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THE DEVELOPMENT OF A KNOWLEDGE ECONOMY AS A FACTOR IN THE COMPETITIVENESS OF CENTRAL AND EAST EUROPEAN COUNTRIES

Abstract

The purpose of this research is to analyse the influence of knowledge resources on the competitiveness of Central and East European (CEE) countries. The aim is to identify the correlation between the achieved development level of the knowledge economy, as measured by the Knowledge Economy Index (KEI), and the competitiveness level, as measured by the Global Competitiveness Index (GCI). The study was conducted using descriptive statistics, correlation, and cluster and regression analysis. Structurally, the paper is composed of the following parts: a) analysis of CEE countries' competitiveness according to the GCI and KEI; b) examination of the correlation between the GCI and KEI in CEE countries; and c) analysis of the influence of pillars within the KEI on the GCI in CEE countries. The research results show that there is a strong positive correlation between the GCI and KEI. The outcomes of this study are useful for development policy-makers in CEE countries and highlight the relevance of improving knowledge economy performance in future.

Keywords: knowledge economy, competitiveness, Central and East European countries, development.

1. Introduction

The challenges modern economies face in the constant pursuit of survival in a competitive global market require continuous efficiency improvements (Danielsen, Radebaugh & Sullivan 2002). Against this background, knowledge stands out as a key resource with an exceptional contribution to make in improving competitive advantage. Increasingly now, it is intellectual rather than physical capital that is becoming the wealth generator for individuals, societies and countries. So it is, that the primary task of modern states in their transition from a traditional to a knowledge economy is to obtain and continuously improve knowledge, which is a sustainable investment that generates economic efficiency and growth. Technological progress and the advent of the information revolution mean that a country's prosperity and development no longer depend on purely economic parameters. Instead, knowledge, innovation, entrepreneurship and the mastering of new technologies are the key drivers in the growth of national competitiveness: "Knowledge is a key resource whose use and exploitation are integral aspects of all forms of economic activities" (Bedford 2013, p. 279).

Meeting the challenge to improve their competitive position requires Central and East European (CEE) countries[1] to develop their knowledge resources, which can make a telling contribution to their ascent in the world rankings. It is therefore relevant to examine how far the knowledge resources of the CEE countries affect their competitiveness. This is achieved in the paper by analysing the level of development of the knowledge economy, as measured by the Knowledge Economy Index (KEI), and by assessing the influence of the development of the knowledge economy on national competitiveness, as measured by the Global Competitiveness Index (GCI). To determine the current position of the countries analysed in relation to the rest of the world, the paper presents an overview of both the current state of development of the knowledge economy and the condition of national competitiveness. It then proceeds to investigate interdependence and the impact of certain segments of the knowledge economy on the level

[1] According to the OECD classification, the CEE countries are: Albania, Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia, Slovenia, Estonia, Latvia and Lithuania (http://stats.oecd.org/glossary/detail.asp?ID=303, date of access: 15.05.2014).

of competition and concludes by pointing out the areas that demand our immediate intervention.

2. Theoretical Basis

Knowledge has always been an ingredient of human societies, but what is specific to the modern condition is the speed of its accumulation and diffusion through information and telecommunication technologies (Lundvall *et al.* 2002, p. 3). As the pace of change on the market accelerates, as technology rapidly improves and as the number of competitors increases, companies that wish to remain successful must constantly generate and disseminate new knowledge while ensuring that it is quickly translated into innovative products and services. All of this must be underpinned by a high-quality and ever-more-effective workforce that is capable of adding new features to products and services (Danielsen, Radebaugh & Sullivan 2002). The performance of personnel at modern enterprises requires improvements in education to deliver the skills and abilities necessary to add to the competitivenes of the products and services they make and design for the market. Knowledge is an important organisational resource and an enabler of firms' competences (Grant 1996). Indeed, knowledge is needed to conceive original product offerings that customers find desirable and to enable companies to respond to the industry conditions and events that affect them. What is more, knowledge allows companies to create personalised products that better match the needs of their customers and to build relationships that foster customer intimacy. Finally, knowledge improves the quality of decision making across the board and underpins service delivery (Chen, Tsou & Huang 2009). However essential it may be, success can no longer rest on cost competitiveness alone. Now, it is increasingly the case that competitive advantage can only be created and sustained if it is nourished by the vital energy of innovation and knowledge (Houghton & Sheehan 2000).

