Analyzing the Efficiency of Travel and Tourism in the European Union

Petra Barišić and Violeta Cvetkoska

Abstract As one of the world's largest and growing economic sectors, travel and tourism significantly contributes to GDP, creates jobs, drives exports, and generates prosperity across the world. Therefore, it is essential to know which countries successfully manage their travel and tourism, and can serve as an example for the others. The aim of the paper is to analyze the efficiency of travel and tourism impact on the GDP and employment in the European Union at the macro level, by using the nonparametric approach data envelopment analysis. All 28 member states of the European Union were included in the research. The observation period was one year (2017). Two inputs and two outputs were selected. Internal travel and tourism consumption and capital investment were the inputs, while travel and tourism's total contribution to GDP and employment were the outputs. The obtained results are presented, interpreted and there are recommendations given for the tourism policymakers regarding making better decisions.

Keywords Operational research · DEA · Decision-making unit · Efficiency analysis · European union · Travel and tourism

1 Introduction

In terms of ever-increasing consumer demand, growing competitiveness, rapid changes in technology, limited resources, and pressures associated with the only irreversible resource—time, it is very difficult to make good decisions. The discipline of Operational Research (OR) helps those who lead organizations to make

P. Barišić
Faculty of Economics & Business, University of Zagreb, Zagreb, Croatia
e-mail: barisic@efzg.hr

V. Cvetkoska (✉)
Faculty of Economics – Skopje, Ss. Cyril and Methodius University in Skopje, Skopje, Republic of Macedonia
e-mail: vcvetkoska@eccf.ukim.edu.mk

N. Mladenović et al. (eds.), *Advances in Operational Research in the Balkans*, Springer Proceedings in Business and Economics,
https://doi.org/10.1007/978-3-030-21990-1_10

better decisions by applying advanced analytical methods (Williams 2008, p. 3). Assignment, data mining, financial decision-making, forecasting, logistics, marketing, tourism, networks, optimization, project planning and management, queuing, simulation, transportation, etc., are some of the decision areas where the powerful discipline of OR is applied (Cvetkoska 2016, p. 350).

One of the leading areas of the discipline of Operational Research is the non-parametric methodology for measuring the efficiency of entities, known as Data Envelopment Analysis (DEA). It has been introduced into OR literature by Charnes et al. (1978), and it was created as an extension of Farell's methods of measuring efficiency (Farell 1957).

Since travel and tourism represent an important economic activity in most countries around the world (WTTC 2017, p. 2), the measurement of efficiency in the tourism industry has been the area of a considerable amount of research in recent years, reflecting both the growing economic importance of tourism as a source of international revenue and domestic employment, and increasing competition in the global tourist markets around the world (Hadad et al. 2012). These days the tourism sector accounts for 10% of the world GDP, 7% of the global trade, and 1 in 10 jobs (UNWTO 2017a, p. 6). The importance of tourism for Europe is even greater; in 2016 Europe remained the most visited region in the world. The 28 European Union countries had 500.1 million tourist arrivals (40.5% of the world international tourist arrivals), and 376.6 US$ bn. (30.9%) international tourist receipts (UNWTO 2017b). Forecasts are moving in the direction that the European continent, within the next 20 years, will be the most evident source of tourist demand for the development of international tourism on a global scale (Metodijeski and Temelkov 2014, p. 239).

Due to its economic and employment potential, as well as its social and environmental implications (Obadic and Pehar 2016, p. 44), increasing the efficiency in tourism is essential, leading to increasing efficient programs and faster achievement of goals. Therefore, the main purpose of this paper is to identify which countries in EU-28 efficiently use their resources, and show the relative efficiency of their travel and tourism impact on the GDP and employment. For this purpose, the latest available data is used in the field of tourism. The data have been analyzed by DEA methodology with the selection of two inputs and two outputs.

The paper is organized as follows. The next section describes the importance of the travel and tourism industry in the EU. A description of DEA methodology can be found in the third section. DEA in tourism is presented in section four, followed by the model and data employed in the research. The sixth section presents the results and analysis, and at the end is given the conclusion.

2 The Importance of Travel and Tourism for the European Union

Tourism plays a major role in the EU economy. According to the European Commission, it is the third largest socioeconomic activity in the EU (after the trade and distribution, and construction sectors), and has an overall positive impact on economic growth and employment (Juul 2015, p. 5; Obadic and Pehar 2016, p. 43), as well on the export revenues and infrastructure development (UNWTO 2017b, p. 2). Tourism also contributes to the development of European regions and, if sustainable, helps to preserve and enhance cultural and natural heritage (Juul 2015, p. 5). Accordingly, Europe is the world's leading tourism destination receiving half of the world's international tourist arrivals (1.3 billion). In 2017, international tourism in Europe grew 8%, one percentage point above the world average, totaling 671 million tourists (UNWTO 2018). Geographically, a growing number of tourists travelling to the EU come from emerging countries, although EU source markets still provide the biggest share of tourists to EU destinations. The second biggest group comes from Europe outside the EU, the third from the Americas, and the fourth from Asia and the Pacific (UNWTO 2014, p. 25).

With its comparatively short distances and good infrastructure (UNWTO 2014, p. 4), and its borderless travel area within the Schengen zone (Juul 2015, p. 5), travel in the EU-28 is characterized by more frequent but shorter trips (UNWTO 2014, p. 4). The new EU Tourism Policy Priority Actions include joint promotion of Europe as one tourist destination in third countries' market and it even consists of 28 countries that all have different tourist products and are competitors on the international tourism market.

In 2016, the direct contribution of travel and tourism to the GDP was EUR 547.9bn (3.7% of total GDP), while its total contribution was EUR 1,508.4bn (10.2% of GDP). The total contribution of travel and tourism to GDP is nearly three times greater than its direct contribution. In EU-28 travel and tourism investment in 2016 was EUR 143.0bn, or 4.9% of the total investment. It should rise by 2.8% over the next ten years. In the long term, growth of the travel and tourism sector will continue to be strong as long as the investment and development take place in an open and sustainable manner (WTTC 2017).

