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Determinants of Resilience Building in Tourism: A Case Study on Romania in the Context of the Pandemic Crises

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ABSTRACT

This article investigates the evolution of Romanian tourism to identify the regions most resilient to health crises (swine flu and COVID-19) and to show the differences in regions' responses to these types of shocks. The crises seriously affected the tourism sector globally and in Romania. Furthermore, due to tourists' fears of contracting an illness during travel, the value of the relevant indicators registered a significant decrease, also impacting the connected sectors. A resilience efficiency index was computed and used in the analysis. The index was a ratio between the output under shock and the normal output. A vector error correction model was developed to emphasize the short-term and long-term relationships between regional development and tourism performance during 1993–2020. The index values computed for 2020 and the evolution of the tourism demand showed that the Romanian regions were not resilient. On the supply side, some regions were resilient during the swine flu pandemic, and some were resilient during both pandemics. The regions displayed different responses to shocks, proving that along with the potential of the tourism sector, other factors are also important, such as management and public policies.

Contribution/Originality: The analysis highlights regions' capabilities to face the challenges of crises. The results might be used to develop the support policy measures necessary to increase local resilience by remodelling tourism and creating sustainable development engines.

1. INTRODUCTION

Resilience refers to the ability of a system to recover after a shock or adapt or transform when a change occurs. Economic resilience comprises not only recovery but reshaping the local equilibrium between potential and results, aiming to (re) build robust recovery for the future. Each economic sector reacts differently to shocks, requiring more consistent adjustment or recalibration of specific balances. Technological level and policy quality are important factors in sustainable development. Among the industries most affected by the recent health crisis, the tourism sector proved to be highly fragile; consumers' reactions were immediate and harsh and required rapid adjustments/adaptations specific to the particularities of the crisis to avoid a complete shutdown. Therefore:

a) The local differences in result indicators depended more on the adaptation measures than on the pre-crisis infrastructure.
b) Analysing economic resilience in sectors that are highly sensitive to the reaction of individual consumers (such as tourism) is important in less developed economies; in these economies, local natural and human potential and small-scale entrepreneurship represent the pillars of local economic, social and cultural sustainable development (Ritchie, 2009).

The developments of the last decades have proven that globalization facilitates tourist activities. However, the impact of health crises is much stronger. They require both immediate adjustments/recalibrations between demand and supply as well as mechanisms for developing robust long-term resilience. The literature has highlighted that the tourism sector is easily affected by global crises (Uğur & Akbıyık, 2020). Travel behaviour significantly impacts outcomes (Hoque, Shikha, Hasanat, Arif, & Hamid, 2020; Mckibbin & Fernando, 2020), and the regional impact can be devastating (Galvani, Lew, & Perez, 2020; Niewiadomski, 2020). Furthermore, health crises have demonstrated that there are multiple associated risks (economic, sociocultural, political, ecological, and technical), which are even more evident in sectors sensitive to individual consumer reactions, such as tourism and accommodation. Increasingly, tourists' choice of destination depends on the health risks and the costs of prevention (Lück, 2004), and the recovery of the sector post-crisis depends to a great extent on domestic tourism, resilience, and investments, which are not homogeneously distributed across provinces (Duro, Perez-Laborda, & Fernandez, 2022; OECD, 2020, 2021; Prayag, 2020; Sharma, Thomas, & Paul, 2021). These are just some of the arguments supporting this paper's research approach.

With its marvellous sights and areas of natural preservation, Romania is among the European countries with high tourism potential. This paper's research focuses on the extent to which Romanian NUTS (nomenclature of territorial units for statistics) 2 regions display resilience in the tourism industry, meaning whether those regions can respond positively to changes. For this purpose, data from the TEMPO Online (National Institute of Statistics) database was used to calculate the tourism resilience efficiency index (TREI) for Romania's eight development regions. These regions are North-West (NW), Centre (C), North-East (NE), South-East (SE), South-Muntenia (SM), Bucharest-Ilfov (BI), South-West Oltenia (SWO), and West (W).

The employed indicators were:

- Regional gross domestic product
- On the supply side, we considered the institutional potential as measured by the infrastructure (number of tourist accommodation establishments) and employment (average number of employees) in the hotels and restaurants sector.
- On the demand side, we used the number of tourists who arrived at the tourist accommodation establishments and the number of overnight stays in the tourist accommodation establishments.

Based on the data, a resilience index was computed for the periods 2007–2011 and 2018–2020 (to emphasize the effects of the two health crises: the swine flu pandemic (2009–2010) and the COVID-19 pandemic).

The paper is structured as follows. The next section presents the relevant literature in the field. Section 3 describes the methodology employed in the research, emphasizing the econometric approach to the relationships between the indicators. Section 4 presents the main results and some discussion of the economic significance of the performed analysis. Finally, the last section concludes with the contribution offered by the paper and the usefulness of the research results.

2. LITERATURE REVIEW

Various previous studies have analysed tourism resilience. A simple query of the Web of Science (WoS) database indicates over 156,000 works published on tourism since 2010, with about 18,000 per year after 2019, highlighting the sector's importance to national economies in the context of globalization and digitalization. However, if we search

for "resilience" and "tourism", the number of publications falls below 2,200, with over 1,000 published during the COVID-19 pandemic. Moreover, if we focus on regional approaches to resilience and tourism, the number of scientific papers identified is only 306 after 2010, with half published since 2020.

An analysis of the thematic links in the papers published in WoS indicates (see Figure 1 and Figure 2):

a) Intense interest in four sub-domains of impact analysis and the correlations between:

- Management-climate change-conservation-ecotourism-ecosystem services.
- Resilience-sustainability-vulnerability-participation-policy-knowledge.
- Sustainable tourism-community resilience-framework-entrepreneurship-destination resilience.
- Performance-COVID-19-model-growth-hospitality-satisfaction-behavior.

b) For the connection between tourism development and local resilience, five sub-topics of interest are identified:

- Tourism-knowledge-policy-community resilience.
- COVID-19-capacity-impact-innovation-sustainability.
- Regional resilience-ecological resilience-economic resilience-transformation-biodiversity.
- Tourism-framework-innovation-capacity-challenges-community.
- Tourism development-conservation-economic growth-recovery-risk.