The now dominant idea of the knowledge economy represents a break with the "old economy" (Drucker 2003). Business is now functioning in an intangible age driven by information in which intellectual resources are indispensable. There have been many attempts to conceptually determine the knowledge economy in the literature. According to Bedford: "The knowledge economy is the one in which knowledge in the form of intellectual capital is the primary factor of production" (Bedford 2013, p. 278), while, paraphrasing

Peters (2010), the knowledge economy has three attributes: learning, creativity and openness (Peters 2010). For Bratianu and Dinca, meanwhile: "The knowledge economy opens new directions, and offers unprecedented opportunities to produce and sell on a mass scale, reduce costs, and adjust to the needs of consumers, all at the same time" (Bratianu & Dinca 2010, p. 210). The knowledge economy is actually based on three main postulates: a) knowledge is what we buy, sell and work with; b) knowledge-based assets – known as intellectual property – are becoming more important for enterprises than physical and financial assets; c) progress in the new economy depends on the productive use of knowledge as a vital asset, which means that enterprises should implement new strategies (Steward 2001, p. 5).

Intellectual assets, which form the base of the knowledge economy, have several common features: they are difficult to quantify or measure, cannot easily be tracked through accounting in an appropriate way, cannot be bought or imitated, appreciate with purposeful use, have multiple applications without value reduction and a short shelf life when not in use (Becker, Huselid & Ulrick 2001, p. 7). Edvinsson and Malone (1997) have defined intellectual capital as "the possession of knowledge, applied experience, organisational technology, customer relationships, and professional skills that provide a competitive advantage in the marketplace" (Edvinsson & Malone 1997, p. 40). Roos and his coauthors have defined intellectual capital as "all non-monetary and non-physical resources that are fully or partly controlled by the organisation and that contribute to the organisation's value creation" (Roos, Pike & Fernstrom 2005, p. 19).

The knowledge society or economy is based on the following postulates: 1) stimulating the development of the environment and institutional regime that provides the efficient mobilisation and allocation of resources prompts creativity and encourages the efficient creation, dissemination and application of existing knowledge; 2) an educated and skilled workforce that is continually improving its skills to create and use new knowledge effectively; 3) an effective innovation system which includes network connectivity companies, research centres, universities and other public organisations that promote the so-called "knowledge revolution" and filter and assimilate the growing amount of global knowledge to adapt it to local development needs; 4) a modern and adequate information infrastructure that will ensure the effective communication, dissemination and analysis of information and knowledge (Wickham 2001).

There are three levels of competition in the global knowledge economy: a) sensing – identifying and accessing new expertise, innovative technologies

and advanced market knowledge; b) mobilising – integrating scattered capabilities and emerging market opportunities to pioneer new products and services; c) operations – optimising the size and configuration of operations for efficiency, flexibility and financial discipline (Yves, Santos & Williamson 2001, p. 6). "Knowledge organisations" (Drucker 1992, p. 248) use their intellectual resources as the main source of their competitive advantage. As a rule, these organisations have few tangible assets and compete, based on their intellectual value, by creating the strikingly different and unique combinations that are necessary to meet the great variety of consumer demands (Teece 2000, p. 248). These are organisations that learn; they are defined by their capacity to restructure their operations, to innovate continuously and adapt at high speed.

The efficiency of 21st-century enterprises is largely determined by the productivity of creative and innovative employees, who are their most important assets. Performing tasks at modern enterprises means improving the level of education to sharpen and deepen the abilities and skills necessary to add competitive value to products and services. Indeed, the highly competitive enterprises in developed "knowledge societies" and "knowledge economies" are the ones that prepare their workforces better in these terms. To make gains within the context of ever-more-sophisticated work processes, as much advantage as possible must be taken of opportunities to create and use personal (tacit) and structural (codified, organisational) knowledge. In short, there is a need for new, expanded, combined and multi-functional knowledge, which can be acquired through formal education, training and practice. As enterprises and nations step up their search for competitive strength in creative ideas, innovative expertise and competences, the importance to the competitiveness of modern enterprises and national economies of the national systems of education that in part provide them is increasingly apparent.