In 2014, one in ten enterprises in the European nonfinancial business economy belonged to the tourism industries. These 2.3 million enterprises employed an estimated 12.3 million persons (Eurostat 2018). According to the WTTC (2017, p. 1) in EU-28 in 2016 travel and tourism directly supported 11.4 million jobs (5.0% of total employment)—a direct contribution to employment. Its total contribution to employment, including jobs indirectly supported by the industry, was 11.6% of the total employment (26.6 million jobs). Over the next 10 years, tourism can create more than 5 million new jobs, not least because the number of tourists is set to double to more than 2 billion. Through the growth of tourism, we can offer real prospects for the new generations and boost strategic sectors of the economy, such as transport,

Table 1 World ranking of EU countries by the number of tourist arrivals in 2015

Rank	Country	Tourist arrivals (in million)
1	France	84.5
3	Spain	68.5
5	Italy	50.7
8	The United Kingdom	34.4
12	Austria	26.7
15	Greece	23.6
20	Poland	16.7
22	The Netherlands	15.0
25	Croatia	12.7
28	Denmark	10.4
32	Portugal	10.0
33	Ireland	9.5
34	Romania	9.3
39	Belgium	8.4
42	Bulgaria	7.1
43	Sweden	6.5
55	Hungary	4.9
67	Estonia	3.0
72	Slovenia	2.7
75	Finland	2.6
78	Lithuania	2.1
81	Latvia	2.0
87	Slovak Republic	1.7
108	Luxembourg	1.1

Source Index Mundi (2015); UNWTO (2017a, p. 13)

trade, luxury goods, shipbuilding, construction, agri-foodstuffs and the cultural and creative industries (UNWTO 2018).

If we analyze the world rank of EU countries by the number of reported tourist arrivals, in 2015 France was in the first place, Spain was in the third place, and Italy was 5th (UNWTO 2017a, pp. 13). Index Mundi (2015) provides the data for 24 EU countries, and they are given in Table 1.

In 2016, Northern Europe led the growth in the region, with a 6% increase in international arrivals, or 5 million more than in 2015. Norway, Ireland and Sweden all boasted above-average growth. The United Kingdom, the subregion's largest destination, reported a comparatively modest growth, despite the weaker British pound. In Central and Eastern Europe, arrivals increased by 4% in 2016. Many destinations enjoyed strong results, including Slovakia, Bulgaria, Romania, and Lithuania. Hun-

Table 2 EU countries by increase in international tourist arrivals in 2016

Country	Increase (in %)
Cyprus	+20
Slovakia	+17
Bulgaria	+16
Portugal	+13
Norway	+12
Ireland	+11
Romania	+11
Lithuania	+11
Malta	+10
Spain	+10
Croatia	+9
Sweden	+8
Hungary	+7
Greece	+5
The Netherlands	+5
Austria	+5
The United Kingdom	+4
Poland	+4
The Czech Republic	+4
Italy	+3
Germany	+2
France	−2
Belgium	−10

Source UNWTO 2017b, p. 7

gary recorded a 7% growth in arrivals, while Poland and the Czech Republic both reported an increase of 4%. Growth in Southern and Mediterranean Europe (+1%) was modest, despite sound results in most countries, driven by Cyprus, Portugal, Malta, the top destination of Spain and Croatia. Greece reported a 5% increase in arrivals and Italy 3%. Results in Western Europe (0%) were rather mixed in 2016, as some destinations were impacted by security concerns. The Netherlands and Austria both reported a 5% growth in arrivals, and Germany a 2% growth. The world's top tourism destination, France, faced the aftermath of security incidents, as did Belgium (Table 2) (UNWTO 2017b, p. 7).

Spain was the most common tourist destination in the EU for nonresidents, with 295 million nights spent in tourist accommodation establishments, or 22.2% of the EU-28 total in 2016. Followed by Italy (199 million nights), France (124 million nights) and the United Kingdom (119 million nights), which together accounted for more than half (55.7%) of the total nights spent by nonresidents in the EU-28. The

Table 3 Top 5 EU-28 countries by the number of beds in 2016

Rank	Country
1	France
2	Italy
3	The United Kingdom
4	Spain
5	Germany

Source Eurostat (2018)

Table 4 Top 3 EU-28 countries by the ratio of travel receipts to GDP in 2016

Rank	Country	Ratio (in %)
1	Croatia	18.6
2	Cyprus	13.7
3	Malta	13.2

Source Eurostat (2018)

Table 5 Top 5 EU-28 countries by the highest international travel receipts in 2016

Rank	Country	In billion EUR
1	Spain	54.7
2	France	38.3
3	The United Kingdom	37.4
4	Italy	36.4
5	Germany	33.8

Source Eurostat (2018)

least common destinations were Luxembourg and Latvia; the effect of the size of these member states should be considered when interpreting these values. The number of nights spent (by residents and nonresidents) can be put into perspective by making a comparison with the size of each country in population terms, providing an indicator of the tourism intensity. In 2016, using this measure, the Mediterranean destinations of Malta, Croatia, and Cyprus, as well as the alpine and city destinations of Austria were the most popular tourist destinations in the EU-28 (Eurostat 2018).

If we look the number of all the beds in the EU-28, in 2016 nearly one third were concentrated in just two of the EU member states, namely France (5.1 million beds) and Italy (4.9 million beds), followed by the United Kingdom, Spain, and Germany (Table 3). In 2016, the ratio of travel receipts to GDP was highest, among the EU member states, in Croatia, Cyprus, and Malta, confirming the importance of tourism to these countries (Table 4). In absolute terms, the highest international travel receipts in 2016 were recorded in Spain, France, and the United Kingdom, followed by Italy and Germany (Table 5) (Eurostat 2018).

