Article

The Enhancement of Sustainable Competitiveness of the CEE Regions at the Time of the COVID-19 Pandemic Instability

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Abstract: The promotion of competitiveness of regions is a key issue nowadays. However, because of the COVID-19 pandemic and the consequences of territorial dimension it caused, the approach towards the concept of regional competitiveness needs to be reformulated in which the sustainability perspective is underlined. Thus, the composition of factors that determine regional competitiveness should be redefined in a way that not only economic but to a greater degree social and concurrently environmental factors need to be considered. The objective of the paper is to discuss the concept of sustainable regional competitiveness and to identify factors that are of utmost importance for this regional competitiveness. The position of particular CEE regions in light of the selected indicators that could determine sustainable competitiveness has been examined. The analysis has allowed us to identify some factors that are crucial for sustainable regional competitiveness in the regions of CEE countries to enable achieving long-term growth in the sustainable manner. This study contributes to the research through proposing some factors that could reflect particular dimensions of sustainable competitiveness in CEE regions, by providing a measure of sustainable competitiveness and through identifying the position of CEE regions in terms of sustainable competitiveness. The support of these key factors may be taken into consideration while planning the interventions within the regional policy.

Keywords: sustainable competitiveness; regional competitiveness; COVID-19; regions; resilience; EU; Central and Eastern European countries

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1. Introduction

The COVID-19 pandemic brought about some instability in the world economy. There are different repercussions in many spheres, not only economic but social and environmental as well. They are diversified, also on the regional level. Especially the regions of Central and Eastern Europe (CEE) countries, which joined the EU in 2004 and which are characterised by a low level of economic development, could be severely affected and face serious challenges. Thus, they should make some efforts to enhance their resilience in the face of instability and changing external environment due to the pandemic. In the long term, they should increase their competitiveness.

The enhancement of competitiveness, including territorial units, through supporting some factors that marked such competitiveness is a key issue nowadays [1–4]. Regions should constantly improve their competitive position, also in relation to other regions located in different countries. However, the COVID-19 pandemic drew special attention to its social and environmental repercussions. Thus, the approach to competitiveness has been reformulated. The position of regions in the international environment should be shaped taking into consideration not only economic but also social and environmental perspectives. Competitiveness, also on the regional level, should be promoted in a sustainable manner and this approach is currently discussed [1] (p. 632).

The objective of this paper is to discuss the concept of sustainable regional competitiveness at the pandemic time and to identify factors that are crucial for this kind of regional

competitiveness. The position of particular CEE regions in light of the selected indicators has been examined.

Taking into consideration the aforementioned discussion, the following research questions were formulated:

Research Question 1 (RQ1): *What factors are essential for creating regional sustainable competitiveness?*

Research Question 2 (RQ2): *What is the position of CEE regions in terms of sustainable competitiveness?*

Nowadays, the concept of regional competitiveness, including sustainable competitiveness, is being discussed [1,2,5]. However, the novelty of this research is that it identifies factors that could reflect the dimensions of sustainable competitiveness in CEE regions and set their position. The measure of sustainable competitiveness has also been proposed. This comprehensive approach has been neglected in research so far.

The following thesis has been formulated: The enhancement of sustainable regional competitiveness requires the promotion of specific factors for each dimension of competitiveness in CEE regions.

The following methods were applied: the analysis of literature, induction and deduction, factor analysis.

The paper consists of three parts. The first part concentrates on the discussion concerning the concept of regional sustainable competitiveness and its role in promoting resilient regional economies at the time of COVID-19. The second part examines factors that characterise different dimensions of sustainable competitiveness in the CEE regions that are identified. The ranking of CEE regions in terms of sustainable competitiveness has also been presented. The next two parts of the paper include discussion and conclusions.

2. Promotion of Regional Sustainable Competitiveness in the COVID-19 Pandemic—Literature Review

2.1. A Regional Dimension of the Impact of the COVID-19 Pandemic

The COVID-19 pandemic impact is of unprecedented scale as it has affected more than 50 million people all over the world. Lockdowns and containment measures were imposed on more than half of the world's population [6] (pp. 2–3). The pandemic has had diversified effects on the development of countries and their regions. The impact on demand and supply and the negative effects on the world economy [7], not only in particular countries, is underlined. Particular fields such as international trade, foreign direct investment flows, global production, and employment affected by COVID-19 [8,9] have been discussed. The social impact of the pandemic reflected in poverty, mostly experienced by women, has been analysed [10]. The impact of the pandemic on ecology and the energy sector has also been presented [11].