In the process of globalisation, the competitiveness of enterprises depends increasingly on the refined skills needed to meet the specific requirements of customers at the right time. This involves managing a large amount of knowledge through extensive use of modern information technology (Lundvall *et al.* 2002, p. 2). Achieving competitive advantage in the knowledge economy means incorporating the new perspective of value based knowledge management (Tisen *et al.* 2006, p. 68), which proposes four principles for the competitive and business success of the enterprise in the knowledge economy: increase in enterprise value, increase in value for our customers, increase in value for society and increase in the value of employees in the organisation.

It is possible by combining current knowledge in a new way, or by generating new knowledge, to introduce innovation to processes, products and services and thus improve the competitive advantage of the enterprise (Krstić 2001). If national competitiveness is based on the specific competitive attributes of the companies in a country, this is very important (Krstić & Stanišić 2013, p. 156). The main feature of economic prosperity in the global economy is knowledge-based competitiveness. Following the era of industrialisation, a changed view of business activities in new conditions and of what lays the foundations for the creation and improvement of competitiveness has taken shape. Inevitably, this has brought the knowledge paradigm into focus. In this era, the wealth of nations and regions depends on the level of knowledge and how effectively it is applied. It is therefore fortunate that, because man's ability to create knowledge is in theory limitless, the resources of the knowledge economy cannot become depleted.

The main feature of the knowledge economy is that knowledge is a vital production resource at the centre of economic and social development. Modern economies and enterprises depend on their knowledge to strengthen their competitiveness. The power has now shifted from those who invest money in the business to those who invest in their knowledge and skills and create value in this way. Improving the effectiveness and the efficiency of a country's education system is of strategic importance for its economic development and competitiveness. This importance is reflected in the contribution the education system makes to increases in productivity and innovation by developing the competences of the labour force and transferring knowledge rapidly between educational and research institutions in different sectors of the economy.

The challenges modern economies face in the relentless quest to survive in a competitive global market require perpetual refinement of all activities directed at the creation and application of knowledge. In this endeavour, the prime emphasis is placed on innovation, research and development, and education and training. Though the task of keeping pace with the developed world economies by continually strengthening competitiveness is a difficult one, it cannot be avoided.

3. Research Methodology and Hypothesis

In one of its definitions, competitiveness is understood as the set of institutions, policies and factors that determine a country's level of productivity (World Economic Forum 2013). The impact of certain factors

on the national competitiveness – and hence the ranking – of the countries on the world list can be evaluated using the methodology of the World Economic Forum (WEF). The Global Competitiveness Index is a generally accepted methodological framework for measuring competitiveness at the national level. The WEF methodology for measuring national and global competitiveness systematises the key factors into 12 groups to quantify the level of competitiveness of national economies, while the GCI, which as we will see measures numerous factors and variables, is composed of key competitiveness factors known as competitiveness pillars: 1) Basic factors (institutions, infrastructure, macroeconomic stability, health, and primary education); 2) Efficiency factors (higher education, goods market efficiency, labour market efficiency, financial market development, technological competence/capacity, market size); 3) Innovation factors (business/business process sophistication, innovation).

In the modern era of the knowledge economy (Powell & Snellman 2004), its determinants and variables influence the national competitiveness of countries (Foray 2004; OECD 1996): "Knowledge is recognised as the driver of productivity and economic growth and it enhances the significance of information, technologies and learning for economic performance" (Zitek & Klimova 2011, p. 821; Brinkley 2006). The study's measurement of the individual countries' progress towards achieving the necessary conditions for building a knowledge economy was made possible by the application of Knowledge Assessment Methodology (KAM), which is a resource of the World Bank Institute, and of the Knowledge Economy Index (Chen & Dahlman 2005).

Using the KAM tool, which measures progress towards a knowledge society and economy, involves analysing structural and qualitative indicators compiled for each country. These are quantified as variables in four pillars thought decisive for the development of the knowledge society and economy: 1) Education (an educated population able to create, exchange, and use knowledge); 2) Innovation system (an effective innovation system including enterprises, research centres, universities, consultancies, and other organisations able to take advantage of the growing knowledge resources at the global level, adapt them to local needs, and so produce new technologies); 3) Information and communication technologies (technologies that will enable the efficient creation, exchange, and processing of information); 4) Institutional framework (an economic and legal framework that will encourage the efficient use of existing and new knowledge, and develop entrepreneurship) (World Bank 2013a; 2013b). The KAM basic scorecard

provides an overview of the performance of a specific country or region in terms of 3 knowledge variables for each of the 4 pillars of the knowledge economy (World Bank Institute 2004).

