TOURISM EFFICIENCY OF V4 COUNTRIES: A COMPARISON WITH AUSTRIA

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Received: 27. January 2022 Reviewed: 02. March 2022 Accepted: 19. March 2022

Abstract

Countries compare themselves to each other in tourism and look for processes in which they could be more competitive. However, these comparisons are inadequate in many cases. Countries have different tourist attractions, so one measure that is successful in one country may not be successful in another. The goal of this study is, based on several factors, to advance the proposal of a comparison of several countries based on multi-criteria analyses and to measure the efficiency of the Visegrad Four countries and Austria. For this purpose, the Data envelopment analysis method was used, specifically the CRS and VRS input models. Four input variables and two output variables were used. The result of this study is a comparison of the efficiency of the countries, in which the differences between the countries of Central Europe were found. For example, Poland lags significantly behind the efficiency of other countries. On the other hand, Austria and Slovakia are among the most efficient countries compared. We also pointed out the weak relationship between the area of protected areas, the GDP generated by tourism, and the occupancy of beds in accommodation facilities. These findings may impact the creation of policies and consider the effectiveness of investments in the tourism industry.

Keywords: tourism, efficiency, DEA, Visegrad four

JEL Classification: C34, C67, L88

Introduction and theoretical background

The efficiency of countries and tourism entities is widely discussed in scientific research. This is because the countries themselves, when creating strategies, must be based on comparing themselves with the best, the so-called benchmarks (Assaf, 2012; Corne, 2015; Peypoch & Solonandrasana, 2008). In the scientific community, we encounter the use of various methods and their modifications. An essential part of the scope of the effectiveness investigation is the sample of destinations or countries that will be subjected to the research. We must not forget comparability. If the research subject shows too much inhomogeneity of the tourism structure with another, the results are more challenging to interpret.

Hadad et al. (2012) concluded that the great interest in measuring efficiency and productivity in the tourism industry is not surprising, given the growing economic importance of tourism as a source of international income and employment and the increase in competition in the world tourism markets. Therefore, measuring efficiency and productivity in tourism has been the subject of considerable research in recent years, reflecting the growing economic importance of tourism as a source of international income and domestic employment and increasing competition in global tourism markets.

Matijová et al. (2019) claim that tourism is considered the most significant service sector, leading to many social and economic changes. Assaf a Josiassen (2012) claim that the key factors of interest to stakeholders in the quest to improve the tourism industry. A key obstacle to improving performance is the number of determinants affecting tourism performance. The literature has yet to provide concrete insight into the determinants of tourism performance and their relative importance. This study addresses this critical gap. The authors provided performance indicators of international tourist destinations. According to Radovanov et al. (2020) policymakers should gradually take control of the above variables to protect the interests of all relevant stakeholders involved in the tourism development process.

The literature that measures tourism-related efficiency can include, for example, the efficiency of airports (Ripoll-Zarraga & Raya, 2020), HORECA sector (Pablo-Romero et al., 2017), spa (Čabinová & Onuferová, 2019), and destinations (Barros et al., 2011).

This study will examine a relatively homogeneous group of Central European countries. Very few studies would compare this territorial grouping from such a point of view. Most research focuses on larger entities such as the European Union, but also others (Lozano & Gutierrez, 2011; Matijová et al., 2019; Radovanov et al., 2020)

For a comprehensive comparison, the Travel & Tourism Competitiveness Index was developed. However, it is extensive and challenging to compare the causes of differences between countries (Martín et al., 2017). Therefore, thanks to its simplicity but good comparability and robustness, a prevalent method is the Data Envelopment Analysis (DEA) method (Prorok et al., 2019).

The goal of this study is, based on several factors, to advance the proposal of a comparison of several countries based on multi-criteria analyses and to measure the efficiency of the Visegrad Four countries and Austria.

