenues do not exceed EUR 8,000,000, or the value of assets does not exceed 4,000,000 euros.
- Medium: the average number of employees in the financial year does not exceed 250, net sales revenues do not exceed 40,000,000 euros, or the value of assets does not exceed 20,000,000 euros.
- Large: it is a company that is not a micro, small or medium-sized company according to the above criteria. Large companies include public interest entities, the stock exchange and companies that have to prepare a consolidated annual report.

5. Results

Between 2001 and 2018, the average score of total factor productivity decreased by 0.2% (Table 2). The main reason for this decline was mainly deterioration in the technological change, which decreased by 0.3%. On the other hand, within the period, enterprises recorded a 0.1% increase in the average score of technical efficiency. It should also be noted that hotel companies recorded a 0.1% increase within the average change in pure technical efficiency and stagnated in a change in scale efficiency. It should also be noted that in only seven years the hotel companies recorded a growth in the average score of total factor productivity and in the remaining ten a decline. The highest average growth of total factor productivity was achieved by hotel companies in the third year, i.e., 2002, reaching 14.8%. On the other hand, hotel companies recorded the highest decrease of total factor productivity in the ninth year, i.e., 2008, where it was 7.3%.

Looking at the average scores of total factor productivity at hotel company level, we can see that, within the period considered, as many as eight hotel companies were associated with growth in total factor productivity and twelve with it decrees (Table 3). The eighth company performed the best between 2001 and 2018, recording an average growth of 3.4% in total factor productivity. This result was due to 0.6% growth within the change in technical efficiency, 2.8% growth within technological changes and 0.6% growth within the change in pure technical efficiency. The company has stagnated in a change in scalar efficiency. The 15th hotel company, on the other hand, fared the worst, with a 3.7% decline in total factor productivity. This decline resulted from a decrease in technical efficiency by 2.6%, a decrease in

Table 2. Malmquist Productivity Index summary of annual means.

Year	Effch	Techch	Pitch	Sech	Tfpch
2001	0.815	1.232	0.936	0.871	1.004
2002	1.231	0.933	1.069	1.151	1.148
2003	0.995	0.939	1.015	0.980	0.934
2004	1.034	1.007	1.012	1.022	1.041
2005	1.032	0.957	1.017	1.015	0.988
2006	0.899	1.111	0.924	0.973	0.999
2007	1.068	0.924	1.088	0.982	0.988
2008	1.006	0.922	0.996	1.009	0.927
2009	1.016	0.956	0.984	1.032	0.971
2010	1.022	0.941	1.018	1.004	0.962
2011	1.015	1.023	1.014	1.001	1.038
2012	0.994	0.990	0.996	0.998	0.984
2013	0.989	0.963	0.999	0.990	0.953
2014	0.992	1.036	0.992	1.000	1.028
2015	1.018	0.988	0.999	1.019	1.006
2016	0.981	1.055	0.985	0.995	1.034
2017	0.977	0.966	0.999	0.978	0.944
2018	0.986	1.060	0.985	1.000	1.045
Mean 2001–2018	1.001	0.997	1.001	1.000	0.998

Source: Authors' estimations.

Table 3. Malmquist Productivity Index summary of the hotel companies means.

Hotel company	Effch	Techch	Pitch	Sech	Tfpch
1	1.015	0.992	1.015	1.000	1.007
2	0.993	1.013	0.993	1.000	1.005
3	1.004	1.018	1.006	0.998	1.022
4	1.019	0.995	1.019	1.000	1.015
5	1.001	0.993	1.003	0.998	0.994
6	0.985	0.985	0.987	0.998	0.970
7	1.000	0.992	1.004	0.996	0.993
8	1.006	1.028	1.006	1.000	1.034
9	0.997	1.000	0.993	1.003	0.997
10	1.000	0.996	1.003	0.998	0.997
11	1.000	0.986	1.000	1.000	0.986
12	0.999	0.989	1.010	0.990	0.988
13	0.992	0.992	1.000	0.992	0.984
14	0.999	0.995	0.999	1.000	0.994
15	0.974	0.988	0.975	1.000	0.963
16	1.025	0.997	1.000	1.025	1.022
17	1.007	0.997	1.006	1.000	1.004
18	1.000	1.002	1.000	1.000	1.002
19	1.000	0.998	1.000	1.000	0.998
20	1.000	0.994	1.000	1.000	0.994
Mean of hotel companies from 1 to 20	1.001	0.997	1.001	1.000	0.998

Source: Authors' estimations.

technological changes by 1.2% and a decrease in pure technical efficiency by 2.5%. The score of the change in scalar efficiency stagnated.