3 DEA Methodology

One of the most important principles in the operation of organizations is efficiency. Efficiency refers to the relationship between the input and the output, i.e., using the minimum resources (human, organizational, financial, material, physical) to produce the desired production volume (Suklev 2016, p. 4). If a higher level of output is obtained, and the same level of input is used, or the same output level is obtained, and a lower input level is used, then the efficiency has increased.

There are two approaches in the literature for measuring the efficiency of the entities: the parametric or econometric approach, and the nonparametric or the mathematical programming approach (Cvetkoska and Savic 2017 p. 318). This paper uses the nonparametric approach, more precisely data envelopment analysis, and for the parametric approach, see Greene (1993, pp. 68–119).

Data envelopment analysis is placed on a pedestal for measuring the efficiency of organizations that use multiple inputs in order to produce multiple outputs (Cvetkoska 2017, p. 9). Entities whose efficiency is measured using DEA should be homogeneous, i.e., they should use the same inputs to produce the same outputs, and they are known in DEA terminology as decision-making units (DMUs).

DEA is categorized as a nonparametric approach because the analytic form of the production function does not require a priori assumption (Naumovska and Cvetkoska 2016). The efficiency measure given by this methodology is relative because it depends on the involved units in the analysis (what they are, and what their number is), as well as from the input and output variables (their number and structure) (Popovic 2006).

Data envelopment analysis is a mathematical programming technique that can determine whether the decision-making units are relatively efficient (which form the efficiency frontier) or relatively inefficient. For one decision-making unit to be efficient, according to Charnes et al. (1978, p. 439), the following two conditions need not be met: (1) any output can be increased without increasing any input and without reducing any remaining output; (2) any input can be reduced without reducing any output and without increasing any remaining input.

With DEA, it can be determined how much a certain input should be reduced and/or increased, thus obtaining valuable information that will help the inefficient entities to improve efficiency and become efficient.

The basic DEA models are: the Charnes-Cooper-Rhodes (CCR) model that assumes constant returns to scale (CRS) and the Banker-Charnes-Cooper (BCC) model assuming variable returns to scale (VRS). If the increase in the inputs of the observed unit results in a proportional increase in the outputs, it is about constant returns to scale. Variable returns to scale is when the increase in the inputs of the observed unit does not necessarily result in a proportional change in the outputs.

The CCR model measures the overall technical efficiency (TE) of the unit and the efficiency frontier given by this model is in the form of a convex cone. The efficiency of this model includes both pure technical efficiency (PTE) and scale efficiency (SE). The BCC model measures pure technical efficiency, and the efficiency frontier is in a form of convex hull. When using the BCC model, a DMU is compared only to those DMUs that have a similar scale, which means that the impact on the scale on operation is not taken into account. When the measure of the efficiency given by the CCR model is divided by the efficiency of the BCC model, the scale efficiency is obtained. With the basic DEA models the DMUs that are identified as relatively inefficient can be ranked, while for ranking the efficient DMUs, see Andersen and Petersen (1993). In addition, there are developed DEA models with a non-convex efficiency frontier, models that enable efficiency assessment when any of the inputs and outputs are exogenous or of a categorical nature, weight restriction models, models that allow productivity analysis, monitoring efficiency through time, etc., details can be found in Cooper et al. (2007).

According to the orientation, the models can be: input-oriented, output-oriented or non-oriented. If the purpose of the model is to minimize inputs to achieve the given output level, that model is input-oriented, and an inefficient unit can become efficient by reducing inputs. In the case when the purpose of the model is to maximize outputs at a given input level, the model is output-oriented, and an inefficient unit can become efficient by appropriately increasing outputs. The model in which simultaneously inputs are reduced and outputs are increased for the DMU to become efficient is known as the non-oriented model.

To solve the DEA models, a number of software tools have been developed to enable the results to be obtained quickly and to devote most of the time to their adequate interpretation.

Even though the initial application of DEA in 1978 was in the nonprofit sector (to measure the efficiency of a set of school districts), it is successfully applied in the profit sector. For a collection of DEA applications, see Charnes et al. (1994), while Sherman and Zhu (2006) use DEA to improve service performance (Cook and Zhu 2008, p. 22).

In the area of DEA, there are several references: Emrouznejad and Thanassoulis (1996a, b, 1997), Seiford (1994, 1997), Tavares (2002), Gattoufi et al. (2004a, b), Emrouznejad et al. (2008), and Emrouznejad and Yang (2018).

The bibliography of DEA published in 2008 (Emrouznejad et al. 2008) includes over 4.000 research papers since its introduction up to 2007; there have been identified 2.500 different authors, and an interesting fact is that 22% of all articles were written by 12 authors, and the largest number of articles in peer-reviewed journals have been published in 2004 (Cvetkoska 2017, p. 17).

Emrouznejad and Yang (2018) give a full list of DEA publications (there have been included 10.300 DEA related articles published in journals) from 1978 to the end of 2016. In each of the last three observed years (2014, 2015 and 2016), about 1.000 papers were published. The greatest number of the analyzed DEA related articles have been published in the following journals: *European Journal of Operational Research* (691 articles), *Journal of the Operational Research Society* (281 articles), *Journal of Productivity Analysis* (255 articles), and *Omega* (237 articles). The first choice journal for DEA articles with applications in the public sector is identified as *Socio-Economic Planning Sciences*. In the analyzed DEA articles, there have been found approximately 11.961 distinct authors and 25.137 distinct key words. Most of the articles have 4 or less than 4 authors (about 94%). The most popular key words are: data envelopment analysis, data envelopment analysis (DEA), DEA or DEA models (9.989), efficiency (2.382), decision-making (1.048), technical efficiency (876), linear programming (722), and productivity (722). The main fields of current studies are: environmental efficiency and directional distance function (DDF), network DEA, benchmarking, bootstrap or bootstrapping, and returns to scale (including scale efficiency). The most popular application areas are: energy, industry, banking, education, and healthcare, including hospitals. The greatest number of journal articles in 2015 and 2016 are in the following 5 application fields of DEA: agriculture, banking, supply chain, transportation, and public policy.