Material and methods

We use the Data envelopment analysis (DEA) method in this study. This method measures the efficiency of decision-making units with a relatively homogeneous subject of productivity. In this study, we perform measurements for DEA models 2022, VOL. 11., N

assuming constant returns to scale (CRS) and variable returns to scale (VRS). These models can be mathematically expressed as follows:

$\min_{\substack{\theta_B,\lambda}} \theta_B$	
s.t. $\theta_B x_o - X \lambda \geq 0$	(1)
$Y\lambda \geq y_{_{0}}$	
$\lambda \geq 0.$	
$\min_{\substack{\theta_B,\lambda}} \theta_B$	
s.t. $\theta_B \mathbf{x}_o - X \lambda \ge 0$	(2)
$Y\lambda \ge y_o$	
$e\lambda = 1$	
$\lambda \ge 0.$	

These models, in their most basic form, were developed and developed by many authors, of which it is necessary to mention several studies that helped the theoretical as well as practical development of this method (Ahn et al., 1988; Charnes et al., 2013; Cooper et al., 2007; Färe et al., 1994; Farrell, 1957).

The DEA method measures the distance of production units from the efficiency frontier. DMUs on the efficiency frontier have an efficiency value equal to 1. The greater their distance from the efficiency frontier, the lower the relative efficiency values they achieve. For efficiencies to be measurable, we need to choose appropriate variables of the DEA model. This study was based on several significant studies and literature reviews. Based on these surveys and the availability of relevant data, we have identified several variables that can be considered suitable for investigating technical efficiency in tourism (Corne, 2015; Ilić & Petrevska, 2018; Nurmatov et al., 2021).

	Variable	Units	
Inputs	Employees in the HORECA	Thousand of persons	
	Employees in travel agencies and reservation services	Thousand of persons	
	Number of beds in accommodation facilities	Number	
	Natural reservations area - Natura 200	km ²	
Outputs	Bed occupancy rate	%	
	The gross domestic product generated by tourism in current prices	mil. €	

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Table 1	Comparis	ion of neo	mle em	nloued	in travel	agencies and	SPTTICPS
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Source: own processing

In general, variables representing the three fundamental factors of production are used as inputs. In our case, the land is represented by the area of protected areas according to Natura 2000. Human capital - work is represented by two variables: the number of employees in the HORECA sector and the number of employees in reservation services. Finally, capital, or the capacity of national systems, is represented in this study by the number of beds in accommodation facilities.

In our case, the output of these sources is the GDP generated by tourism services and the occupancy of beds in accommodation facilities. For a more detailed description, see table 1.

Individual variables are not relativised concerning the number of inhabitants or other indicators. This is made possible precisely by the nature of DEA models. Of course, it is also possible to use relativised variables, but all variables would have to be relativised. Only in this way would we ensure the consistency of the results.

In this study, we examine the effectiveness of the relatively homogeneous countries that make up the grouping of the Visegrad Four (V4) and Austria, which is often a model for improving tourism-related processes for the V4 countries. Austria can be considered a leader in tourism in the given region of countries. We will examine the efficiency of the countries for the period from 2010 to 2018 to sufficiently capture the development in the period between significant crises that also affected the tourism industry. We obtained data for our research from publicly available Eurostat databases (Eurostat, 2022) and The World Bank (The World Bank, 2021).

Results and discussion

In this chapter, we will characterise the results of our research in two main subchapters. First, we will focus on developing selected variables in the five investigated countries. Then we will look at the results and the comparison of technical efficiency in the V4 countries and Austria.

Development of selected tourism indicators in V4 countries and Austria

In this section, we will compare selected variables' development in the monitored five Central European countries. Figure 1 shows the development of the number of employees in the HORECA sector.



Figure 1 Comparison of people employed in the HORECA sector

Source: own processing based on the data from Eurostat (2022)

Poland has the highest number of employees in the HORECA sector, where in 2018, it exceeded 400,000 people. On the contrary, the lowest numbers are recorded in Slovakia, where in 2018, 110 thousand people were employed in the HORECA sector. The numbers of employees in the HORECA sector are very similar in the case of Hungary, Austria and the Czech Republic. In general, no dramatic increase in the number of employees can be observed. However, there has been a slight increase in the last few years.