Bailey et al. 2020 stresses that the impact of the pandemic geographically is unevenly distributed. It has been regional rather than national, and the variations of the impact and its intensity are high within countries [12,13] (pp. 32–37). Not only economic but social, employment, and demographic consequences are also recorded on the regional level [13] (pp. 73–76). OECD underlines the heterogeneity of the territorial impact of COVID-19, and it identifies its different dimensions related to health, economic, social, or fiscal impact [6]. The economic impact is reflected across the regions differently and is related to the exposure of regions to tradable sectors, to global value chains. Regional employment has also been affected [6]. The studies on the regional impact in certain countries confirm the heterogeneity of the local economic impact of COVID-19 in selected countries [14], i.e., in their specific areas both urban [15,16] and rural [17].

Böhme and Besana also point out high asymmetry of the territorial impact of COVID-19 and they underline that it is due to the health repercussion of COVID-19 and the territorial dimension of policy responses. The exposure and sensitivity to COVID-19 policy responses differ and, hence, the territorial impact of the pandemic varies [18] (pp. 3–10). It is the result of policy responses timing and the length of lockdowns. The restrictions on

mobility are also decisive for the differences in the intensity of the impact. The medium and long-term impact depends on the spread of the disease and its influence on the structure of the economy. The policy tools, also the financial ones, which support certain activities could influence the ability to reduce economic costs [12].

The impact of COVID-19 on subnational governments is worth mentioning. In the short- and medium-term, the impact on their finances due to a large increase in expenditures and decreasing revenues, so-called “scissors effect” is observed. The subnational governments have strong pressure to increase spending and the largest increase refers to social services, social benefits spending, including SMEs, the self-employed, public health, mostly these domains in which they have responsibilities. They are planning to borrow new funds to cover expenditures related to counteracting the negative effects of the pandemic instability and to introduce some recovery measures [19]. The multi-level governance framework is decisive for the scale of effect of the pandemic. If decentralisation is high, then a high impact on the subnational expenditures is also observed. The levels of government are affected differently, and delayed effects are recorded between regions due to the geographic localisation, socio-demographic profile, and their economic activities [6] (pp. 29–30).

Regional policies should respond to the current challenges, and top priorities for decision makers to be attained include access to basic services that are affordable and accessible across territories, promoting regional resilience, and counteracting digital divide. Regional and municipal respondents indicate that a transition to a sustainable and low-carbon economy is also important when elaborating the regional development policy [19].

2.2. Sustainable Regional Competitiveness at the Time of COVID-19 Instability

European Union regions present different growth patterns and, therefore, the core and periphery spatial regime could be distinguished. The determinants of their growth differ (examining growth dynamics 2009–2015). Most CEE regions were classified among the regions in the peripheral spatial regime [20]. Therefore, they could also present different growth patterns under the pandemic. The group of newly admitted countries to the EU after 2004 is diversified as far as GDP growth rate in 2020/2019 is concerned. Selected CEE countries recorded a strong decrease in terms of GDP. In Croatia, for example, the GDP growth rate dropped to -8.0% , while in Lithuania to -0.9% , and Poland to -2.7% , due to pandemic repercussions [21]. The analysis of changes related to regional GDP in 2020 is not possible because of GDP data limitations on the EU regional level. However, the data concerning the unemployment rate are available and they show an increase in the unemployment rate to a varying extent (among people aged 15–74) in most of these regions compared to 2019. In about 31% of the regions, the unemployment rate fell in 2020 in comparison with the previous year [22].

Considering the diversified impacts of the pandemic on the territorial units, the question is how to promote resilient regions in this turbulent time. If we employ a systemic perspective, then the concept of system resistance to shocks returning to a previous state could be adopted. However, sometimes it is not desirable or possible. Therefore, the complex adaptive system approach underlines the non-linear dynamics and also the adaptive capacity. Thus, resilience is not related to returning to normality but could be perceived through the prism of the capacity to adapt [23] (pp. 94–95). Referring to the discussion above the notion of resilience as an adaptation to some challenges and hereinafter the capability of local places and its governments to withstand the global economic punches while respecting environmental limits, external changes, and assuring high levels of social inclusion is also underlined [24,25]. If we adapt the notion of resilience to external shocks, then the adaptability of the system means resilience and the adaptive cycle model was proposed [26] (pp. 1306–1315). Taking into account different approaches towards resilience, we can assume that resilience enables the system of the regional economy as such to absorb and rebound from a shock to improve its performance through some changes of different

nature (structural, functional, and organizational). Resilience of the particular region is reflected in its rate of growth [25], for example.