In the section that follows special attention is given to the application of the DEA in the tourism industry.

4 DEA in Travel and Tourism

The majority of research that deals with the DEA in tourism is focused on the efficiency measurements of micro-units (Hadad et al. 2012, p. 931), like hotels, tour operators and destination websites. Sigala (2004) applied DEA for measuring and benchmarking hotel productivity, as well as Poldrugovac et al. (2016). The obtained results present a high average efficiency, but not all hotels performed at their maximum efficiency. Aside from this, there was found to be a significant relationship between the size and hotel efficiency. Barros (2005) and Barros and Mascarenhas (2005) measured the efficiency of hotels that belong to the Pousadas de Portugal (a Portuguese state-owned chain). Oliveira et al. (2013) benchmarked the efficiency and its determinants in Portuguese hotels in the Algarve. The results showed that the number of hotel stars is an important factor for performance. Assaf (2012) measured the efficiency of leading hotels and tour operators in the Asia Pacific region. This paper introduces an innovative methodology that combines data envelopment analysis and stochastic frontier analysis (SFA) in a Bayes framework. Regarding both tour operators and hotel companies, the most efficient were Australia, Singapore, and South Korea. It was also found that international hotels have a slightly higher efficiency in comparison with local hotels. The efficiency of tourism destination websites has been obtained by using the nonparametric methodology DEA by Alzua-Sorzabala et al. (2015).

Liu et al. (2017) evaluate the tourism eco-efficiency of 53 Chinese coastal cities. The observed period was 2003–2013 and they applied a DEA-Tobit model. The overall tourism eco-efficiency of the analyzed cities was 0.860. Man and Zhang (2015), by using DEA, analyze the factors that influence the efficiency of the urban tourism industry. Their research was conducted in China. Yi and Liang (2014) analyze the tourism efficiency of 21 cities in the Guangdong Province, China, by using seven-year panel data. In the research they applied DEA and the Malmquist Index (MI) and they discussed evolutional models based on DEA and MI. According to the obtained results, it has been found that the Guangdong Province as a whole has a relatively high tourism efficiency; a trend of improvement in the efficiency in tourism was noted by MI; a quadrant chart was constructed, where the DMUs (cities) were classified in 4 categories; and the following 4 evolutional models of tourism efficiency were identified: stable, reciprocating, progressive, and radical.

There are few studies that have been using DEA in tourism and travel at the macro level. One of the first research includes Fuchs (2004) research, which applies DEA for benchmarking the relative efficiency of tourism service processes on the level of tourism destinations. Wöber (2008) applies DEA for measuring and evaluating the performance of travel and tourism. Hadad et al. (2012) analyze the efficiency of the tourism industry by using DEA. Their sample consists of 105 countries (34 developed and 71 developing countries). Cvetkoska and Barisic (2014) measure the tourism efficiency of 15 European countries. The sample consists of: Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, the Czech Republic, France, Greece, Italy, Macedonia, Montenegro, Portugal, Serbia, Slovenia, and Spain. The observed period was 10 years (from 2004 to 2013). As input factors, the following were selected: visitor exports and domestic travel and tourism spending, while as outputs the following were selected: travel and tourism's total contribution to GDP, and travel and tourism's total contribution to employment. The DEA technique window analysis was used. Based on the obtained results, it was found that there is no country that is efficient in every year in every window; 10 of the 15 countries show efficiency results (overall efficiency by years) over 95%: Italy (99.67%), Cyprus (99.64%), France (98.99%), Spain (98.99%), etc., while Montenegro showed the lowest overall efficiency (by years) (71.53%). The highest efficiency results were achieved in 2004, and the lowest in 2011.

Abad and Kongmanwatana (2015), through DEA, measured the performance of 27 EU countries (excluding Malta) based on the position of destination management organizations, while Corne (2015) benchmarked the effects of tourism in France by the DEA model. The results show that there is potential to improve the efficiency of the tourism sector in France, and budgets and hotel groups were more efficient than others. Cvetkoska and Barisic (2017) analyze the relative efficiency of the tourism industry in the Balkans. The sample consists of 11 countries (Albania, Bosnia, and Herzegovina, Bulgaria, Croatia, Greece, Macedonia, Montenegro, Romania, Serbia, Slovenia, and Turkey). The covered period was 6 years (from 2010 to 2015). As input and output factors, the same ones were selected as in Cvetkoska and Barisic (2014). The DEA technique window analysis was used, and according to the obtained results (overall efficiency by years), Albania, Croatia, Romania, and Turkey were identified as the most efficient countries, while Montenegro, Serbia, and Bosnia and Herzegovina were found to be the least efficient. The tourism industry in the Balkans in the observed period has shown the average efficiency of 93.42%. The highest average efficiency of the tourism industry was achieved in 2013 (95.44%), and the lowest in 2011 (91.77%). Martin et al. (2017) went a step further: they created a composite index of the travel and tourism competitiveness in order to rank a sample that consists of 139 countries worldwide. Their method is based on the virtual efficiency data envelopment analysis model.