On the contrary, in 2013 and 2014, we observed a slight decrease in employees in the HORECA sector. This can be attributed to one of the consequences of the decrease in economic optimism. Figure 2 shows the development of the number of travel agencies and reservation services employees.



Figure 2 Comparison of people employed in travel agencies and services

Source: own processing based on the data from Eurostat (2022)

The highest number of employees in travel agencies and reservation services is also observed in Poland. In 2018, approximately 22 thousand people were employed in this sector. The fewest people in this sector were employed in Slovakia. In 2018 it was approximately 4,700 people. The development of the number of employed people did not have a uniform trend of increase in the examined countries. Even since 2013, a downward trend can be observed. This can be caused by the increased use of modern reservation systems and the electronification of this sector. Figure 3 shows the development of bed capacity in accommodation facilities.





Figure 3 Comparison of the number of beds in accommodation facilities

Source: own processing based on the data from Eurostat (2022)

Regarding capacity, Austria has the highest number of beds in accommodation facilities. The number of beds increased from approximately 590,000 in 2010 to approximately 615,000 in 2018. Even in the country with the fewest available beds, Slovakia, there was an increasing number of beds, from approximately 49 thousand to more than 60 thousand. In general, an increase can be observed, which was slightly corrected in 2014 or 2015. In Figure 4, we present the absolute values of the area of protected areas in the countries we studied.





Source: own processing based on the data from Eurostat (2022)

Poland, which is also the largest country by area, has the significantly highest absolute value of the area of protected areas. The area of protected areas in Poland is approximately 60,000 square kilometres. Other countries' protected areas range from 10 to 20 thousand square kilometres. Figure 5 shows the occupancy rate of beds in accommodation facilities.



Figure 5 Comparison of bed occupation rate

Source: own processing based on the data from Eurostat (2022)

This variable reflects how effectively they use the capacity of beds in a given country because a high number of beds does not necessarily mean a high number of tourists. In most countries, the bed utilisation rate in accommodation facilities increased over time. They use the bed capacity most efficiently in the Czech Republic, where there was a significant increase from 35% to approximately 50% in 2018. The lowest values were reported in Slovakia, where the bed capacity utilisation was approximately 36%. Figure 6 shows the development of the GDP variable generated by tourism.



Figure 6 Comparison of GDP generated from tourism

Source: own processing based on the data from Eurostat (2022)

Undoubtedly, the highest GDP generated by tourism among the countries we examine was achieved by Austria. This is also the reason why Austria is a model for creating tourism strategies in neighbouring countries. The GDP in Austria increased significantly from almost €44 billion to approximately €64 billion, an increase of 46.1%. Even the other countries did not lag behind the relatively significant increase of Austria, but the absolute values of the GDP generated by tourism were significantly lower. For example, there are approximately 10.8 billion in Hungary or 12.8 billion in Slovakia. Table 2 shows the results of the correlation analysis of inputs and outputs of DEA models.

	Employees in the HORECA sector	Employees in travel agencies and services	Number of Beds	Natura 2000 areas	Occup. rate	HDP Tourism
Employees in the HORECA	1.0000					
Employees in travel agencies	oyees vel 0.9167 ies					
Number of Beds	0.5368	0.7018	1.0000			
Natura 2000 areas	0.7999	0.6045	-0.0459	1.0000		
Occupancy rate	0.2534	0.2931	0.3311	-0.0056	1.0000	
HDP Tourism	0.4191	0.5442	0.9071	-0.0854	0.2230	1.0000

Table 2 Correlation between sele	cted indicators
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Source: own processing

The results indicate a relatively high interconnectedness of the inputs and, thus, a possible relationship of a positive nature. On the other hand, a very weak and even negative relationship can be observed between the number of beds and the area of protected areas. Moreover, we can observe a negative correlation between the area of protected areas and GDP. We also did not confirm the correlation between bed occupancy and GDP generated by tourism.

Tourism efficiency of V4 countries and Austria

This section presents the efficiency measurement results using the DEA CRS and DEA VRS models. First, in Figure 7, we present the DEA CRS model's results using the abovementioned variables.