Promotion of competitiveness, which requires some changes to attain regional growth, can be regarded as a determinant of the resilience of the region [27]. The pandemic puts social and environmental issues [28,29] on the agenda, which should be reflected in the current approach towards competitiveness.

In light of the aforementioned discussion, the concept of sustainable competitiveness whose promotion could keep the regions resilient in the face of social problems, growing polarization of societies, and environmental problems is of particular importance during the COVID-19 pandemic.

Aiginger, Bärenthaler-Sieber, and Vogel underline the need to redefine the competitiveness concept in relation to a region as its ability “to deliver the beyond-GDP goals for its citizens” [30] (p. 1). This concept captures the transition of the economy towards a more dynamic path of growth, more socially inclusive and environmentally sustainable, where the ultimate aim is the welfare of citizens. Under the new perspective, the facets of competitiveness should not be reduced to price competitiveness. A broader approach and interpretation also embrace the quality/technological competitiveness through the prism of sources of competitiveness and their prospects. During the transition to a new growth path, there are some components that are important including the capability of the social system (social aspect), and the ecological aspect, which could be the driver of economic growth [30] (pp. 9–14).

Sustainability is also underlined in another definition of regional competitiveness, according to which it is “the ability to offer an attractive and sustainable environment for firms and residents to live and work” [31] (p. 4). Thus, also including commercial and well-being goals [31] (p. 4). Corrigan et al. stress that sustainable competitiveness is “the set of institutions, policies, and factors that make a nation productive over the longer term while ensuring social and environmental sustainability” [32] (p. 55) and this concept has been adopted for the purpose of this paper. Social and environmental sustainability constitute an integral part of the concept of sustainable competitiveness. The concept of regional sustainable competitiveness at the time of the pandemic is presented in Figure 1, which underlines three main pillars (spheres) of sustainable competitiveness: economic, social, and environmental, which are adopted in this study to operationalise this concept.

Figure 1. The concept of regional sustainable competitiveness at the time of the COVID-19 pandemic. Source: own elaboration.

The resilience of regions is inevitably associated with the sustainable competitiveness. There is a question concerning factors that could contribute to the regional competitiveness with respect to its sustainability. The factors explaining regional competitiveness is widely recognized, which try to capture the complexity of this competitiveness [33]. They can be presented as the model, e. g., formed the regional hat [3]. However, the causes of sustainable competitiveness, due to the complexity of this notion are difficult to capture. Doyle 2017 reviewed a wide range of indicators referring to sustainable competitiveness and describing them as a set of elements, with economic performance being the central pillar and the social and environmental the domains [34]. Aiginger 2013 grouped these factors into the income, social, and ecological pillars from the country perspective [30]. This country perspective was adopted in another study [35].

Aiginger and Frigo present the drivers of regional competitiveness in the new perspective, which are innovation, education, institutions, social cohesion, and ecological ambitions [36]. However, there is a lack of consensus regarding the factors underpinning the regional sustainable competitiveness and its measurement.

3. Materials and Methods

Taking into account the aforementioned discussion, the paper aims at presenting not only the concept of sustainable competitiveness at the time of the pandemic but also at identifying factors that are decisive for regional competitiveness. CEE regions could be classified as the group which on average present a similar spatial pattern of growth. It is assumed that similar factors could determine sustainable competitiveness for the whole group of CEE regions. To attain the specified objective the following research questions have been formulated:

Research Question 1 (RQ1): *What factors are essential for creating regional sustainable competitiveness?*

Research Question 2 (RQ2): *What is the position of CEE regions in terms of sustainable competitiveness?*

The following thesis has been identified and formulated: The enhancement of sustainable regional competitiveness requires the promotion of relevant factors for each dimension of competitiveness, specific for CEE regions.

The competitiveness has been analysed in the group of 57 regions NUTS 2 level from the following CEE countries: Bulgaria (6), Czechia (8), Croatia (2), Hungary (8), Latvia (2), Poland (17), Romania (8), Slovenia (2), and Slovakia (4).

In order to answer the above research questions and verify the thesis, a factor analysis technique was used. Numerous studies of a country or a regional dimension are also related to innovativeness applied to the factor analysis [37–40].

The following steps in factor analysis were applied, on the basis of the literature review [41–44].

A large number of variables were collected, which described each of the competitiveness dimension for CEE regions: economic, social, and environmental. The data was derived from the database from the European Social Progress Index on the European regional level [45] and from the European Statistical Office [46]. It covers the period before the pandemic years, 2015–2020, depending on the indicator. In total, 59 variables were taken into consideration.