5 Model and Data

The BCC model was introduced by Banker et al. (1984). The envelopment form of the output-oriented BCC model is given in (1)–(5), (Cooper et al. 2007, p. 93; Cvetkoska and Barisic 2014, p. 79, and Cvetkoska and Barisic 2017, pp. 33–34):

$$(BCC - O_o) \quad \max_{\eta_B, \lambda} \eta_B \tag{1}$$

$$\text{subject to} \quad X\lambda \leq x_o \tag{2}$$

$$\eta_B y_o - Y\lambda \leq 0 \tag{3}$$

$$e\lambda = 1 \tag{4}$$

$$\lambda \geq 0 \tag{5}$$

where η_B is scalar. The input data for DMUj ($j = 1,\ldots,n$) are ($x_{1j}, x_{2j},\ldots,x_{mj}$), and the output data are ($y_{1j}, y_{2j},\ldots,y_{sj}$); the data set is given by two matrices X and Y, where X is the input data matrix, and Y is the output data matrix, λ is a column vector and all its elements are nonnegative, while e is a row vector and all its elements are equal to 1 (Cooper et al. 2007, p. 22, pp. 91–92). BCC-efficient DMUs are those that form the efficiency frontier and their efficiency result is 1 (100%). More details about the BCC DEA model can be found in: Banker et al. (1984) and Cooper et al. (2007, pp. 90–94).

To measure the efficiency of the travel and tourism industry in the European Union, there have been selected two inputs and two outputs, which all represent economic impacts of tourism. The following are selected as inputs: internal travel and tourism consumption (input 1) and capital investment (input 2), while as outputs the following were selected: travel and tourism's total contribution to GDP (output 1) and travel and tourism's total contribution to employment (output 2).

Input 1, internal travel and tourism consumption is a starting point for all tourism economic impacts (Cavlek et al. 2011, p. 310). It can be defined as part of the national income, i.e., personal consumption, which the population allocates for travelling (Bogoev 1975, p. 1409). It is one of the freest and most independent forms of personal consumption, since its implementation in most cases is not conditioned by time, lifestyle, business, organization or any other form of coercion. The moment when tourism consumption is realized, it becomes an economic category that is the ultimate result of the interaction of two poles of tourism market (Cavlek et al. 2011) (the supply and demand side of market).

Input 2. Tourism is a highly capital intensive sector. Different types of capital investments should be implemented so that the tourism system can function successfully. Without airports, highways, parking places, or luxury hotels and resorts not a single tourist destination can survive on the international tourism market. Given that, capital investments in tourism play a role in redistribution of capital, and serve as part of a country's macroeconomic policy (Cavlek et al. 2011).

Based on the previous research conducted by Cvetkoska and Barisic (2014), for this research as outputs were selected travel and tourism's total contribution to GDP (output 1) and travel and tourism's total contribution to employment (output 2). Travel and tourism's total contribution to GDP (output 1) represents the financial economic impact of tourism. It even seems better that one country has a high total contribution of travel and tourism to GDP, which is not correct because that means that the local economy depends on one sector that is prone to the influence of various external factors that we can not control. If we speak globally, tourism accounts for 10% of the world GDP (UNWTO 2017a, p. 6).

One of the most important economic impacts of tourism is employment, i.e., the creation of new jobs within the core economic activities in the tourism sector, as well as a number of other economic activities that support this sector. Full employment is the goal of every country, where tourism can have a big contribution. From the standpoint of local people, tourism becomes attractive (and often only) access to employment, with relatively good working conditions and generous income, which are, however, an average seasonal character.

According to the WTTC (World Travel and Tourism Council), descriptions of the selected input and output are given in Table 6.

Data was collected from the period of one year (2017).

For the selected inputs and outputs for the observed units, there is no missing data, and all values are positive. Correlation analysis between inputs and outputs was carried out and all correlation coefficients were positive, and there is a presence of a strong relationship between all variables (Table 7).

The number of DMUs should be at least three times the total number of inputs and outputs (Cooper et al. 2007). In the case where this is not satisfied, a larger number of DMUs can appear as relatively efficient, and the obtained results are questionable. In this paper, the sample of analysis consists of 28 EU member states (the minimum number of DMUs according to the above mentioned should be 12).

To solve the output-oriented BCC model, specialized DEA software—DEA SolverPro 10e has been used, and the obtained results are presented and interpreted in the section that follows.

6 Results and Analysis

The obtained results from the output-oriented BCC DEA model are shown in Table 8. From this table, it can be seen that 13 EU member states are relatively efficient (Bulgaria, Cyprus, Estonia, Germany, Greece, Hungary, Italy, Latvia, Malta, Portugal, Romania, Spain, and the United Kingdom). According to the orientation of the model this means that these 13 EU member states with the given level of inputs have achieved the maximum possible level of outputs. By contrast, the remaining 15 EU member states (Austria, Belgium, Croatia, the Czech Republic, Denmark, Finland, France,

Table 6 Description of inputs and outputs

Inputs	Description
Internal travel and tourism consumption	Total revenue generated within a country by industries that deal directly with tourists, including visitor exports, domestic spending, and government individual spending. This does not include spending abroad by residents. This is consistent with the total internal tourism expenditure in Table 4 of the TSA: RMF 2008 *Visitor exports* Spending within the country by international tourists for both business and leisure trips, including spending on transport, but excluding international spending on education. This is consistent with the total inbound tourism expenditure in Table 1 of the TSA: RMF 2008 *Domestic travel and tourism spending* Spending within a country by that country's residents for both business and leisure trips. Multiuse consumer durables are not included since they are not purchased solely for tourism purposes. This is consistent with the total domestic tourism expenditure in Table 2 of the TSA: RMF 2008. Outbound spending by residents abroad is not included here, but is separately identified according to the TSA: RMF 2008 *Government individual spending* Spending by the government on travel and tourism services directly linked to visitors, such as cultural services (e.g., museums) or recreational services (e.g., national parks)
Capital investment	Includes capital investment spending by all industries directly involved in travel and tourism. This also constitutes investment spending by other industries on specific tourism assets, such as new visitor accommodation and passenger transport equipment, as well as restaurants and leisure facilities for specific tourism use. This is consistent with the total tourism gross fixed capital formation in Table 8 of the TSA: RMF 2008
Outputs	Description
Travel and tourism's total contribution to GDP	GDP generated directly by the travel and tourism sector plus its indirect and induced impacts (see below) *Direct contribution to GDP* GDP generated by industries that deal directly with tourists, including hotels, travel agents, airlines and other passenger transport services, as well as the activities of restaurant and leisure industries that deal directly with tourists. It is equivalent to the total internal travel and tourism spending within a country less the purchases made by those industries (including imports). In terms of the UN Tourism Satellite Account methodology, it is consistent with the total GDP calculated in Table 6 of the TSA: RMF 2008
Travel and tourism's total contribution to employment	The number of jobs generated directly in the travel and tourism sector plus the indirect and induced contributions (see below)