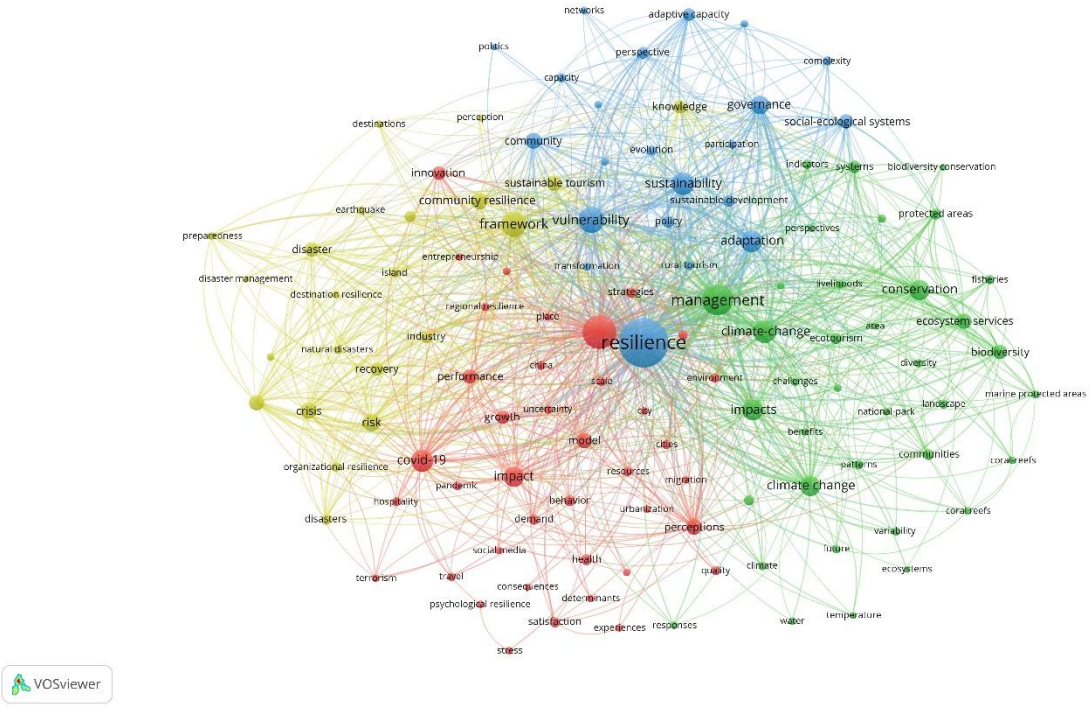


Figure 1. Research on topics related to tourism's impact on local resilient development, based on papers published in WoS in the period 2010–2022, tourism + resilience (20).

Resilience in tourism and the impact of tourism activity on the development of local resilience are the main aspects pursued by recent studies (Braje, Dumančić, & Hruška, 2022; Cheer, Milano, & Novelli, 2019; Giannakis & Bruggeman, 2017; Watson & Deller, 2022). Various aspects have been analysed, such as the short-term resilience of domestic tourism demand (Boto-García & Mayor, 2022), local development strategies (Bellini, Grillo, Lazzeri, & Pasquinelli, 2017), smart specialization (Romão, 2020), and climate change (Jopp, DeLacy, Mair, & Fluker, 2013; Sheller, 2021), as well as the need to increase the resilience of tourism entrepreneurs (Badoc-Gonzales, Mandigma, & Tan, 2022).

An approach that responds to regional variations in the resilience of the tourism industry with regionally adapted tourism planning and management policies is that of Karoulia, Gaki, and Kostopoulou (2015). Talmaciu and

Manolescu (2021) underlined the importance of several factors in improving the resilience of tourism to crises, such as:

- Cooperation and collaboration among all stakeholders.
- Improving the capacity of public authorities to adopt appropriate policies to support the business environment in overcoming crises.
- Improvement of companies' knowledge of and capacity for crisis management; according to the authors, a proactive approach to crisis management must be adopted.

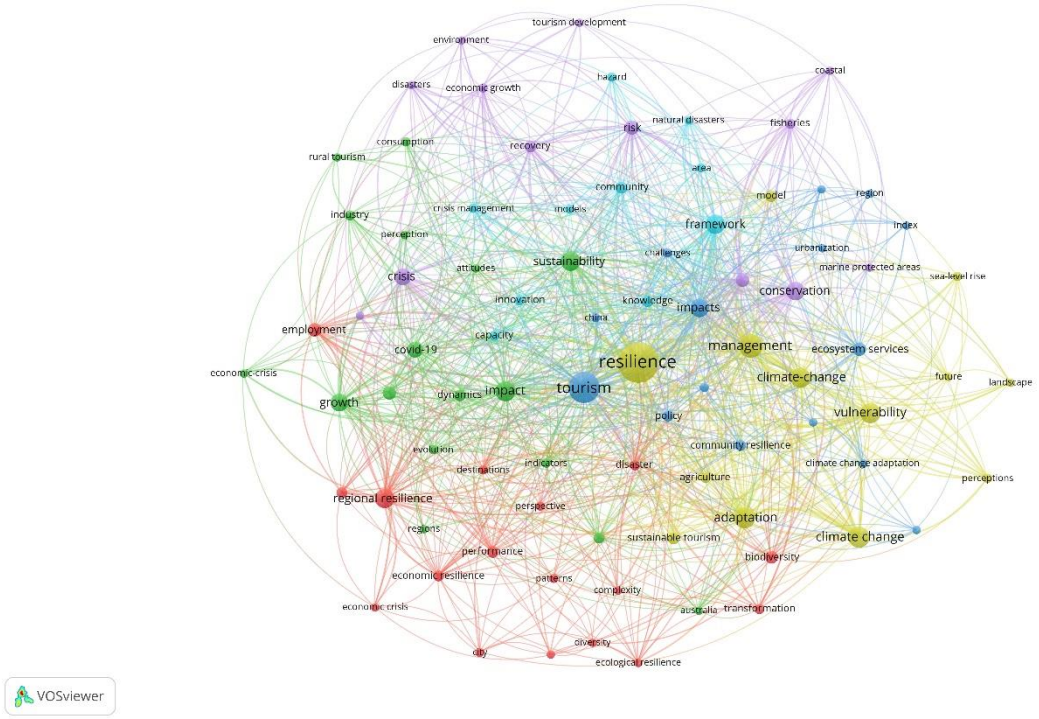


Figure 2. Research on topics related to tourism's impact on local resilient development, based on papers published in WoS in the period 2010–2022, tourism + resilience + regional (5).

Karoulia et al. (2015) examined the impact of the economic crisis (financial crisis of 2007–2008) on regional tourism indicators. They estimated the extent to which tourism is resilient to economic shocks at the regional level. Janusz, Six, and Vanneste (2017) developed an analysis to understand residents' perceptions of the tourism industry. According to the authors, residents support tourism if they benefit from the tourism-related infrastructure. Bellini et al. (2017) discussed the contribution of tourism to regional economic resilience. The authors identified innovation policies in tourism in connection with different types of regional economic resilience, such as engineering, ecological, and evolutionary resilience.

Amore, Prayag, and Hall (2018) discussed destination resilience from a multilevel perspective that considered the following as integrated elements of the tourism system: landscape, regime, niche, and actors. According to the authors, the multilevel perspective helps increase understanding of tourism destination planning, considering various changes on both the demand and supply sides. Butler (2020) analysed the tourism industry and the effects of the COVID-19 pandemic. Ibanescu, Eva, and Gheorghiu (2020) discussed the possibility that tourism could positively affect economic and demographic resilience in highly accessible rural areas.

Bangwayo-Skeete and Skeete (2021) discussed the opportunities in the tourism sector. According to the authors, the factors causing lower resilience include management deficiencies, inadequate cohesion among stakeholders, and lack of innovation. Sharma et al. (2021) proposed a resilience-based framework for reviving the tourism industry after the COVID-19 pandemic. Their framework included four factors for building resilience: government response, technology innovation, local belongingness, and consumer and employee confidence.

Della Corte, Del Gaudio, Sepe, and Luongo (2021) proposed a conceptual framework for destination resilience and innovation. According to the authors, the drivers of destination resilience that lead to post-crisis recovery strategies are technology innovation, absorptive capacity, dynamic capabilities, knowledge and experience, and collaboration and networks. Watson and Deller (2022) analysed the effects of dependency on tourism and hospitality activity on regional economic resiliency. According to the authors, greater dependency reduces resiliency rates, but the location and nature of the tourism and hospitality industry matter. Ntounis, Parker, Skinner, Steadman, and Warnaby (2022) explored the perceptions of "tourism-dependent businesses" regarding resilience in a crisis context, showing that such businesses were more vulnerable to the pandemic.

Bui and Ngo (2022) emphasized the economic, ecological, institutional, and social impact of the COVID-19 pandemic on tourism resilience. Estiri, Heidary Dahooie, and Skare (2022) proposed a framework for selecting resilience policies for tourism small and medium-sized enterprises (SMEs) during the COVID-19 pandemic. According to the authors, disaster management planning capabilities and marketing management were the most important success factors. Financial support for SMEs was the most effective policy to help tourism SMEs recover. Pocinho, Garcês, and De Jesus (2022) analysed the impact of the COVID-19 response measures on tourism, focusing on well-being and resilience.