Then the variables that showed low coefficient of variations 10% or less were removed. The variables were standardized because they were presented in different units of measurement, and it was difficult to compare them. The correlation matrix was prepared for each of the dimension, which allowed us to show a high correlation among several variables. The significance of those links could explain the existing correlation between variables, and, thus, the rationale for using factor analysis. However, the variables with the correlation above 90% were excluded.

Factor analysis was preceded by calculating the value of the Kaiser–Meyer–Olkin measure (KMO). The Bartlett’s test of sphericity was also applied in order to confirm that

data reduction analysis produces a result that is meaningful. The Kaiser's criterion was used to select the number of factors.

The existing set of variables in each dimension was reduced to a certain number of hypothetical factors describing each of the dimension of sustainable competitiveness in the best possible way.

4. The Results

The economic dimension of competitiveness covers factors that contribute to high growth and productivity including institutions. The initial set of indicators covers 20 variables and finally, following the procedure indicated in the methodology part, they were reduced to 12 variables (Table 1). The analysis allows us to identify three factors characterising regional competitiveness that are related to education and human resources, institutions, and ICT development, which importance is confirmed in some studies.

The economic dimension of sustainable competitiveness comprises three factors (Table 1). Factor 1 referring to education and human resources well qualified. The first eigenvalue of 3.78 corresponds to this first factor that associated with 29% of the variance in the original data. The second eigenvalue is 3.13 and corresponds to 24% of the variance in the original data. The second factor relates to the institutional framework of regions. While the third eigenvalue is 3.93 and corresponds to 30.2% of the total variance in the data. Factor 3 consists of variables creating a conducive environment and framework for ICT development. The identified factor explained 83.2% of the initial variance of variable.

The achievement of a high social dimension of competitiveness determines high competitiveness because growth opportunities must be gained by each member of society. Therefore, the achievement of social inclusion and social cohesion is put on the agenda. If this dimension is associated with all the factors, institutions, and policies that make people healthy, active, and safe [32] (p. 55), a wide set of indicators could describe this dimension. This approach underlines that people enhance their potential to benefit from prosperity and they make some contribution [32] (p. 55). Initially, 35 indicators were selected for the analysis and they were reduced to twelve indicators (Table 2). The analysis revealed that three factors are important when social aspects are included in the concept of competitiveness. They are related to trust and support to government and the effectiveness of its activities, security, and environment, which is conducive to the development of the human-being.

The cumulative percentage of the total variance explained by the factors amounted to 76.1%. The first eigenvalue corresponding to the first factor was equal to 3.37 and corresponds to 28% of the variance in the original data. Factor 1 related to the support for the government and policy effectiveness covers indicators concerning trust in the national government, the legal system, and the effectiveness of the policy to assure security. The second eigenvalue of 1.77 corresponds to the second factor that associated with 14.7% of variance in the original data. Factor 2 is related to personal security and safety. The third eigenvalue is 4.01 and corresponds to 33.4% of the variance in the original data. Factor 3 refers to conducive regional environment for health.

Finally, the environmental dimension of sustainable competitiveness could be characterised by institutions, policies, and factors to assure the management of resources in an efficient way. However, the prosperity of generations must also be attained [32] (p. 55). Initially, four variables were taken into consideration, but they were reduced to three variables. The only one eigenvalue that was equal to 2.196 corresponds to 73.2% of the total variance in the original data (Table 3).

Table 1. Economic dimension of regional competitiveness—latent factors, and variables.

Variable	Factor 1 Education and Human Resources Well Qualified	Factor 2 Institutions	Factor 3 ICT Development	Total Variance Explained	KMO	Bartlett's Test of Sphericity	Sig
Upper-secondary enrolment rate (percentage of 14–18-year-old students enrolled)	0.615				0.843	Chi Squared	Df
Lower-secondary completion only (percentage of people aged 25 to 64 who have successfully completed, at most, lower-secondary education)	0.628					765.147	78
Tertiary education attainment (percentage of population aged 25–64 with tertiary education attainment)	0.949						0.000
Human Resources in Science and Technology (persons with tertiary education and/or employed in science and technology as a percentage of active population)	0.914						
Disposable income in PPS per inhabitant	0.764						
Institution quality index (quality and accountability of government services)		0.784					
Institution corruption index (perceived level of corruption)		0.910					
Institution impartiality index (level of impartiality of government services)		0.836					
Online interaction with public authorities (percentage of individuals who used the internet to interact with public authorities)			0.773				
Internet access (share of people who declared they have access whether on a mobile phone, a computer, or another device)			0.880				
Lifelong learning (percentage of people aged 25 to 64 who stated that they have received education or training in the four weeks preceding the survey)			0.843				
Total intramural R&D expenditure as a % of GDP			0.738				
Eigenvalue	3.775	3.125	3.927				
% variance	29.0	24.0	30.2	83.2			

Source: own elaboration.