(continued)

Table 6 (continued)

Inputs	Description
	Indirect and induced impacts *Indirect* The contribution to GDP and jobs of the following three factors: • Capital investment • Government collective spending: government spending in support of a general tourism activity. This can include national as well as regional and local government spending. For example, it includes tourism promotion, visitor information services, administrative services, and other public services. This is consistent with the total collective tourism consumption in Table 9 of TSA: RMF 2008 • Supply chain effects: purchases of domestic goods and services directly by different industries within travel and tourism as inputs to their final tourism output. *Induced* The broader contribution to GDP and employment of spending by those who are directly or indirectly employed by travel and tourism
Outputs	**Description**
Travel and tourism's total contribution to GDP	GDP generated directly by the travel and tourism sector plus its indirect and induced impacts (see below) *Direct contribution to GDP* GDP generated by industries that deal directly with tourists, including hotels, travel agents, airlines and other passenger transport services, as well as the activities of restaurant and leisure industries that deal directly with tourists. It is equivalent to the total internal travel and tourism spending within a country less the purchases made by those industries (including imports). In terms of the UN Tourism Satellite Account methodology, it is consistent with the total GDP calculated in Table 6 of the TSA: RMF 2008
Travel and tourism's total contribution to employment	The number of jobs generated directly in the travel and tourism sector plus the indirect and induced contributions (see below)
	Indirect and induced impacts *Indirect* The contribution to GDP and jobs of the following three factors: • Capital investment • Government collective spending: government spending in support of a general tourism activity. This can include national as well as regional and local government spending. For example, it includes tourism promotion, visitor information services, administrative services, and other public services. This is consistent with the total collective tourism consumption in Table 9 of TSA: RMF 2008 • Supply chain effects: purchases of domestic goods and services directly by different industries within travel and tourism as inputs to their final tourism output. *Induced* The broader contribution to GDP and employment of spending by those who are directly or indirectly employed by travel and tourism

Source WTTC (2017)
TSA—Tourism Satellite Account

Table 7 Correlation

	I1	I2	O1	O2
I1	1	0.86582	0.98884	0.98892
I2	0.86582	1	0.8919	0.85594
O1	0.98884	0.8919	1	0.98766
O2	0.98892	0.85594	0.98766	1

Source Author's calculation

Ireland, Lithuania, Luxembourg, the Netherlands, Slovakia, Slovenia, and Sweden) have been identified as relatively inefficient, i.e., they invest more in tourism considering the fact that they gain from it, in the sense of employment in tourism and its share in GDP. The average efficiency is 0.9441, the maximum efficiency is 1, the minimum is 0.7406, and the standard deviation is 0.0783.

By solving the basic BCC DEA model, the efficient countries are given a rank of 1, while inefficient countries are ranked from 14 to 28 (Poland is given a rank of 14, and Ireland is placed last (rank of 28)).

For each relatively inefficient member country of the European Union, a reference set is shown in Table 9. For four EU member countries: Austria, Belgium, Finland, and Denmark, the reference set is the same and consists of the following three countries: Italy, Malta, and Spain. For two relatively inefficient states (France and Luxembourg), the reference set comprises two states; for nine relatively inefficient states (Austria, Belgium, Denmark, Finland, Ireland, Lithuania, Poland, Slovenia, and Sweden), the reference set covers three states; and for four relatively inefficient states (Croatia, the Czech Republic, the Netherlands, and Slovakia), the reference set covers four states.

According to the frequency with which efficient units appear in the reference set of inefficient units, Spain can be distinguished as an indicator of good practice (it has the highest number of appearances, i.e., 9), followed by Romania (7 appearances), Italy and Malta (6 appearances), Bulgaria (5 appearances), etc. (Table 9).

In addition, three relatively inefficient states have been analyzed, i.e., Poland, Slovenia, and the Netherlands. Poland with its efficiency result is closest to the relatively efficient countries, and has a rank of 14, Slovenia is ranked 22nd and the Netherlands is ranked 27th. For each of them to become efficient, an appropriate projection of the input and output values has been made. In order for the inputs to remain unchanged, the changes are only in the outputs: Poland should increase the first output by 9.95% and the second output by 0.76%, Slovenia should increase the first output by 8.51% and the second output by 37.24%, while the Netherlands should increase the two outputs by 29.35%.

Table 8 Results of the output-oriented BCC DEA model

No.	DMU	Result	Rank
1	Austria	0.9736	15
2	Belgium	0.8876	23
3	Bulgaria	1	1
4	Croatia	0.8106	25
5	Cyprus	1	1
6	The Czech Republic	0.9447	19
7	Denmark	0.9498	18
8	Estonia	1	1
9	Finland	0.9412	20
10	France	0.9576	17
11	Germany	1	1
12	Greece	1	1
13	Hungary	1	1
14	Ireland	0.7406	28
15	Italy	1	1
16	Latvia	1	1
17	Lithuania	0.8574	24
18	Luxembourg	0.9279	21
19	Malta	1	1
20	The Netherlands	0.7731	27
21	Poland	0.9925	14
22	Portugal	1	1
23	Romania	1	1
24	Slovakia	0.7984	26
25	Slovenia	0.9216	22
26	Spain	1	1
27	Sweden	0.9588	16
28	The United Kingdom	1	1

Source Author's calculation

7 Conclusion

In this paper, the relatively efficient and relatively inefficient EU member states in tourism are identified. The reference set for inefficient countries is shown and it is indicated what changes should be made by relatively inefficient states, or more precisely how much they should increase the outputs to become relatively efficient. In addition, the rank of relatively inefficient states is also given. All this information