The pandemic crisis not only required a reconsideration of tourist destinations' survival strategies but also changed the sector's medium and long-term development strategy. Thus, various aspects have been highlighted, such as the temporal dimensions of resilience and the differing resilience levels within and between industries (Ntounis et al., 2022), social innovation (Partanen, 2022), the binary between industry recovery and reform (Higgins-Desbiolles, 2020), a dynamic resilience framework (Jiang, Ritchie, & Verreynne, 2021), and the significance of tourism in measuring community resilience (Yang, Kim, Pennington-Gray, & Ash, 2021).

Overall, the literature has underlined the importance of various factors in improving tourism resilience, such as developing stakeholder networks, adopting measures to support businesses, creating innovation policies, supporting consumer and employee confidence, using the crisis management approach, and effective marketing management. Therefore, our research addressed the topic of tourism resilience by attempting to identify the regions of Romania that registered low fluctuations in the values of various macroeconomic indicators during the crisis periods.

3. METHODOLOGY

Several indicators were used in the analysis that could highlight the resilience of this important economic sector. Data from the TEMPO Online database (National Institute of Statistics) was used to compute the tourism resilience efficiency index (TREI) for Romania's eight development regions. The following aspects were considered:

- The computation for the two time periods:
  - 2009–2010 – during the swine flu pandemic (influenza A virus subtype H1N1).
  - 2020, the first year of the COVID-19 pandemic (according to the World Health Organization).
- The computation formula was resilience efficiency = output under shock / normal output (Karoulia et al., 2015; Proag, 2014); a region was considered resilient if the value of the index was greater than 1.
- The index was computed considering the indicators presented in Table 1.

The choice of Romania as a case study is supported by its existing tourist potential, the regional specificities, and the sector's vulnerability to crises. Romania's tourism is influenced not only by the attractiveness of its destinations but also by the comparative advantages/disadvantages at the regional level (Zaman, Vasile, Surugiu, & Surugiu, 2010) and in the national and European context, as well as its challenges as an emerging state in the EU and as an active promoter of digital transformation, as a factor of economic and social resilience (Bănescu, Boboc, Ghiţă, & Vasile, 2021; Vasile & Ciuhu, 2019). Therefore, an annual data set for the 1993–2020 period was created (balanced panel) for the eight development regions of Romania. EViews provided the results of a vector error correction model (VECM),

and the variables used in the analysis are presented in Table 1. After the VECM analysis, the impulse response function was developed.

Table 1. Variables used in the analysis.

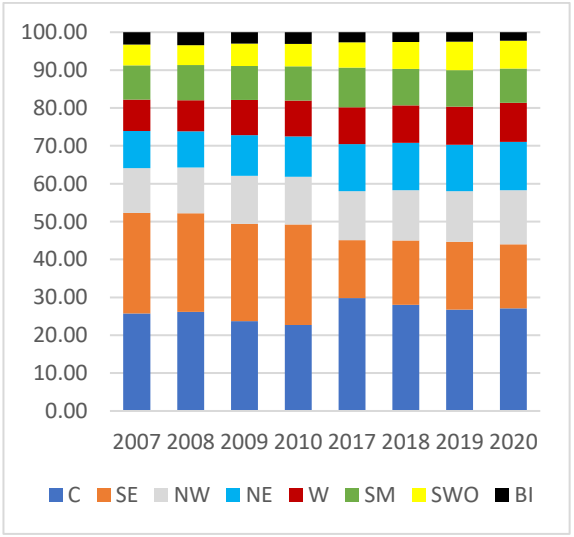
Acronym	Explanation	Measurement unit	Source
GDP	Regional gross domestic product - current prices	Million lei (national currency)	TEMPO Online - National Institute of Statistics
TE	Number of tourist accommodation establishments	Number	
AR01	Number of tourists who arrived at the tourist accommodation establishments	Number of persons	
NS	Number of overnight stays in the tourist accommodation establishments	Number	
EMP	Average number of employees in the hotels and restaurants sector	Number of persons	

4. RESULTS

4.1. Statistical Analysis of the Indicators

In Romania, in January 2010, there were 3,112 registered cases of swine flu; in this period, the highest number of cases was registered in China (62,871 cases; Rogers, 2009). Regarding COVID-19, in December 2020, there were 632,263 registered cases in Romania, and the highest number of registered cases were in the United States (20,191,295 cases; Ritchie et al., 2022). Figure 3 illustrates the tourism potential at the regional level. Regarding the number of tourist accommodation establishments (share of total value per region), in 2010, there was a reduced share in the North-West, Centre, North-East, South-Muntenia, and South-West Oltenia regions. In 2020, the first year of the COVID-19 pandemic, there was a reduction in the share in the following regions: South-East, South-Muntenia, Bucharest-Ilfov, and South-West. Of course, some regions responded differently to the effects of the two crises. However, some regions registered a reduction in the value of this indicator in both periods, specifically the South-Muntenia and South-West regions. Despite the negative effects of both pandemic crises, the number of tourist accommodation establishments increased in the South-East, Bucharest-Ilfov, and West regions in 2010 and in the North-West, Centre, North-East, and West regions in 2020. The Centre region recorded the most significant values, followed by the South-East and North-West regions.

The number of tourist accommodation establishments



The average number of employees in the hotels and restaurants sector

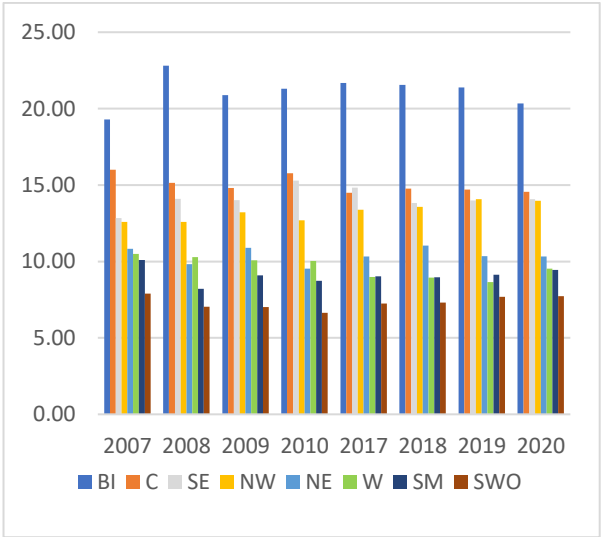


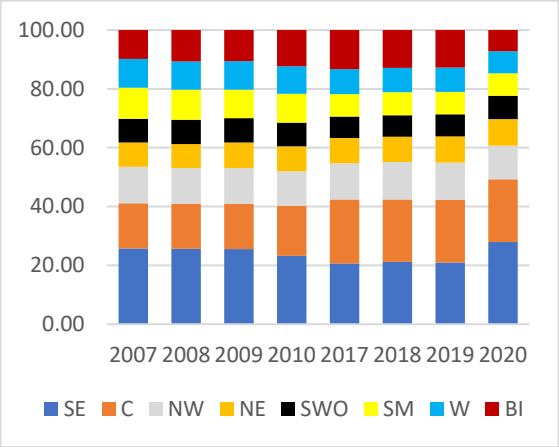
Figure 3. Romania's tourism supply, distribution by region, 2007–2020 (% of regions in total).
Note: NW - North-West, C - Centre, NE - North-East, SE - South-East, SM - South-Muntenia, BI - Bucharest-Ilfov, SWO - South-West Oltenia, W – West.