Table 2. Social dimension of regional competitiveness—latent factors and variables.

Variable	Factor 1 Support for Government and Policy Effectiveness	Factor 2 Personal Security	Factor 3 Regional Environment for Health-Nutrition, Basic Healthcare and Wellness	Total Variance Explained	KMO	Bartlett's Test of Sphericity		
Crime (percentage of people who declared they had faced the problem of crime, violence, or vandalism in the local area)	−0.712				0.761	Chi Squared	Df	Significance
Trust in the national government (share of people who have confidence in their national government)	0.882					532.256	66	0.000
Trust in the legal system (share of people who have confidence in their country's judicial system and court)	0.884							
Trust in the police (share of people who have confidence in their local police force)	0.676							
Money stolen (share of people who claimed that, within the last 12 months, they had money or property stolen from themselves or another household member)		0.804						
Assaulted/mugged (share of people who claimed they have been assaulted/mugged)		0.807						
Premature mortality < 65 (percentage ratio between the number of deaths below age 65 and the population below the age of 65)			0.921					
Infant mortality (per 1000 live births)			0.601					
Insufficient food (percentage of people claiming they are living in a household that cannot afford a meal with meat, chicken, fish every second day)			0.649					
Standardised cancer death rate (for those under 65 years old to cancer per 100,000 inhabitants)			0.707					
Standardised heart disease death rate (for those under 65 years old to ischemic heart diseases per 100,000 inhabitants)			0.837					
Leisure activities (percentage of people who regularly participated in leisure activity)			−0.918					
Eigenvalue	3.366	1.766	4.006					
% of variance	28.0	14.7	33.4	76.1				

Source: own elaboration.

Table 3. Environmental dimension of regional competitiveness—latent factor, and variables.

Variable	Factor 1
Air pollution NO ₂	−0.616667
Air pollution PM _{2.5}	−0.938803
Air pollution PM ₁₀	−0.966553
Eigenvalue	2196
% of variance	73.2

Source: own elaboration.

The question is (RQ2): What is the position of CEE regions in terms of sustainable competitiveness? To answer this question, we used the sum of standardized variables (SSV), which was calculated for each of the dimension of competitiveness and for sustainable competitiveness treated as the total and then presented them in the ranking (Tables 4 and 5). The Czech regions are characterized by high sustainable competitiveness. The highest position in the ranking was taken by the two Czech regions because they are characterised by the highest value of SSV. Six out of eight Czech regions were classified among the tenth best regions. The last positions in the general ranking of sustainable competitiveness were taken by Romanian and Bulgarian regions.

Table 4. The rank of regions in terms of sustainable competitiveness according to the sum of standardized variables.

NUTS 2 Region	Region's Name	Ranking	SSV
CZ01	Praha	1	1.0749
CZ06	Jihovýchod	2	0.9215
SI04	Zahodna Slovenija	3	0.8501
CZ03	Jihozápad	4	0.7706
SK01	Bratislavský kraj	5	0.7517
PL91	Warszawski stołeczny	6	0.7323
CZ02	Střední Čechy	7	0.7201
CZ07	Střední Morava	8	0.7152
CZ05	Severovýchod	9	0.6996
SI03	Vzhodna Slovenija	10	0.6904
LT01	Sostinės regionas	11	0.5441
PL63	Pomorskie	12	0.5111
PL21	Małopolskie	13	0.4853
LT02	Vidurio ir vakarų Lietuvos regionas	14	0.4579
PL84	Podlaskie	15	0.4417
CZ08	Moravskoslezsko	16	0.3954
PL92	Mazowiecki regionalny	17	0.3091
HU11	Budapest	18	0.2905
PL82	Podkarpackie	19	0.2839
PL81	Lubelskie	20	0.2757
PL51	Dolnośląskie	21	0.2710

Table 4. Cont.

