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The impact of COVID-19 pandemic on foreign tourism in European countries

Abstract: The subject of this study is the COVID-19 pandemic that has shaken the world's tourism industry since March 2020. The aim is to propose the use of the Perkal index to assess the impact of the pandemic on tourism in European countries. Five variables from the UNWTO and Eurostat were used in the research and they concerned thirty European countries. These variables are: data on the percentage change in nights spent at tourist accommodation establishments, percentage change in international tourism, and percentage change in net occupancy rate of bed-places and bedrooms in hotels and similar accommodation. On the basis of the Perkal index value, it is evident that the crisis of 2020 affected the countries located in the Mediterranean (including Italy and Greece) to a largest extent. On the other hand, the pandemic least influenced the Scandinavian countries, the Baltic countries and those located in the central part of the European continent. The proposed index allows to evaluate changes in a time series system and enables comparative analysis between territorial units. In both international and domestic comparisons, the impact of COVID-19 on tourism assessment index may be a useful analysis tool and is likely to be widely used in the future.

Keywords: COVID-19; Europe; Perkal's index; pandemic; tourism

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INTRODUCTION

Tourism is one of the sectors most affected by the COVID-19 pandemic. According to the UNWTO (2021), only in 2020 the number of foreign tourists decreased by over 70%. This, in turn, resulted in significant drops in their spending, which are estimated at almost 1.3 billion USD. This situation was aggravated by the governments' introduction of numerous restrictions in most countries, implemented in order to prevent the spread of the COVID-19 pandemic. Changes in tourism, especially foreign (Więckowski,

2021) and transborder (Wendt et al., 2021) are also associated with certain emotional and psychological factors, such as the fear of travelling, as evidenced by surveys, e.g. in Poland (Korinth, 2020; Walas, Kruczek, 2020).

The aim of this study is to show how the pandemic influenced foreign tourism in European countries. For the purpose of this analysis, the Perkal's index was used (Kurkiewicz et al., 1991). It is characterised by transparency and, above all, little loss of information during data aggregation. The study used five variables from the United Nations World Tourism Organization (UNWTO) and Eurostat (statistical office of the European Union). A total of 30 European countries was selected for the analysis. Majority of them are EU countries. This choice was dictated by the availability of data.

This article aims to fill the research gap regarding the impact of a pandemic on tourism. It complements the various research methods used so far. In the case of research on tourism, numerous publications are devoted to forecasting its development in the coming years. An example is the use of the ARIMA model (Kufel, 2020) or the Delphi corrective forecasting model (Zhang et al, 2021). Other research methods related to the study of the impact of a pandemic on tourism also include DEMATEL method analysis on quarantine decisions (Altuntas and Gok, 2021). The use of the Perkal index complements the already rich methodology related to the study of the impact of a pandemic on tourism.

Methodology and data

In the initial phase of the development of the Perkal's index, the following data was collected and aggregated: data on the percentage change in nights spent at tourist accommodation establishments (Eurostat, 2021a), percentage change in international tourist arrivals (UNWTO, 2021), percentage change in international tourism receipts (UNWTO, 2021), percentage change in persons employed in tourism (Eurostat, 2021b), and percentage change in net occupancy rate of bed-places and bedrooms in hotels and similar accommodation (Eurostat, 2021c). All values referred to changes in 2020 which were compared to the previous year – 2019.

The procedure for creating a Perkal index (PI) is to build a synthetic index being the sum of standardised partial indices. It consists of the following steps:

Step 1: Creating a data matrix.

Step 2: Standardisation of variables.

Step 3: Taking into account the characteristics of stimulant and destimulant. Step 4: Calculation of the index.

Accordingly, a table was created with five variables obtained from UNWTO (2021) and Eurostat (2021a, 2021b, 2021c). The collected data was standardised (scaled down to a small range) based on their arithmetic means (μ) and standard deviation (σ). This was done using the equation to calculate the normalised value:

 $z = \frac{\overline{x} - \mu}{\sigma}$

where:

z – standardised value

 \overline{x} - custom variable,

 μ – arithmetic average,

 σ – standard deviation of the population.

A similar approach to data standardisation is put forward in many scientific publications. In subject literature, this activity was performed, among others, as means to analyse tourism development (Lee and Chang, 2008), for the analysis of main outflows from tourism markets for health tourism spending (Ridderstaat et al., 2019) or for statistical analysis of urban tourism (Wöber, 2000). However, it is the definition of standard deviation proposed in the publication of Hwang and Yoon (1981) that was considered by the author as most relevant. Standardisation was performed on the three variables previously mentioned in table 1.

Among all the indicators, we can distinguish stimulants and destimulants. In this study, only destimulants were used, which allowed to bypass this step. Perkal's index is an arithmetic mean calculated from standardised variables. It was created based on the formula:

$$Pi = \frac{1}{n} \sum_{i=1}^{n} Y'i$$

where:

Pi – Perkal index

n – number of objects,

Y'i – standardised value of the j-th feature in the i-object, after replacing the destimulant with stimulants.