The eight-hotel company thus advanced in all aspects of total factor productivity, whilst the latter 15th one declined.

6. Discussion and implications

The efficiency of the Slovenian hotel companies is analysed through the Malmquist Productivity Index, which allows to break down the total factor productivity into the

change in technical efficiency and on the technological change. We can also break down the change in technical efficiency into a change in pure technical efficiency and on scalar efficiency.

The results showed that, on average, hotel companies recorded a decline in total factor productivity during the period considered, which is largely attributable to the inability to implement new production technologies. Technological change is defined by the upward or downward shift of production function and is mainly due to innovations that occur in the hospitality industry. The upward shift reflects technological improvement, and the downward shift is a negative change in technology. As we can see in Table 2, between 2008 and 2010, the negative shift in production function was mainly influenced by the global economic crisis. Within these three years, hotel companies recorded positive efficiency growth and negative growth in technological change. The large increase in tourist arrivals and overnight stays in Slovenia had a positive impact on the upward shift of the production frontier curve, which is reflected between 2014 and 2018. Overall, hotel companies recorded growth in total factor productivity, which was mostly due to a change in technical efficiency. If we break down the change in technical efficiency, we come to interesting insights. Between 2001 and 2018, hotel companies recorded on average growth in pure technical efficiency and stagnation in scalar efficiency. The improvement in pure technical efficiency reveals that there were investments in organisational factor associated with hotel management, such as marketing initiatives, improvement in quality, achievement of a better balance between inputs and outputs (Barros, 2005). On the other hand, on average stagnating scalar efficiency suggests that there have been no significant optimisations or changes in the size of hotel companies. On average, no hotel company was large enough to take advantage of economies of scale.

One potential source of inefficiencies could be seasonality, which is recorded throughout the hotel industry in the period considered. Most overnight stays are in the spring and summer months, while the autumn and winter months are poorly occupied. Some hotels are even closed during certain winter months. Certain hotel companies in the capital of Ljubljana are partial excluded out of seasonality due mainly to congress and business tourism, but nevertheless they are also exposed to the consequences of the seasonality phenomenon. Easing seasonality would certainly help to improve overall total factor productivity to some extent.

In our case, the analysis has focussed on reducing inputs to achieve the given level of output. The output largely consists of the sum of revenues from sales and to a lesser extent other operating revenues. Except for certain tourist supplies such as the coastal sun, sea, and sand tourism, and health resorts, Slovenia is not considered as a country with a mass tourism. Attention is given to boutique tourism development, in which tourist companies in their activities aim to integrate the guest experience. Typical examples are the natural beauties with world recognised natural attractions and the local gastronomic offers as potential sources and drivers of the competitive advantage of the Slovenian tourist destinations. Boutique tourism for hotel companies can bring the possibility of setting higher prices for higher quality of tourist offers as the guest is willing to pay more for a higher quality of overall experiences. Higher prices with the same amounts of tourist arrivals and overnight stays would contribute

to a higher added value of the output, which would consequently affect the higher value of TFP. However, the heterogeneity in quality of tourist offers is also present between the Slovenian tourist destinations. While there is a tendency to increase the quality of tourists offers through different innovative approaches, two destinations in Slovenia have inherited mass tourism development characteristics. At the first glance these are the Slovenian coastal and health resorts, which due to a lack of quality competition cannot set higher competitive premium prices. In the case of coastal tourism there are strong competitive pressures that can be observed from the Adriatic coastal destinations, particularly from neighbouring –Croatia (Gričar et al., 2021a, 2021b), and in the case of health tourism there are also competitive pressures from other Central European countries such as Hungary. Therefore, when a competitive premium price due to a lack of quality competition is not possible to achieve, output could be increased through the increase in quantity of sales by exploiting economies of scale to potentially achieve higher TFP.