The evolution of employment in the tourism industry from 2007 to 2020 (share of total value by region) was as follows: in 2010, the share was reduced in the North-West, North-East, South-Muntenia, South-West Oltenia, and West regions. In 2020, there was a reduction in the share in the North-West, Centre, North-East, and Bucharest-Ilfov regions. On the other hand, the average number of employees increased in the Centre, South-East, and Bucharest-Ilfov regions in 2010 and in the South-East, South, South-West Oltenia, and West regions in 2020. Therefore, the most important share was recorded in the Bucharest-Ilfov region, followed by the Centre and South-East regions.

If we consider tourism demand, two statistical dimensions are significant for our research approach – the overnights spent and the total number of tourists who used the infrastructure. Figure 4 shows the evolution of nights spent per region (share of total value per region). In 2010, the share was reduced in North-West, North-East, South-East, South-West Oltenia, and West. In 2020, there was a reduction in the share in the North-West, Centre, South-Muntenia, Bucharest-Ilfov, and West regions. The regions with a decline in the value of this indicator in both periods were North-West and West. On the other hand, the number of nights spent increased in the Centre, South-Muntenia, and Bucharest-Ilfov regions in 2010 and in the North-East, South-East, and South-West Oltenia regions in 2020. The most significant shares were in the South-East region, followed by the Centre and North-West regions.

The evolution of arrivals per region is plotted as a share per region of the total value. In 2010, the share was reduced in the North-West, North-East, South-East, South-Muntenia, South-West Oltenia, and West regions. In 2020, the share was reduced in the North-West, Bucharest-Ilfov, and West regions. The regions with a decline in the values of this indicator in both periods were the North-West and West regions. Despite the adverse effects of both pandemic crises, the number of arrivals increased in the Bucharest-Ilfov (in 2010), Centre (in 2010 and 2020), North-East, South-East, South-Muntenia, and South-West Oltenia regions (in 2020). The Centre region recorded the most significant share, followed by the South-East and Bucharest-Ilfov regions.

The number of overnight stays in tourist accommodation establishments.



The number of tourists arriving at tourist accommodation establishments.

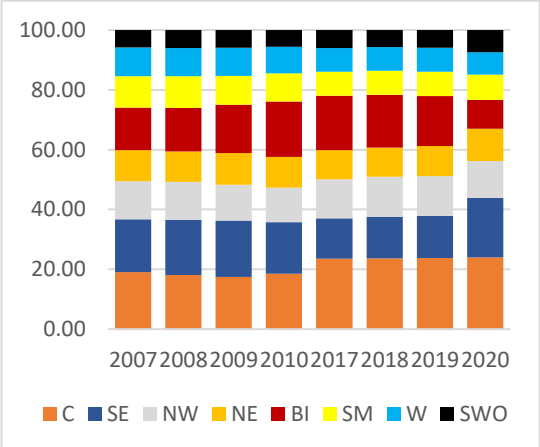


Figure 4. Romania's tourism demand, distribution by regions, 2007–2020 (% of regions in total).
Note: NW - North-West, C - Centre, NE - North-East, SE - South-East, SM - South-Muntenia, BI - Bucharest-Ilfov, SWO - South-West Oltenia, W – West.

The comparative analysis of the last two indicators and the hierarchy of the regions in 2020, in which there were differences in these indicators, highlights:

a) The specificity of the combination of resources for the provision of tourist services by region.
b) Efficiency differences, influenced not only by the potential but also by the level of local development, which affect/limit the diversity and quality of complementary services (accessibility and support services for quality of life).
c) The competitiveness of tourist services on the international market; this aspect should include the comparative cost of services and the quality-cost ratio; it is important to make the comparison to similar offers in the EU

or even the extra-EU market (it is well known that Romania displays comparative disadvantages for similar services compared to Bulgaria, Greece, or Italy, for example).

The gross domestic product (GDP) growth rate is an indicator of the general health of the economy. According to the World Bank database, the world GDP (annual %) registered decreases of 1.326% in 2009 and 3.271% in 2020. Figure 5 presents the evolution of GDP per region (share per region of total value). In 2010, the share was reduced in the North-West, North-East, South Muntenia, and South-West Oltenia regions. In 2020, the share was reduced in the following regions: Centre, South-Muntenia, Bucharest-Ilfov, and West. The South-Muntenia region saw a decrease in the values of this indicator in both periods. On the other hand, the GDP level increased in the Centre, South-East, Bucharest-Ilfov, and West regions in 2010 and in the North-West, North-East, South-East, and South-West Oltenia regions in 2020. The largest share was recorded by the Bucharest-Ilfov region, followed by South-Muntenia and North-West regions.

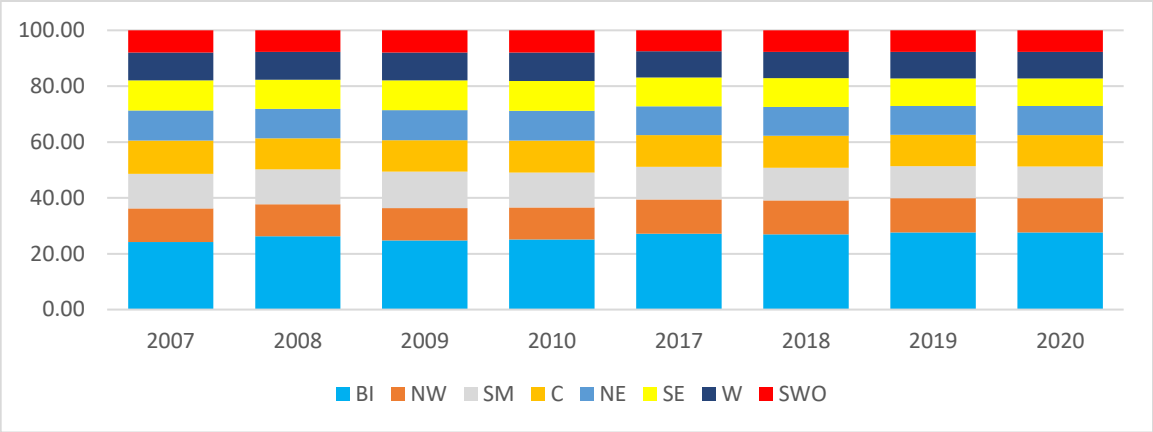


Figure 5. Regional gross domestic product, current prices (% of regions in total).
Note: NW - North-West, C - Centre, NE - North-East, SE - South-East, SM - South-Muntenia, BI - Bucharest-Ilfov, SWO - South-West Oltenia, W – West.

Figure 6 indicates which regions were more attractive in terms of the number of tourism establishments and arrivals. The figure emphasizes the asymmetry between demand and supply. The Centre region is the highest point, followed by the South-East region, while the South-West Oltenia region represents the lowest.