NUTS 2 Region	Region's Name	Ranking	SSV
PL22	Śląskie	22	0.2262
PL41	Wielkopolskie	23	0.2059
PL52	Opolskie	24	0.2037
HU22	Nyugat-Dunántúl	25	0.1968
PL42	Zachodniopomorskie	26	0.1861
SK02	Západné Slovensko	27	0.1640
PL62	Warmińsko-mazurskie	28	0.1517
PL61	Kujawsko-pomorskie	29	0.1277
HR03	Jadranska Hrvatska	30	0.1228
HU21	Közép-Dunántúl	31	0.1141
PL72	Świętokrzyskie	32	0.1033
PL43	Lubuskie	33	0.0952
CZ04	Severozápad	34	0.0884
HU12	Pest	35	0.0574
PL71	Łódzkie	36	0.0123
HU33	Dél-Alföld	37	−0.0058
SK03	Stredné Slovensko	38	−0.0627
SK04	Východné Slovensko	39	−0.1325
HU23	Dél-Dunántúl	40	−0.1674
HR04	Kontinentalna Hrvatska	41	−0.2814
RO32	Bucureşti-Ilfov	42	−0.3907
HU32	Észak-Alföld	43	−0.3921
HU31	Észak-Magyarország	44	−0.5378
RO42	Vest	45	−0.6068
RO12	Centru	46	−0.7072
BG41	Yugozapaden	47	−0.7378
BG32	Severen tsentralen	48	−0.7705
RO11	Nord-Vest	49	−0.8034
RO31	Sud-Muntenia	50	−0.8810
RO41	Sud-Vest Oltenia	51	−0.8914
BG33	Severoiztochen	52	−0.9131
BG42	Yuzhen tsentralen	53	−1.0091
RO21	Nord-Est	54	−1.0311
BG34	Yugoiztochen	55	−1.2376
RO22	Sud-Est	56	−1.2539
BG31	Severozapaden	57	−1.4348

Source: own elaboration.

Table 5. Ranking of NUTS 2 regions of CEE countries according to each dimension of sustainable competitiveness with the use of the SSV.

Ranking	NUTS 2 Region	Economic	Ranking	NUTS2 Region	Social	Ranking	NUTS 2 Region	Environmental
54	BG31	−1.39948	57	BG31	−1.64569	48	BG31	−0.74413
46	BG32	−0.73272	52	BG32	−0.93928	40	BG32	−0.25924
48	BG33	−0.91128	55	BG33	−1.18319	21	BG33	0.159244
55	BG34	−1.42228	56	BG34	−1.24928	46	BG34	−0.39018
35	BG41	0.019788	54	BG41	−1.15619	57	BG41	−2.34691
49	BG42	−1.06238	51	BG42	−0.89043	52	BG42	−1.25313
1	CZ01	1.658575	3	CZ01	0.758667	38	CZ01	−0.18925
10	CZ02	0.724649	7	CZ02	0.706577	11	CZ02	0.754623
9	CZ03	0.727273	8	CZ03	0.686977	4	CZ03	1.293131
39	CZ04	−0.15606	30	CZ04	0.173765	9	CZ04	0.806084
11	CZ05	0.695327	5	CZ05	0.724501	13	CZ05	0.618932
5	CZ06	1.137309	6	CZ06	0.715604	8	CZ06	0.809928
7	CZ07	0.78231	2	CZ07	0.784509	24	CZ07	0.147501
14	CZ08	0.633401	14	CZ08	0.509657	50	CZ08	−1.09316
41	HR03	−0.35691	20	HR03	0.319109	2	HR03	1.416537
43	HR04	−0.4067	38	HR04	−0.12678	44	HR04	−0.35659
8	HU11	0.760505	26	HU11	0.211458	53	HU11	−1.42988
33	HU12	0.030678	27	HU12	0.197842	45	HU12	−0.38852
36	HU21	−0.02179	29	HU21	0.188534	18	HU21	0.405661
37	HU22	−0.03546	19	HU22	0.358298	15	HU22	0.557692
42	HU23	−0.39582	35	HU23	−0.00121	22	HU23	0.157532
45	HU31	−0.50113	45	HU31	−0.63387	42	HU31	−0.31289
44	HU32	−0.422	43	HU32	−0.43422	35	HU32	−0.09373
28	HU33	0.085499	37	HU33	−0.11039	32	HU33	0.016934
4	LT01	1.173505	41	LT01	−0.35365	3	LT01	1.407219
13	LT02	0.63728	39	LT02	−0.13458	1	LT02	2.050828
16	PL21	0.530898	1	PL21	0.934769	55	PL21	−1.51041
17	PL22	0.394384	11	PL22	0.578337	56	PL22	−1.91083
19	PL41	0.307177	25	PL41	0.226379	43	PL41	−0.31471
26	PL42	0.118591	33	PL42	0.061329	6	PL42	0.97777
32	PL43	0.034666	34	PL43	0.041059	14	PL43	0.574489
18	PL51	0.371919	22	PL51	0.264102	37	PL51	−0.13892
20	PL52	0.217502	18	PL52	0.367541	47	PL52	−0.51137
23	PL61	0.176533	31	PL61	0.118998	33	PL61	−0.0492
38	PL62	−0.03553	28	PL62	0.194855	10	PL62	0.790263
15	PL63	0.563143	21	PL63	0.307312	5	PL63	1.100353
25	PL71	0.155975	32	PL71	0.106845	49	PL71	−0.9881
30	PL72	0.05956	23	PL72	0.248393	41	PL72	−0.28799
24	PL81	0.168707	17	PL81	0.421576	23	PL81	0.156153
29	PL82	0.074035	12	PL82	0.576304	31	PL82	0.023956
22	PL84	0.177908	10	PL84	0.606749	7	PL84	0.924312
2	PL91	1.287123	9	PL91	0.608104	51	PL91	−1.17513
21	PL92	0.202574	16	PL92	0.478546	26	PL92	0.092696
50	RO11	−1.13899	47	RO11	−0.67062	25	RO11	0.120026
51	RO12	−1.16171	42	RO12	−0.41188	28	RO12	0.080779
56	RO21	−1.5331	50	RO21	−0.76727	27	RO21	0.088861
57	RO22	−1.69999	53	RO22	−1.09148	30	RO22	0.029882
52	RO31	−1.2569	48	RO31	−0.67468	34	RO31	−0.07738
27	RO32	0.091076	46	RO32	−0.64777	54	RO32	−1.4505
53	RO41	−1.2794	49	RO41	−0.70367	29	RO41	0.038669