Table 9 Reference set for relatively inefficient states

No.	DMU	Reference (Lambda)							
1	Austria	Italy	0.174	Malta	0.683	Spain	0.143		
2	Belgium	Italy	0.049	Malta	0.852	Spain	0.099		
3	Croatia	Bulgaria	0.575	Cyprus	0.333	Hungary	0.043	Italy	0.049
4	The Czech Republic	Bulgaria	0.486	Estonia	0.14	Greece	0.307	Romania	0.067
5	Denmark	Estonia	0.674	Romania	0.215	Spain	0.111		
6	Finland	Italy	0.037	Malta	0.895	Spain	0.068		
7	France	Spain	0.515	UK	0.485				
8	Ireland	Estonia	0.059	Romania	0.864	Spain	0.077		
9	Lithuania	Bulgaria	0.092	Latvia	0.083	Malta	0.824		
10	Luxembourg	Malta	0.930	Romania	0.070				
11	The Netherlands	Cyprus	0.474	Greece	0.318	Italy	0.065	Spain	0.143
12	Poland	Bulgaria	0.122	Portugal	0.577	Romania	0.301		
13	Slovakia	Bulgaria	0.023	Estonia	0.877	Greece	0.093	Romania	0.006
14	Slovenia	Estonia	0.961	Romania	0.027	Spain	0.012		
15	Sweden	Italy	0.166	Malta	0.746	Spain	0.088		

Source Author's calculation

is valuable for making adequate steps in order to improve the efficiency of relatively inefficient countries.

The data collected for the input and output factors relate only to one year (2017), so in our further research we plan to cover a longer period of time and to apply the DEA technique Window Analysis that will enable monitoring the efficiency through time. Since DEA tries to show each decision-making unit (which is part of the sample for analysis) in the best light, it may occur that an input or output does not get the proper weight, and in order to overcome this problem, we plan to link the nonparametric methodology DEA with the leading method of multicriteria decision-making (MCDM)—the analytic hierarchy process (AHP)—in the direction of restricting the weights for the input and output factors.

Additionally, inputs could be different, the internal travel and tourism consumption could be replaced with domestic travel and tourism spending or a number of tourist arrivals or nights spent, as well as with a number of hotels or destination management organizations in a particular country. Future research could be directed toward findings as to why certain observed countries have an efficient tourism industry, while others don't, and how it is related with the overall economic development of the country.

References

Abad A, Kongmanwatana P (2015) Comparison of destination competitiveness ranking in the European Union using a non-parametric approach. Tourism Econ. 21:267–281

Alzua-Sorzabala A, Zurutuzaa M, Rebona F, Gerrikagoitiaa JK (2015) Obtaining the efficiency of tourism destination website based on data envelopment analysis. Procedia Soc Behav Sci 175:58–65

Andersen P, Petersen NC (1993) A procedure for ranking efficient unit in data envelopment analysis. Manag Sci 39:1261–1264

Assaf AG (2012) Benchmarking the Asia Pacific tourism industry: a Bayesian combination of DEA and stochastic frontier. Tour Manag 33:1122–1127

Banker RD, Charnes A, Cooper WW (1984) Some models for estimating technical and scale inefficiencies in data envelopment analysis. Manag Sci 30:1078–1092

Barros CP (2005) Measuring the efficiency in the hotel sector. Ann Tour Res 32:456–477

Barros CP, Mascarenhas MJ (2005) Technical and allocative efficiency in chain of small hotels. Int J Hosp Manag 24:415–436

Bogoev K (ed) (1975) Economic lexicon. Savremena administracija, Beograd

Cavlek N, Bartoluci M, Prebezac D, Kesar O (2011) Tourism economic bases and organizational systems. Skolska knjiga, Zagreb

Charnes A, Cooper WW, Rhodes EL (1978) Measuring efficiency of decision making units. Eur J Oper Res 2:429–444

Charnes A, Cooper WW, Lewin AY, Seiford LM (1994) Data envelopment analysis: theory methodology and applications. Kluwer Academic Publishers, Boston

Cook WD, Zhu J (2008) Data envelopment analysis: modeling operational processes and measuring productivity. Create Space Independent Publishing Platform

Cooper WW, Seiford LM, Tone K (2007) Data envelopment analysis: a comprehensive text with models, applications, references and dea-solver software, 2nd edn. Springer Science+Business Media, LLC, New York

Corne A (2015) Benchmarking and tourism efficiency in France. Tour Manag 51:91–95

Cvetkoska V, Savic G (2017) Efficiency of bank branches: empirical evidence from a two-phase research approach. Econ-Res-Ekon—Istraz 30:318–333

Cvetkoska V, Barisic P (2014) Measuring the efficiency of certain European countries in tourism: DEA window analysis. In: Zivkovic Z, Mihajlovic I, Djorgjevic P (eds) Book of proceedings of the international may conference on strategic management—IMKSM2014. University of Belgrade, Technical Faculty in Bor, Management Department, Bor, pp 77–86

Cvetkoska V, Barisic P (2017) The efficiency of the tourism industry in the Balkans. Proc Fac Econ East Sarajev 14:31–41

Cvetkoska V (2016) A survey of the use of operational research in decisions made by micro, small and medium-sized enterprises in Macedonia. Croat Oper Res Rev 7:349–365

Cvetkoska V (2017) Applying multi-criteria decision-making methods in banking: the case of Komercijalna Banka AD Skopje. Lambert Academic Publishing, Saarbrücken

Emrouznejad A, Yang GL (2018) A survey and analysis of the first 40 years of scholarly literature in DEA: 1978–2016. Socioecon Plan Sci 61:4–8

Emrouznejad A, Thanassoulis E (1996a) An extensive bibliography of data envelopment analysis (DEA). Work Pap 1:1–55