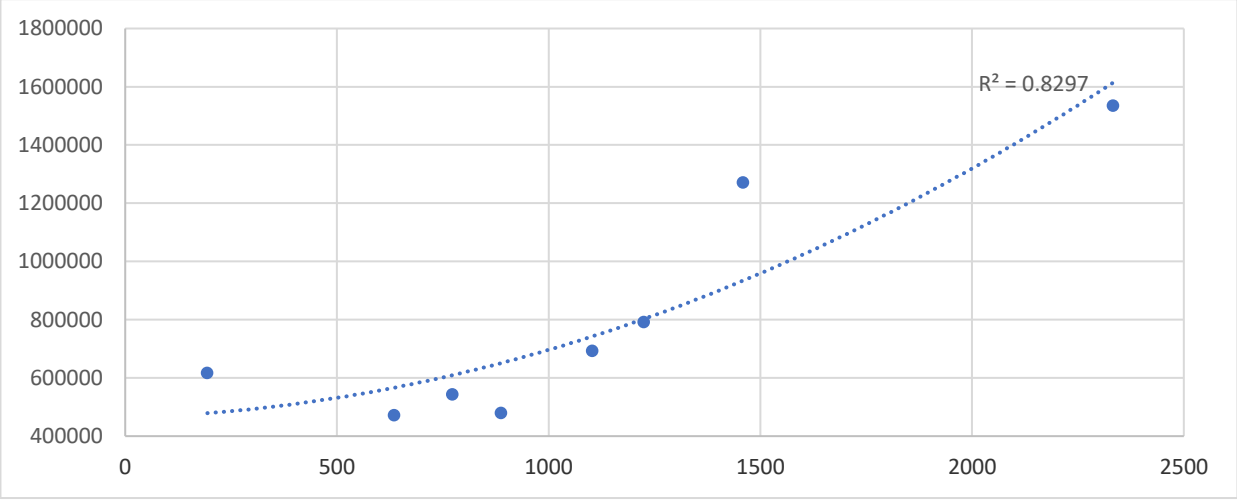


Figure 6. Number of arrivals and number of tourism establishments, by region, in 2020.

The dependence between the attractiveness of tourist locations and the level of development indicates that the Bucharest-Ilfov and South-East regions are the most popular tourist destinations. Figure 7 shows the relationship between occupancy rate (%) and regional GDP per capita. The lowest point represents South Muntenia, which can

be partially explained by its lack of tourist locations with heritage value or key tourist activities for vacation periods (sports or cultural activities).

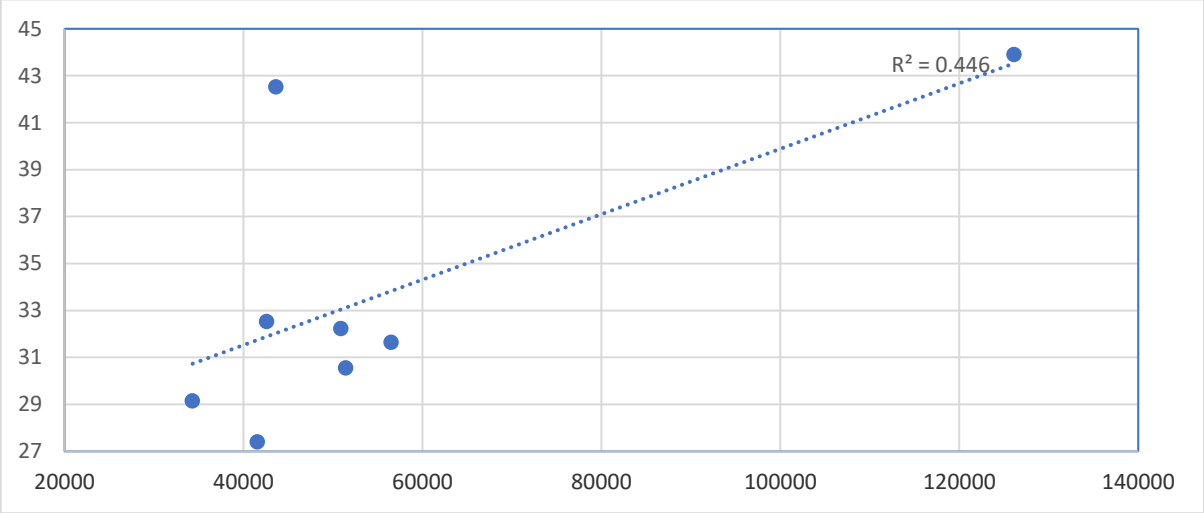


Figure 7. Occupancy rate (%) and regional GDP per capita (national currency, lei), 2019.

Note: The occupancy rate of bed places is obtained by dividing the total number of overnight stays by the number of bed places and the number of days when the bed places are available. The result is multiplied by 100. The data is from the Tempo Database, National Institute of Statistics.

Table 2 shows the evolution of the indicators by region. Notably, some regions registered an increase/decrease in the values of the indicators in 2010 and 2020, thus showing the different impacts of the two crises.

Table 2. Evolution of the indicators by region (increases or decreases of the share in total).

Year / Region	2010		2020	
	Increase	**Decrease**	**Increase**	**Decrease**
BI	GDP, TE, AR01, NS, EMP			GDP, TE, AR01, NS, EMP
C	GDP, AR01, NS, EMP	TE	TE, AR01	GDP, NS, EMP
W	GDP, TE	AR01, NS, EMP	TE, EMP	GDP, AR01, NS
SM	NS	GDP, TE, AR01, EMP	AR01, EMP	GDP, TE, NS
NW		GDP, TE, AR01, NS, EMP	GDP, TE	AR01, NS, EMP
NE		GDP, TE, AR01, NS, EMP	GDP, TE, AR01, NS	EMP
SWO		GDP, TE, AR01, NS, EMP	GDP, AR01, NS, EMP	TE
SE	GDP, TE, EMP	AR01, NS	GDP, AR01, NS, EMP	TE

Note: GDP - regional gross domestic product - current prices; TE - the number of tourist accommodation establishments; AR01 - the number of tourists who arrived at the tourist accommodation establishments; NS - the number of overnight stays in the tourist accommodation establishments; EMP - the average number of employees in the hotels and restaurants sector; NW - North-West, C - Centre, NE - North-East, SE - South-East, SM - South-Muntenia, BI - Bucharest-Ilfov, SWO - South-West Oltenia, W – West.

Table 3 presents the percentage point change of the examined indicators (weights of the values by region out of the total for Romania). Again, a positive value shows that during the crisis, there was an increase in the share of the region's value out of the total, indicating that there were tourist destinations in that region that could be considered resilient and able to adapt to the new conditions.

Considering the results of each indicator, the analysis shows that:

- The fewest positive values are observed for the night spent indicator, followed by arrivals in second place, and tourist establishments and employment in third place (both indicators).
- The most values with a positive sign are found for the GDP indicator.

Analysing the numbers by region, positive values can be observed for the following indicators:

- Tourist establishments – for the North-West, North-East, South-West Oltenia, and West regions (for both pandemic periods).
- Arrivals – for Bucharest-Ilfov (for the swine flu pandemic), Centre, South-Muntenia, South-West Oltenia (for the COVID-19 pandemic), North-East, and South-East (for both pandemic periods).
- Nights spent – for Bucharest-Ilfov (for the swine flu pandemic), South-East, South-West Oltenia (for the COVID-19 pandemic), Centre, and North-East (for both pandemic periods).
- Employment – for Bucharest-Ilfov, North-East (for the swine flu pandemic), South-West Oltenia, West (for the COVID-19 pandemic), North-West, South-East, and South-Muntenia (for both pandemic periods).
- Gross domestic product – for Centre, South-East, South-Muntenia (for the swine flu pandemic), North-West, North-East, Bucharest-Ilfov, South-West Oltenia, and West (for both pandemic periods).

Table 3. Evolution of indicators by region (percentage points, p.p.).