Table 5. Cont.

Ranking	NUTS 2 Region	Economic	Ranking	NUTS2 Region	Social	Ranking	NUTS 2 Region	Environmental
47	RO42	−0.90951	44	RO42	−0.49557	19	RO42	0.260415
12	SI03	0.669559	4	SI03	0.727831	12	SI03	0.631216
3	SI04	1.26849	13	SI04	0.552863	20	SI04	0.226439
6	SK01	1.046799	15	SK01	0.50548	16	SK01	0.457943
34	SK02	0.029645	24	SK02	0.244602	17	SK02	0.423977
31	SK03	0.043716	40	SK03	−0.16206	36	SK03	−0.12605
40	SK04	−0.21694	36	SK04	−0.02372	39	SK04	−0.20182

Source: own calculation.

The rankings of regions according to each dimension of sustainable competitiveness allows us to identify some regions that have a similar position in terms of the economic and social dimensions. There are also regions whose positions in both rankings are diversified and this needs further studies.

To measure the strength and direction of relationship between two dimensions of sustainable competitiveness, Spearman's rank-order correlation was adopted. It showed monotonic association between economic and social dimension of sustainable competitiveness. Spearman's correlation coefficient stood at $r_s = 0.799002$. However, there is no correlation between ranks of the environmental dimension of sustainable competitiveness and other dimensions, i.e., economic and social ones, assuming the adopted data.

5. Discussion

During an unstable economic situation, including a pandemic, the achievement of growth should be beneficial for all members of society and without a detrimental effect on the environment. Thus, the concept of sustainable regional competitiveness should be strongly promoted. There are some methods allowing us to measure competitiveness, e.g., a Cobb–Douglas production function [47], multiple-criteria decision making techniques [48], the taxonomic methods [49] or the factor analysis. The factor analysis applied in this study enabled us not only to reduce the number of variables but also to identify a limited number of factors—pillars—of each dimension of competitiveness. Then, the SSV allowed us to create the ranking of the regions of CEE countries.

The ranking of regions in terms of competitiveness have also been constructed, i.e., regional competitiveness index [33,50] and others [51]. However, it is difficult to make comparisons between rankings due to different factors/indicators included in the index.

The conducted analysis in this paper identified some factors specific for regional competitiveness, the importance of which was confirmed in some studies.

The economic dimension of sustainable competitiveness refers to human capital, fundamental for economic growth. Human capital is essential for the new economy and knowledge-based activities. It is reflected on the education level and its capacity for the modern economy supported by the available financial resources as well as in stock of human capital described by employment in high-tech sectors (human resources in science and technology). The level of education is an important driver of productivity [3] (pp. 3–35). Thus, human capital constitutes a driver of competitiveness being the primary factor in the regional investment climate [3] (pp. 2–37).

The factor: Institutions contribute to competitiveness. However, the further question is: what kind of institution matters? No one size fits all, different institutional arrangements are required, “there is a lack of consensus as to whether institutions are a prerequisite or a natural outcome of development” [52] (pp. 14–15). Institutions are crucial for facilitating the input to be transferred to high-value outcomes. Institutional enablers determine the potential for competitiveness, being the most important factor in the regional system [53]. High quality institutions have a significant impact on entrepreneurship and economic growth [54].