Then the results of the research were presented in the form of a choropleth map, which was created based on the arithmetic mean and standard deviation of the Perkal index for all countries. The division criterion was adopted:

 $\overline{\mathbf{x}} - \sigma = -0.8$ $\overline{\mathbf{x}} = -0.1$ $\overline{\mathbf{x}} + \sigma = 0.6$

where:

 $\overline{\mathbf{x}}$ – custom variable,

 σ – standard deviation of the population.

The principle was adopted that the higher index value characterised the smaller impact of the pandemic on tourism in the country.

The comparative analysis method used in this article is known in the literature on the subject as the Z-scores method (Smith, 1972). In this work, it is identified as the Perkal index. This definition of the indicator was dictated by its popularity in the Polish literature on the subject (Parysek and Wojtasiewicz, 1979). The presented method is the most frequently used solution in works on the use of taxonomy in regional research. It is particularly known among Polish scientists who successfully use this method in publications in renowned scientific journals, for example Sustainable Cities and Society (Impact Factor: 5.26), Sustainability (Impact Factor: 2.57) or European Spatial Research and Policy (Impact factor: 1.69). Scientists use the Perkal index to analyse the city's greening (Lewandowska and Szymańska, 2021) or to analyse the spatial diversity of sustainable development in Poland (Chrobocińska, 2021). The Perkal Index is also used in tourism-related publications, for example to study the role of cultural heritage objects in creating the tourism potential of small towns (Kwiatek-Sołtys and Bajgier-Kowalska, 2019).

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		Perkal's index	1.0	0.6	-1.0	0.1	-0.9	0.0	0.1	-0.4	-0.2	-0.1	-1.2	0.0	-1.1
	nal tourist vals	noitasibrabnats rəfta əulaV	1.0	-0.1	0.3	-0.1	-1.1	-0.1	-0.2	-0.2	-0.3	-0.1	-0.6	0.4	-0.8
	Internation arriv	Percentage change compared to the same period in the previous year	-48.3	-68.0	-60.2	-67.7	-84.1	-67.9	-69.2	-68.4	-70.4	-66.5	-76.8	-59.1	-79.9
	persons in ndustry*	noitasibrabnatz rəfta əulaV	-0.2	0.5	-2.1	-0.2	1.2	-0.2	0.2	-1.0	-0.4	-0.5	0.2	0.0	-1.9
	Employed tourism i	Percentage change compared to the same period in the previous year	-1.3	-0.6	-3.4	-1.3	0.2	-1.3	-0.9	-2.2	-1.5	-1.6	-0.9	-1.1	-3.2
	it at tourist odation hments	Value after standardisation	2.7	0.1	-0.5	1.3	-1.4	-0.3	0.7	0.2	0.2	0.6	-0.7	-0.7	-0.9
	Nights sper accomm establis	Percentage change compared to the same period in previous year	-44	-69	-75	-58	-83	-73	-63	-68	-68	-64	-77	-77	-79
	ancy rate aces and hotels and mmodation	noitasibrabnatz rəfta əulaV	0.8	1.3	-1.4	-0.8	-2.6	-0.2	-0.6	-1.5	-1.2	-0.1	-2.3	-0.4	-1.9
(PI).	Net occup of bed-pl bedrooms ir similar acco	Percentage change compared to the same period in the previous year	-34.0	-40.0	-39.0	-57.0	-62.0	-37.0	-45.0	-41.0	21.0	-35.0	-41.0	-48.0	-56.0
Perkal index	ıal tourism ipts	noitasibrabnatz rəfta əulaV	0.8	1.3	1.4	0.8	-2.6	-0.2	-0.6	-1.5	-1.2	-0.1	-2.3	-0.4	-1.9
to build the	Internatior rece	Percentage change compared to the same period in the previous year	29.7	21.6	63.0	54.3	-82.0	-44.7	-50.6	-64.4	-59.9	-43.6	-76.3	-47.7	-70.3
Table 1. Variables used		Country	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czechia	Denmark	Estonia	Finland	Germany	Greece	Hungary	Iceland