Indicator	TE		AR01		NS		EMP		GDP	
Time period / Region	2009-2007	2020-2018	2009-2007	2020-2018	2009-2007	2020-2018	2009-2007	2020-2018	2009-2007	2020-2018
Emerging resilience										
C	-2.066	-0.929	-1.608	0.321	-0.046	0.076	-1.197	-0.204	-0.597	-0.162
SWO	0.351	0.301	0.180	1.630	0.194	0.662	-0.863	0.424	-0.019	0.030
Low resilience										
SE	-0.835	-0.019	1.184	5.902	-0.175	6.780	1.174	0.263	-0.140	-0.437
NW	0.857	0.895	-0.834	-0.977	-0.267	-1.324	0.645	0.396	-0.459	0.240
W	1.016	0.471	-0.310	-0.378	-0.069	-0.785	-0.413	0.577	0.022	0.079
Low vulnerable										
NE	0.977	0.306	0.398	1.072	0.497	0.472	0.062	-0.715	-0.055	0.044
SM	-0.106	-0.675	-0.832	0.461	-0.900	-0.259	-1.004	0.480	0.691	-0.386
Highly vulnerable										
BI	-0.194	-0.349	1.821	-8.031	0.765	-5.622	1.596	-1.221	0.557	0.592

Note: GDP - regional gross domestic product - current prices; TE - the number of tourist accommodation establishments; AR01 - the number of tourists who arrived at the tourist accommodation establishments; NS - the number of overnight stays in the tourist accommodation establishments; EMP - the average number of employees in the hotels and restaurants sector; NW - North-West, C - Centre, NE - North-East, SE - South-East, SM - South-Muntenia, BI - Bucharest-Ilfov, SWO - South-West Oltenia, W – West.

4.2. Resilience Efficiency Index in Tourism

Equation 1 presents the resilience efficiency index. The results are presented in Table 4. Values above 1 show that the respective region is resilient. The formula used for the resilience efficiency index is a ratio between the output under shock (S_{ij}) and the normal output (N_{ij}):

$$REI_{ij} = \frac{S_{ij}}{N_{ij}} \quad (1)$$

The index is computed for regional GDP, the number of tourist accommodation establishments, the number of arrivals, the number of overnight stays, and the average number of employees in tourism. In the formula, *i* represents the development region, and *j* represents the years of analysis.

In the case of two indicators (arrivals and number of overnight stays), the regions of Romania were not resilient. For the other indicators, the situation was as follows:

- Tourist establishments – the regions resilient during the swine flu pandemic were South-Muntenia and Bucharest-Ilfov; the regions resilient in both pandemics were North-West, North-East, South-East, South-West Oltenia, and West.
- Employment – the regions resilient during the swine flu pandemic were North-West, Centre, North-East, South-East, South-Muntenia, and Bucharest-Ilfov; the regions resilient during the COVID-19 pandemic were South-West Oltenia and West.
- GDP – all regions were resilient (in both pandemic periods).

Table 4. Tourism resilience efficiency index (TREI) by region.

Time period	2008/2007	2009/2008	2011/2010	2019/2018	2020/2019
Indicator / Region	TE				
C	1.049	0.952	1.008	0.949	1.037
SE	1.009	1.042	0.703	1.049	0.970
BI	1.086	0.939	0.951	0.955	0.924
W	1.023	1.191	1.032	1.014	1.052
NW	1.056	1.103	0.988	0.997	1.090
NE	1.009	1.184	1.090	0.974	1.072
SM	1.054	1.018	1.129	0.994	0.953
SWO	0.985	1.173	1.236	1.055	1.006
Indicator / Region	AR01				
C	0.971	0.831	1.274	1.039	0.484
SE	1.063	0.884	1.087	1.053	0.670
BI	1.042	0.953	1.140	0.981	0.276
W	0.999	0.854	1.178	1.055	0.447
NW	1.021	0.807	1.138	1.026	0.448
NE	1.011	0.905	1.121	1.076	0.512
SM	1.029	0.788	1.075	1.046	0.501
SWO	1.065	0.853	1.266	1.071	0.595
Indicator / Region	NS				
C	0.992	0.846	1.218	1.060	0.482
SE	1.004	0.832	1.085	1.037	0.648
BI	1.093	0.830	1.075	1.040	0.275
W	0.988	0.845	1.118	1.043	0.442
NW	0.995	0.827	1.106	1.043	0.437
NE	0.991	0.900	1.134	1.089	0.493
SM	0.973	0.791	1.072	1.031	0.477
SWO	1.034	0.833	1.152	1.076	0.516
Indicator / Region	EMP				
C	1.048	0.976	0.948	1.034	0.898
SE	1.218	0.991	0.949	1.052	0.912
BI	1.311	0.913	1.033	1.030	0.862
W	1.086	0.978	0.987	1.003	1.000
NW	1.108	1.048	1.040	1.076	0.900
NE	1.006	1.105	0.981	0.971	0.906
SM	0.903	1.103	1.031	1.060	0.936
SWO	0.989	0.995	1.005	1.091	0.913
Indicator / Region	GDP				
C	1.190	0.996	1.028	1.099	0.997
SE	1.222	1.007	1.094	1.065	1.000
BI	1.379	0.925	1.105	1.140	0.998
W	1.270	0.984	1.033	1.123	0.999
NW	1.201	0.999	1.008	1.132	1.002
NE	1.242	0.999	1.000	1.109	1.008
SM	1.277	1.031	1.112	1.080	0.996
SWO	1.232	1.010	0.998	1.115	1.001

Note: data for 2021 was not available; values above 1 show that the respective region was resilient. GDP - regional gross domestic product - current prices; TE - the number of tourist accommodation establishments; AR01 - the number of tourists who arrived at the tourist accommodation establishments; NS - the number of overnight stays in the tourist accommodation establishments; EMP - the average number of employees in the hotels and restaurants sector; NW - North-West, C - Centre, NE - North-East, SE - South-East, SM - South-Muntenia, BI - Bucharest-Ilfov, SWO - South-West Oltenia, W – West.

4.3. Panel Vector Error Correction Model

Analysing the relationship between the dependent and independent variables involved several steps. First, the vector error correction model (VECM) showed the variables' dynamics and how they returned to equilibrium after a shock. The steps of the analysis were (1) the test for unit root, (2) the cointegration test, (3) the development of the VECM, and (4) the impulse function. The period analysed was between 1993 and 2020.

The first step was to develop the panel unit root test, which required all variables to have the same properties. The variables needed the same order of integration. The results of the test showed that all series were stationary in the first difference and integrated of order one, I(1) (see Appendix A). The cointegration analysis was conducted using

the Johansen-Fisher panel cointegration test (see Appendix B). Based on the results, the alternative hypothesis was accepted, meaning that the variables were cointegrated with long-term relationships. The next step in the analysis was the development of the panel VECM, which showed the speed of return to equilibrium after a shock. In the case of a system with two variables and no lagged difference terms, the formulas for the vector error correction (VEC) model are those in Equation 2 and Equation 3:

$$\Delta y_{1,t} = \alpha_1\left(y_{2,t-1} - \beta y_{1,t-1}\right) + \varepsilon_{1,t} \quad (2)$$

$$\Delta y_{2,t} = \alpha_2\left(y_{2,t-1} - \beta y_{1,t-1}\right) + \varepsilon_{2,t} \quad (3)$$

Where:

- $y_{i,t}$ is the variable.
- α_i is the coefficient measuring the speed of adjustment towards the equilibrium of the i-th endogenous variable.
- β_i is the cointegrating vector.
- $\varepsilon_{i,t}$ is the error term.