ICT and the potential to develop in this dimension is key issue nowadays. The factor related to ICT is often neglected in the studies on regional competitiveness. Digital transformation can boost economic growth as well as economic cooperation, best exemplified by western Balkan countries [55]. Some studies underline the role of ICT for competitiveness [56,57]. However, they confirm that the promotion of regional competitiveness through ICT seems to be a difficult process, which could also lead to growing disparities [58]. The regions should be smart as well as cities [59].

The social aspect of competitiveness should be taken into consideration including qualitative factors. The conducted analysis revealed some decisive factors for the social aspect of regional competitiveness: nutrition, basic healthcare, health, and wellness, which constitute important factors for the social dimension of competitiveness. The identified factors are confirmed in the literature and relate to these factors that characterise social cohesion.

These factors refer to the favourable living conditions, quality of life. They also refer to social cohesion, which can be perceived and measured by the inequality dimension regarding the factors mentioned above, also promoting and reducing disparities in terms of health status and basic healthcare [60]. It can be perceived as and measured by the existing social disparities reflected in different indicators [61] (pp. 21–23) and related to social cohesion in terms of social relations and interconnectedness with a political outcome, wellbeing, equity, and political order [62] (p. 11). The Council of Europe perceived social cohesion through the prism of society's ability to secure long-term well-being [63] (p. 23).

The second identified factor, i.e., the support for the government and policy effectiveness covers variables related to security and trust in institutions, which in the analyses relates to social capital dimension [60]. Social cohesion or "a cohesive society is characterised by resilient social relations, a positive emotional connectedness between its members and the community and a pronounced focus on common goods" [64] (p. 13). Three domains can be mentioned here: connectedness, social networks and focus on the common goods [64], and, as Jensen indicates, social cohesion as trust [61] (p. 24). Besides, the level of crime in deprived areas is related to social cohesion [65].

The third factor relates to personal security reflected in the indicators referring to violence [66]. Good social protection, and quality of governance and public institutions are essential. It also describes social protection and state-building [62] (p. 5).

The social, environmental, and economic factors should be the mutual reinforcing dimensions that creates resilient regions.

The regions of CEE do not present a homogenous group in terms of sustainable competitiveness and could have the potential to create resilient economy at the time of the pandemic. They are differently equipped with all these factors and must create their own combination of factors that constitute this kind of regional competitiveness.

This study allows us to identify factors that could contribute to sustainable competitiveness in regions of the CEE countries. However, it is a preliminary study that needs further conceptualization, especially the significance of identified factors from the pandemic perspective. This study has some practical significance. The proposed factors characterising the dimension of sustainable competitiveness may be taken into consideration by public authorities while planning interventions in the regions. The created rankings in each sphere of competitiveness and generally in competitiveness allow us to identify the position of each region in the group and elaborate such activities to be implemented that may contribute to enhancing specific factors of competitiveness.

6. Conclusions

The COVID-19 pandemic affected regional economies in a diversified way. Its repercussions are reflected in many spheres: economic, social, and environmental. The concept of sustainable regional competitiveness is under consideration and deeply discussed particularly at this turbulent time when keeping resilience and enhancing growth in regions are necessary.

The analysis allows us to identify the factors that are decisive for each dimension of sustainable regional competitiveness in the regions of CEE countries, the promoting of which will allow us to achieve long-term growth beneficial not only from an economic but also social and environmental perspectives. The regions of the CEE countries that were taken into consideration are diversified as far as all the dimensions of sustainable competitiveness are concerned. However, while ranking of regions in terms of competitiveness in relation to social and economic dimensions, the relationship was proved. The study could be a starting point for discussion on measurement of regional competitiveness from the sustainability perspective.

The conducted study has various limitations. Firstly, the limitations of data that is available and its completeness. Especially the environmental dimension of regional competitiveness requires its extension of variables. Secondly, the analysed period, which refers to the time before the COVID-19 pandemic, should be extended to the pandemic time as soon as the data is available to capture the changes that were observed.

This research has some policy implications. It gives us some preliminary indication of what should be done to promote sustainable competitiveness of regions, but it requires further studies.

Further research should cover a wider period of time to present the changes that took place during the pandemic. The research should not be limited to the regions of countries admitted to the EU in 2004 and after 2004, but to the regions of other EU countries in order to verify if the factors selected are the same for the group of regions from the countries that are diversified in terms of sustainable competitiveness. The dynamic analysis is also recommended. All this will be taken into consideration in the further research.

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