Our results are consistent with some previous research for hotels or hotel companies in some other countries or tourist destinations that deal with a shorter period and largely applied output-oriented Malmquist Productivity Index. Using similar methodological approach, Barros and Alves (2004) and Barros (2005) estimated the Malmquist Productivity Index that on average is lower than 1 suggesting a decrease in total factor productivity within the analysed periods. These results are in line with our findings. However, there have been some differences in technological change and a change in technical efficiency. Both comparative surveys by Barros and Alves (2004) and Barros (2005) recorded results that are on average less than one, as opposed to ours, where on average we recorded growth in the change in technical efficiency and a decline in technological changes within the period considered. The decomposition of change in technical efficiency into a change in the scalar and a change in pure technical efficiency shows some striking differences. Both Barros (2005) and Barros and Alves (2004) present the results as they record on average growth in scalar efficiency and a decline in pure technical efficiency within the period considered. Our results differ as we have recorded on average growth in pure technical and stagnation in scalar efficiency.

There are only a few conducted studies in Slovenia regarding the efficiency of Slovenian hotels. Assafa and Cvelbar (2010) were one of the first to do so through the DEA analysis. The survey included the 24 largest Slovenian hotels in the period between 2005 and 2007. The results showed the increase of efficiency within the period analysed, as well as the number of years in business, the number of stars, and hotel size have a positive impact on it. In addition, they provided a study of efficiency within SFA analysis estimating the impact of different factors on hotel efficiency. They included 23 largest Slovenian hotels in the period between 2004 and 2008 (Assaf and Cvelbar 2011). The results show that hotel efficiency is positively related to privatisation and international attractiveness, and negatively related to longer management tenure. On the other hand, there is no significant link between market competition and hotel efficiency. One of the recent study's is provided by Frančeškin and Bojnec (2021) on the economic efficiency of the hotel

companies located on the Slovenian coast. They included 16 hotel companies between the years 2015 and 2018. The results showed that most of the hotel companies were economically inefficient and associated with decreasing returns to scale. They also failed to confirm the thesis that location and economic growth affect economic efficiency.

7. Conclusion

The article contributes novel empirical results and findings on total factor productivity and its decomposition for the Slovenian hotel companies using the balanced panel data for the eighteen years period. The crucial finding is that during the analysed period 2001-2008 total factor productivity has not increased but stagnated or even declined. This suggests that transformation of the Slovenian hotel companies has lacked a significant improvement in each of four its components. Whilst a change in technical efficiency, including in pure technical efficiency and in scalar efficiency has remained at similar level, as a striking finding is the decline in technological change. Therefore, among the issues for the research in future is to investigate the reasons for its decline either due to a lack of investments to implement new production technologies or enabling macro-economic and sectoral environment such as instabilities in demand due to economic crises and presence of the contained seasonality throughout the tourism industry.

Among the study limitations, they relate to the accessibility and structure of data that was obtained from the GVIN company accounts portal. The data are available at the level of hotel companies (and not at individual hotels) to which the main profit-making activity is related to sales of hotel accommodations. It has been identified that some hotel companies have also other accommodation establishments in their portfolio, which represented a minor share. However, it would be difficult to obtain and compile data at the level of an individual hotel within the hotel companies mainly because of the length of the period and their ownership and organisational transformation. It should also be pointed out that the hotel companies included in the sample have changed their structures over time such as due to divestment of certain hotels or purchase of new hotels, which is not specifically misled in the long-term panel dataset. As a limitation, we can also highlight the selection of inputs-oriented vis-à-vis output-oriented estimation approach that were primarily selected based on a literature review and the data availability.

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

Štefan Bojnec http://orcid.org/0000-0002-1270-6372

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