Emrouznejad A, Thanassoulis E. (1996b) An extensive bibliography of data envelopment analysis (DEA). Work Pap 2:1–21

Emrouznejad A, Thanassoulis E (1997) An extensive bibliography of data envelopment analysis (DEA). Work Pap 1:1–24

Emrouznejad A, Parker BR, Tavares G (2008) Evaluation of research in efficiency and productivity: a survey and analysis of the first 30 years of scholarly literature in DEA. Socioecon Plan Sci 42:151–157

Eurostat. Tourism statistics (2018). http://ec.europa.eu/eurostat/statistics-explained/index.php/Tourism_statistics. Accessed 7 Apr 2018

Farell MJ (1957) The measurement of productive efficiency. J R Stat Soc 120:253–290

Fuchs M (2004) Strategy development in tourism destinations: a DEA approach. Poznań Univ Econ Rev 4:52–73

Gattoufi S, Oral M, Reisman. A (2004a) A taxonomy for data envelopment analysis. Socioecon Plann Sci 38:141–158

Gattoufi S, Oral M, Reisman A (2004b) Data envelopment analysis literature: a bibliography update (1996–2001). Socioecon Plan Sci 38:122–159

Greene WH (1993) The econometric approach to efficiency analysis. In: Fried HO, Lovell CAK, Schmidt SS (eds) The measurement of productive efficiency: techniques and applications. Oxford University Press, New York, pp 68–119

Hadad S, Hadad Y, Malul M, Rosenboim M (2012) The economic efficiency of the tourism industry: a global comparison. Tour Econ 18:931–940

Index Mundi (2015) International tourism, number of arrivals – country ranking. https://www.indexmundi.com/facts/indicators/ST.INT.ARVL/rankings. Accessed 4 Apr 2018

Juul M. (2015) Tourism and the European Union. Recent trends and policy developments. In-depth analysis. European parliamentary research service https://doi.org/10.2861/310682

Liu J, Zhang J, Fu Z (2017) Tourism eco-efficiency of Chinese coastal cities—analysis based on the DEA-Tobit model. Ocean Coast Manag 148:164–170

Man D, Zhang, H (2015) The study of DEA application in tourism city: A case for members of the world tourism city federation in China. In: Zhang, Z, Shen, Z, Zhang, J, Zhang, R (eds) LISS 2014. Springer, Berlin, Heidelberg, pp 831–835

Martin JC, Mendoza C, Roman C (2017) A DEA travel-tourism competitiveness index. Soc Indic Res 130:937–957

Metodijeski D, Temelkov Z (2014) Tourism policy of Balkan countries: review of national tourism development strategies. UTMS J Econ 5:231–239

Naumovska E, Cvetkoska V (2016) Efficiency of the Macedonian banking sector. Yugosl J Oper Res 26:317–329

Obadic A, Pehar L (2016) Employment, capital and seasonality in selected Mediterranean countries. Zagreb Int Rev Econ Bus 19(s1):43–58

Oliveira R, Pedro MI, Marques RC (2013) Efficiency and its determinants in Portuguese hotels in the Algarve. Tour Manag 36:641–649

Poldrugovac K, Tekavcic M, Jankovic S (2016) Efficiency in the hotel industry: an empirical examination of the most influential factors. Econ-Res-Ekon—Istraz 29:583–597

Popovic G (2006) Assessment of efficiency of loan programs using data envelopment analysis. Master's thesis, University of Belgrade, Faculty of Organizational Sciences, Belgrade (in Serbian)

Seiford LM (1994) A DEA Bibliography (1978–1992). In: Charnes A, Cooper WW, Lewin AY, Seiford LM (eds) Data envelopment analysis: theory, methodology and applications. Kluwer, Boston, pp 437–469

Seiford LM (1997) A bibliography for data envelopment analysis (1978–1996). Ann Oper Res 73:393–438

Sherman DH, Zhu J (2006) Service productivity management: Improving service performance using data envelopment analysis. (DEA), Springer Science, Boston

Sigala M (2004) Using data envelopment analysis for measuring and benchmarking productivity in the hotel sector. J Travel Tour Mark 16:39–60

Suklev B (2016) Management, 9th edn. Faculty of Economics-Skopje (in Macedonian)

Tavares G (2002) A bibliography of data envelopment analysis (1978–2001). RUTCOR, Rutgers University. http://rutcor.rutgers.edu/pub/rrr/reports2002/1_2002.pdf

UNWTO, World tourism organization (2014) International tourism trends in EU-28 member states. Current situation and forecasts for 2020–2025–2030. http://www.eucentre.sg/wp-content/uploads/2015/08/UNWTO_TT2030_EU28.pdf. Accessed 4 Apr 2018

UNWTO, World tourism organization .2016 annual report (2017a). http://cf.cdn.unwto.org/sites/all/files/pdf/annual_report_2016_web_0.pdf. Accessed 4 Apr 2018

UNWTO, World tourism organization. Tourism highlights (2017b). https://www.e-unwto.org/doi/pdf/10.18111/9789284419029. Accessed 4 Apr 2018

UNWTO, World tourism organization (28 February 2018) UNWTO deepens tourism cooperation with the European Union. http://media.unwto.org/press-release/2018-02-28/unwto-deepens-tourism-cooperation-european-union. Accessed 4 Apr 2018

Williams T (2008) Management science in practice. Wiley, Chichester

Wöber KW (2008) Data envelopment analysis. J Travel Tour Mark 21:91–108

WTTC, World travel & tourism council (2017) Travel & tourism economic impact 2017 European Union LCU. https://www.wttc.org/-/media/files/reports/economic-impact-research/regions-2017/europeanunionlcu2017.pdf. Accessed 4 Apr 2018

Yi T, Liang M (2014) Evolutional model of tourism efficiency based on the DEA method: a case study of cities in Guangdong province. China. Asia Pac J Tour Res 20:789–806