In our case, the equation that considered the GDP variable in difference as the dependent variable is written as follows (R-squared = 0.23) (see Equation 4 and Equation 5):

$$\Delta GDP_t = \alpha_1 \times (GDP_{t-1} + \beta_1 \times TE_{t-1} - \beta_2 \times AR01_{t-1} + \beta_3 \times NS_{t-1} - \beta_4 \times EMP_{t-1} - u_t) + \alpha_2 \times \Delta GDP_{t-1} + \alpha_3 \times \Delta GDP_{t-2} + \alpha_4 \times \Delta TE_{t-1} + \alpha_5 \times \Delta TE_{t-2} + \alpha_6 \times \Delta AR01_{t-1} + \alpha_7 \times \Delta AR01_{t-2} + \alpha_8 \times \Delta NS_{t-1} + \alpha_9 \times \Delta NS_{t-2} + \alpha_{10} \times \Delta EMP_{t-1} + \alpha_{11} \times \Delta EMP_{t-2} + \varepsilon_t \quad (4)$$

$$\Delta GDP_t = -0.242 \times (GDP_{t-1} + 42.190 \times TE_{t-1} - 0.037 \times AR01_{t-1} + 0.003 \times NS_{t-1} - 1.353 \times EMP_{t-1} - 31730.912) - 0.965 \times \Delta GDP_{t-1} - 0.244 \times \Delta GDP_{t-2} + 24.208 \times \Delta TE_{t-1} - 34.632 \times \Delta TE_{t-2} + 0.130 \times \Delta AR01_{t-1} + 0.055 \times \Delta AR01_{t-2} - 0.030 \times \Delta NS_{t-1} - 0.014 \times \Delta NS_{t-2} + 1.426 \times \Delta EMP_{t-1} + 0.976 \times \Delta EMP_{t-2} + 2513.450 \quad (5)$$

In the VEC model:

- The value of α_1 shows the long-term causality.
- Coefficients' values (from α_4 to α_{11}) show the causality in the short term if there are significant p-values for each (see Table 5).

The results showed that the variables were characterized by a long-run causality (from the independent to the dependent variable). Moreover, the speed of adjustment to long-term equilibrium for the system was represented by the α_1 value of -0.242 (24.2% annually).

The coefficients of the lagged independent variables (from α_4 to α_{11}) showed the positive (ΔTE_{t-1}, $\Delta AR01_{t-1}$, $\Delta AR01_{t-2}$, ΔEMP_{t-1}, ΔEMP_{t-2}) or negative (ΔTE_{t-2}, ΔNS_{t-1}, ΔNS_{t-2}) impact on the dependent variable, considering a one per cent change. Ceteris paribus, this impact is considered, on average, in the short run. If we check the values of the associated probabilities for each coefficient of the lagged independent variables (from $\alpha 4$ to $\alpha 11$), there are only two statistically significant coefficients: the coefficient of $\Delta AR01t-1$ ($\alpha 6$) and the coefficient of $\Delta NSt-1$ ($\alpha 8$).

Table 5. The VECM coefficients and associated probabilities.

System; Estimation Method: Least Squares; Sample: 1996–2020; Included observations: 200; Total system (balanced) observations: 1000		
Coefficient	**Coefficient value**	**Prob.**
α_1	-0.242	0.0001
α_2	-0.965	0.0107
α_3	-0.244	0.5484
α_4	24.208	0.3673
α_5	-34.632	0.1947
α_6	0.130	0.0003
α_7	0.055	0.0998
α_8	-0.030	0.0144
α_9	-0.014	0.2044
α_{10}	1.426	0.1041
α_{11}	0.976	0.1941

An impulse response function shows the effect of shocks on the variables' future (expected) values. For example, the impulse response function showed the impact of a shock on the GDP variable over ten years (see Figure 8). The effect of a positive shock showed a fluctuating evolution, but the effect was positive for the variables TE, AR01, and

EMP. In the case of the NS variable, the effect was negative at the beginning of the period before turning positive, then negative, and then positive again.

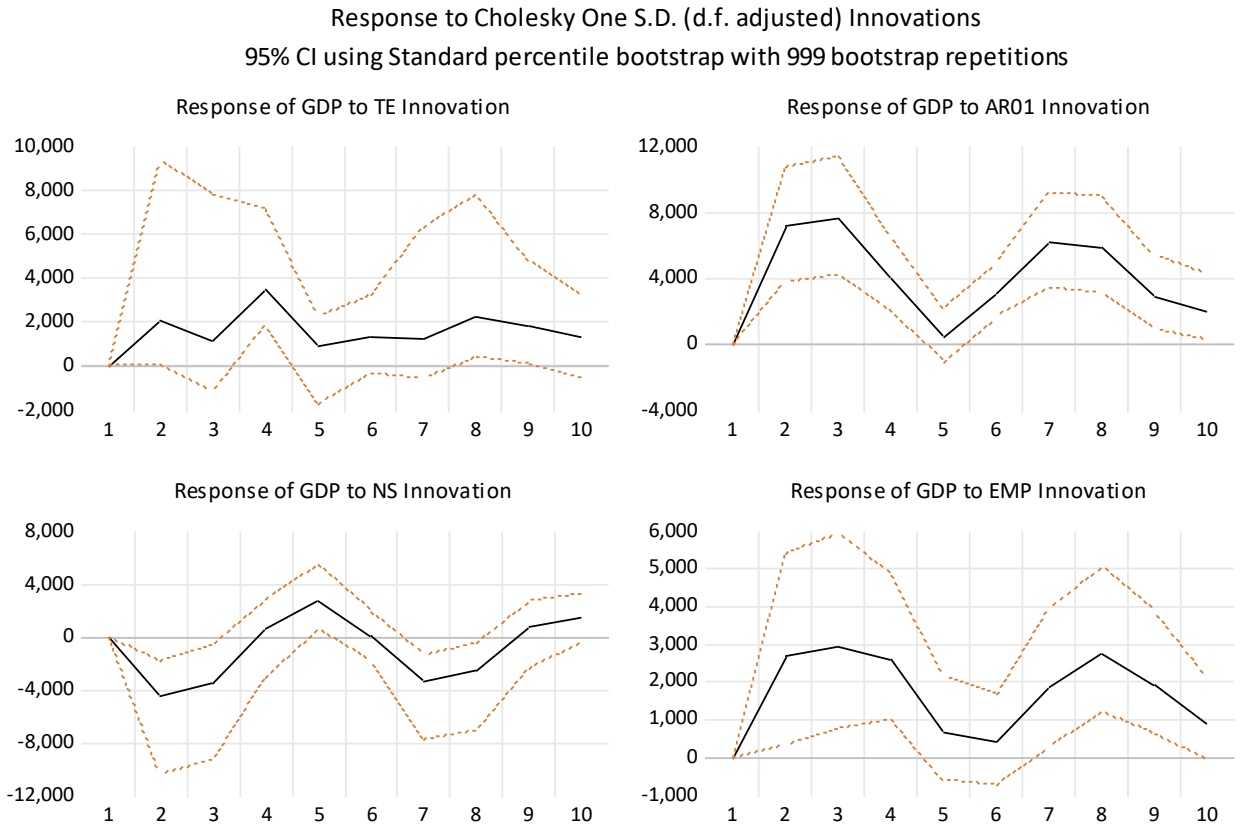


Figure 8. Impulse response functions of GDP.