	onerator and	agency, tour	tion: Travel	Accommoda	ice activities:	nd food servi	nmodation a	usport: Accor	ev.2 - Air tra	es – NACE R	nomic activiti	Classification of ecor
	0.7											
	-0.1											
	0.2	-0.3	-70.1	0.8	-0.2	0.4	-66	-0.6	-26.0	-0.6	-50.1	Switzerland
	-0.1	-0.5	-73.6	-0.2	-1.3	-0.1	-71	-0.7	-36.0	-0.7	-52.9	Sweden
	-1.3	-0.6	-76.9	-1.6	-2.9	-1.1	-80	-2.2	-49.0	-2.2	-76.1	Spain
	-0.5	-0.4	-73.1	0.5	-0.5	-0.1	-71	-1.2	-39.0	-1.2	-60.4	Slovenia
	0.6	0.1	-63.6	-0.8	-2.0	0.7	-63	2.1	-32.0	2.1	-8.9	Slovakia
	0.4	-0.5	-75.1	0.8	-0.2	0.2	-68	1.0	-35.0	1.0	-25.6	Serbia
	-1.1	-1.0	-82.7	-0.6	-1.8	-1.7	-86	-1.2	-44.0	-1.2	-60.3	Romania
	-0.4	-0.5	-75.2	-0.8	-2.0	-0.4	-74	-0.9	-51.0	-0.9	-55.8	Portugal
	1.0	2.8	-16.1	0.9	-0.1	0.5	-65	0.0	-37.0	0.0	-41.6	Poland
	-0.3	-0.6	-76.1	0.5	-0.5	0.1	-69	-1.9	-29.0	-1.9	-71.1	Norway
	-0.1	-1.1	-84.4	0.7	-0.3	-1.5	-84	0.0	-46.0	0.0	-41.5	N. Macedonia
	0.5	0.2	-62	1.0	0.0	1.2	-59	-0.3	-41.0	-0.3	-45.5	Netherlands
	0.0	-0.5	-75.2	3.4	2.6	-0.5	-75	-2.4	-62.0	-2.4	-78.1	Malta
	1.5	0.8	-51.6	2.0	1.1	1.9	-52	1.3	-39.0	1.3	-21.9	Luxemburg
	-0.5	-0.3	-70.1	-0.4	-1.5	-0.3	-73	-1.6	-50.0	-1.6	-66.7	Lithuania
	-0.3	-0.3	-70.1	-0.7	-1.9	0.9	-61	-0.8	-44.0	-0.8	-53.6	Latvia
	-0.7	0.4	-58.1	-0.8	-2.0	0.0	-70	-1.1	-39.0	-1.1	-58.1	Italy
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other reservation service and related activities.

Source: Authors' own work based on UNWTO (2021) and Eurostat (2021a, 2021b, 2021c).

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Results

For the majority of European countries tourism can be considered as one of the biggest economy players (Ilieş, Wendt, 2015). The outbreak of the pandemic strongly affected this sector, causing a decrease in the occupancy of the accommodation base, a decrease in the number of foreign tourists and a decrease in foreign tourists' spending.

When analysing the research results, it should be highlighted that the impact of the pandemic on foreign tourism in European countries varied in terms of space, which stems from different levels of the countries' tourist attractiveness. The lowest Perkal index values was recorded mainly in the receiving countries for the foreign arrivals tourism, especially in Spain (PI=-1.3) and Greece (PI=-1.2). The rest of the countries in the Mediterranean had average values for the Perkal index. These countries include Portugal (PI=-0.4), Italy (PI=-0.7) and Croatia (PI=0.1). Central and Western Europe can be distinguished among the regions characterised by a lower impact of the pandemic on tourism. Poland (PI=1.0), Austria (PI=1.0), Belgium (PI=0.6) and Luxembourg (PI=1.5) are the countries with the highest values of the Perkal index. The rest of the European countries were characterised by average values of the Perkal index, and thus the impact of the pandemic on tourism was also average.



Figure 1. Impact of the COVID-19 pandemic on international tourism in Europe in 2020 (using the Perkal index)

Source: Authors' own work based on table 1.

DISCUSSION

The COVID-19 pandemic constitutes one of the largest research gaps which is subject to daily updates provided by the world literature. The indicators of its impact on tourism have already been developed and are, similarly to this study, based on statistical data. An example of such an index is the "Discussion about Pandemics Index" (Karabulut et al., 2020), which was created on the basis of seven variables, including Natural Logarithm of Number of Tourist Arrivals, Natural Logarithm of Discussion about Pandemics Index or Natural Logarithm of GDP per capita (constant 2010 US \$). The authors of the research show that the negative impact of the pandemic on the arrivals of tourists is particularly visible in the countries of southern Europe. On the one hand, the index takes into consideration many important economic values. On the other hand, tourism is only one of its elements (Więckowski, 2020; Liu et al., 2021).

CONCLUSIONS

The analysis of selected variables made it possible to present the situation in which European countries found themselves at the time of the COVID-19 pandemic. The conducted research has shown that the Perkal index is an interesting tool for assessing the impact of a pandemic on tourism in given spatial units.

Research has shown large disproportions in the impact of the COVID-19 pandemic on tourism in European countries. The countries most affected were countries hosting relatively large numbers of tourists each year, like Spain (Moreno-Luna et al., 2021) and Greece (Kousi et al., 2021). They reached the lowest values of the Perkal index. An extremely interesting example is Italy, which, despite the enormous problems associated with high morbidity, was not characterised by the worst situation. The same can be concluded in the case of other important tourist destinations such as Croatia or Slovenia. Perhaps this was due to the fact that European markets, which were partially open during the pandemic, are of key importance for Italy.

The highest values of the Perkal index, and thus the relatively best situation in international tourism, were experienced by countries with smaller importance of tourism overall. Countries such as the Netherlands, Belgium or Luxembourg have never dominated both in the number of tourists in previous years and in the sum of their expenses.

Taking into account the available data and the analysis carried out, it can be concluded that there is a clear difference between the impact of tourism on the main destinations in international tourism of the Mediterranean countries and the countries of Central Europe as well Scandinavian once. It can also be concluded that the proposed method may be useful in determining the size of the impact of a pandemic situation on changes in the volume of traffic in intern

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