Source: own processing

As seen in Figure 7, the positive trend is the increase in efficiency in all countries. This indicates a more efficient use of resources to increase the output, which is the rate of bed capacity utilisation and the economic benefit of tourism - GDP. During the last three years, as many as three countries were efficient – Austria, the Czech Republic and Slovakia. Poland achieved the lowest efficiency. Poland's efficiency values ranged from 0.38 in 2010 to 0.47 in 2018, which is low. Hungary is among the three most efficient countries and Poland. The most significant increase in efficiency was achieved in the Czech Republic and Austria. Figure 8 presents the DEA CRS model's results using the abovementioned variables.



Figure 8 Individual results of VRS efficiencies

Source: own processing

Since the VRS model uses a non-linear frontier of efficiency, it can be said to be more benevolent towards individual DMUs. This was also reflected in the achieved efficiency scores. The Czech Republic and Slovakia are efficient throughout the entire examined period. Austria also achieved excellent results. Hungary also achieved efficiency in the last year under review. Poland is significantly the least efficient, but in recent years efficiency has been growing significantly. From a value of 0.41 in 2010, the efficiency increased to approximately 0.70 in 2018. In Table 3, we present a summary table of the typical descriptive characteristics of the variables used in these models.

Model	Country	Mean	Standard deviation	Variance	Min	Max
	Czech republic	0.854550	0.118963	0.014152	0.716232	1
	Hungary	0.700560	0.057645	0.003323	0.621394	0.814296
CRS	Austria	0.920838	0.082257	0.082257 0.006766		1
	Poland	0.420109	0.029309 0.000859		0.380229	0.472383
	Slovakia	0.935443	0.068745	0.004726	0.832986	1
VRS	Czech republic	0.999966	< 0.0001	<0.0001	0.999694	1
	Hungary	0.779311	0.107538	0.011564	0.691479	1
	Austria	0.990901	0.011160	0.000125	0.966375	1
	Poland	0.513716	0.099233	0.009847	0.413172	0.704791
	Slovakia	1	0	0	1	1

Table 3 Descriptive statistical indicators of efficiencies

Source: own processing

The highest average value of CRS efficiency was achieved by Slovakia (0.94), followed by Austria (0.92) and the Czech Republic (0.85). This is in significant contrast to the average efficiency of Poland, which was only 0.42. The same countries achieved very high average VRS efficiency values as in the case of the CRS model. The variability of the statistical sets was not high.

Conclusion

Several interesting conclusions and recommendations can be evaluated based on the above results. First, none of the investigated countries is a significant seaside destination. Although Poland has access to the sea, this is not very important in summer seaside tourism destinations compared to, for example, the countries of the Mediterranean Sea. These countries attract the most tourists thanks to their natural and cultural attractions. Although there are differences between countries, Hungary and the Czech Republic, do not have significant high mountains. However, natural capital also needs to be promoted effectively and used sustainably. However, in many cases, this is replaced by other cultural attractions and the capital cities' attendance. Therefore, to a certain extent, the given set can be considered homogeneous, at least from a geographical and cultural point of view. However, natural capital also needs to be promoted effectively and used sustainably.

We must evaluate the increase in efficiency in all countries very positively, which is very important from an economic point of view and sustainability. Inefficient

use of resources leads to waste and, subsequently, to worsened economic results. Despite the enormously higher GDP generated by tourism, Austria cannot be considered the most efficient country, which is somewhat surprising. These revenues are also due to a higher rate of entry. Conversely, Poland, which employs a relatively high number of people in the tourism industry, achieves a relatively low GDP for these inputs, reflected in the efficiency results. Over-employment may result from significant investments that Poland has made in infrastructure and accommodation facilities, mainly thanks to the support of the European Structural Funds. However, these investments require some time to be reflected in economic benefits.

Comparing these countries using the DEA method showed us an important fact. Countries cannot be compared only to one or two indicators, but multi-criteria relationships must be understood. Only such a thorough comparison can provide a basis for implementing strategies and policies at the level of regions, states and political groups.

Acknowledgement

This research was supported by the National Research VEGA 1/0338/22,VEGA 1/0240/20, KEGA 035EU-4/2022

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