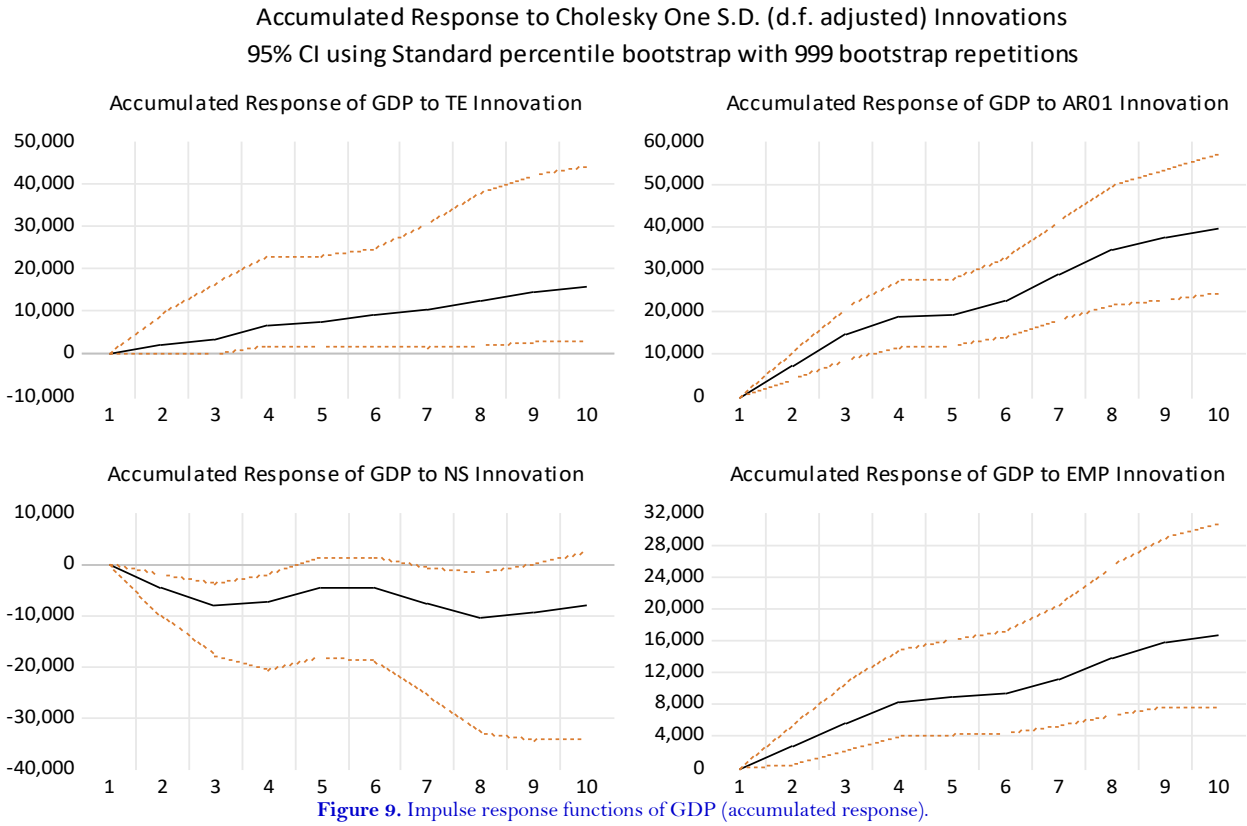


Figure 9. Impulse response functions of GDP (accumulated response).

The accumulated response (see Figure 9) indicated a positive effect of the variables TE, AR01, and EMP (the average number of employees in the hotels and restaurants sector) in ten years (the expected future values of the

variables). The effect was negative for the NS variable (the number of overnight stays in the tourist accommodation establishments), but the trend showed that after the 10th year, the effects might become positive.

5. CONCLUSIONS

The analysis investigated the evolution of tourism, focusing on the Romanian NUTS 2 level regions. We obtained interesting results using the tourism resilience efficiency index (TREI) and five important indicators (regional GDP, number of establishments, number of arrivals, number of overnight stays, and employment in the hotels and restaurants sector). The index is important because it shows regions' capacity to face the challenges of crises.

Thus, in the case of demand (tourist arrivals and overnight stays), all regions of Romania were shown to be resilient (values above 1) if we check the values of the index for the year 2011 (after the swine flu pandemic). However, if we check the values for 2020 (the COVID-19 pandemic year with available data), we can see that for two indicators, the regions are not resilient.

Considering the tourism supply side (tourism establishments and employment) and the economic level (regional GDP), the situation is different, indicating that many of Romania's regions are resilient (if we check the values of the index for both 2011 and 2020). The situation is as follows:

- Regarding tourism establishments:
  - In 2011, only three regions registered values below 1, the South-East, Bucharest-Ilfov, and North-West regions, although the North-West region registered a value close to 1 (0.988).
  - In 2020, the regions with index values below 1 were South-East, Bucharest-Ilfov, and South-Muntenia; in this case, the South-East region registered a value close to 1 (0.970).
- Regarding employment:
  - In 2011, four regions registered values below 1: Centre, South-East, West, and North-East.
  - In 2020, only the West region registered an index value of 1.
- Regarding GDP:
  - In 2011, all regions registered values above 1, except the South-West Oltenia region, but this region registered a value close to 1 (0.998).
  - In 2020, the regions with index values below 1 were the Centre, Bucharest-Ilfov, West, and South-Muntenia regions; however, these regions registered values close to 1, ranging from 0.996 to 0.999.

The VECM emphasized the long-run relationships between the variables. Also, the findings suggested a short-run causality relationship, running from the independent variables (the number of tourists who arrived at tourist accommodation establishments and the number of overnight stays in tourist accommodation establishments) to the dependent one (GDP). The impulse response function showed the effect of shocks on the variables' future (expected) values. There was a positive impact on GDP, except for the overnight stays variable.

Concerning the support policy measures necessary to develop local resilience through the remodelling of tourism and the creation of sustainable development engines, the results obtained from the comparative analysis of the two health crises suggest a new strategy for the regional development of tourism activities, based on the following pillars:

- Innovation in service offers, starting from local specifics – the local natural and anthropogenic potential – and emphasizing the flexibility of offers by customer category
- Integrated development at the local level to ensure accessibility, combined services addressed to customers, and connectivity with tourist routes or nearby locations for complementary activities associated with longer stays
- Sustaining resilience through creative destruction, with the valorization of less promoted local heritage
- The association of young people's employment with digital solutions for promoting and accessing services, using social media platforms to stimulate demand

Tourism companies and the local community must be involved in the systematic analysis of their development and comparison with other, potentially competing, locations at the national and international levels. It is important to adapt development strategies to incorporate the principles of nature preservation, support for the local economy,

and the promotion of local cultural specificity, as well as incorporating digital technology in the consumption of integrated tourism services. The authors suggest basing future research on these considerations.

The lack of available data after 2020 was the current study's main limitation. That is why future research should focus on the following:

- Re-computation of the tourism resilience efficiency index using newer data (after 2020).
- Analysing the effect of nights spent on GDP to identify the relationship between the variables; also, an intensity indicator might be used in the analysis with both cost and value-added components.

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APPENDIX

Appendix A. Panel unit root test statistics.

Variables	Levin, Lin, and Chu	ADF—Fisher Chi-Square	PP—Fisher Chi-Square
Level			
TE	8.340	0.465	0.383
AR01	−2.301 *	21.489	15.161
NS	−2.852 **	21.281	21.888
EMP	0.824	4.958	4.445
GDP	−2.273 *	16.720	16.720
First difference			
Δ(TE)	−6.421 ***	80.050 ***	121.686 ***
Δ(AR01)	−6.146 ***	57.209 ***	55.916 ***
Δ(NS)	−6.969 ***	66.442 ***	65.637 ***
Δ(EMP)	−16.099 ***	209.062 ***	244.361 ***
Δ(GDP)	−6.317 ***	57.754 ***	56.335 ***

Note: * p-value ≤ 0.05, ** p-value ≤ 0.01, *** p-value ≤ 0.001; GDP - regional gross domestic product - current prices; TE - the number of the tourist accommodation establishments; AR01 - the number of tourists who arrived at the tourist accommodation establishments; NS - the number of overnight stays in the tourist accommodation establishments; EMP - the average number of employees in the hotels and restaurants sector.

Appendix B. Johansen Fisher panel cointegration test.

Series: GDP TE AR01 NS EMP, Sample 1993 2020, Included observations: 224, Lags interval (in first differences): 1 1, Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)		
Hypothesized No. of CE(s)	**Fisher Stat. (from trace test)**	**Fisher Stat. (from max-eigen test)**
None	151.200***	99.340***
At most 1	68.280***	56.060***
At most 2	28.570*	16.63
At most 3	19.82	15.3
At most 4	14.63	14.63

Note: * p-value ≤ 0.05, *** p-value ≤ 0.001.