Turning to the Knowledge Economy Index (KEI), what we find is an aggregate index of the overall level of progress made by countries or regions as they strive to make knowledge society a reality[2]. The KEI, which can be understood as a disaggregated version of the basic scorecard, makes it easier for countries to identify all of the challenges and opportunities that lie before them on the path to creating a knowledge-based economy and society. The potential for the application of knowledge in innovation, entrepreneurship, and research and development, is recognised as a central element of the growth and development of the global economy. By monitoring and extracting information from the KEI and its sub--indexes, each country can identify its major advantages and disadvantages and benchmark the leading regional and global performers it may wish to emulate. Once a country has identified the areas that require attention, it can then define development programmes, strategies and policies at both the national and regional level (Bratianu & Dinca 2010).

This research sets out to examine the interdependence of the Knowledge Economy Index and Global Competitiveness Index, as well as that between the latter and the four pillars of the former (Economic Incentive and Institutional Regime, Innovation, Education and ICT), while also seeking to determine the influence of the KEI pillars on the values describing the performance of Central and East European countries on the GCI.

The authors tested the following hypotheses related to the research aims identified above:

H1: There is no heterogeneity in the levels of knowledge-economy development and competitiveness achieved by CEE countries.

H2: The level of knowledge-economy development achieved in CEE countries has a significant influence on the level of competitiveness.

The following methods were employed: descriptive statistics, cluster analysis, correlation, and regression analysis.

The analysis is based on data drawn from the "Global Competitiveness Report 2012–2013" and from the World Bank's "Knowledge Economy Index" of 2012.

[2] KEI scores range from 1 (worst) to 10 (best). The KEI is calculated as the average of normalised results from all four pillars of the knowledge society, where each pillar is represented by three key indicators.

4. Results and Discussion

For the purposes of clarity, flow, and ease of understanding in testing the hypotheses, the paper has been organised according to the following sections:

– analysis of CEE countries' competitiveness according to GCI and KEI,
– examination of the correlation between GCI and KEI in CEE countries,
– analysis of the influence of the KEI pillars on GCI in CEE countries.

Analysis of CEE countries' competitiveness according to GCI and KEI

This is based on the rank and score on the GCI (WEF methodology), and on the rank and score on the KEI (World Bank methodology). Table 1 shows the position of CEE countries according to their rank and score on the GCI and KEI for 2012[3].

Table 1. Rank and Score on the GCI and KEI for CEE Countries in 2012

Countries	GCI 2012		KEI 2012	
	rank	score	rank	score
Albania	89	3.9	82	4.53
Bulgaria	62	4.3	45	6.80
Croatia	76	4	39	7.29
Czech Republic	39	4.5	26	8.14
Estonia	34	4.6	19	8.40
Hungary	60	4.3	27	8.02
Latvia	55	4.3	37	7.41
Lithuania	45	4.4	32	7.80
Poland	41	4.5	38	7.41
Romania	78	4.1	44	6.82
Slovak Republic	71	4.1	33	7.64
Slovenia	56	4.3	28	8.01

Source: World Economic Forum (2013); World Bank (2013b).

It can be concluded when considering the GCI scores of the CEE countries (Table 1) that Estonia (4.6), the Czech Republic (4.5), and Poland (4.5) achieved the highest scores and Croatia (4.0) and Albania (3.9) the lowest. The remaining countries recorded GCI scores of between

[3] The World Bank analysed and ranked a total of 145 countries in 2012.

4.0 and 4.5. Apart from Albania, Croatia, and Romania, all of the CEE countries that concern us appeared in the top 77 of the 144 countries ranked on the GCI in 2012–13.

Turning now to the KEI, the highest scores were achieved by Estonia (8.40), the Czech Republic (8.14) and Hungary (8.02). As we may note, the top two countries on the GCI are also the top two on the KEI. The lowest score on the KEI was recorded by Albania (4.53), which earned the country 82nd place on the KEI. All of the other CEE countries were ranked in the top half of the index.

Table 2 presents the descriptive statistics corresponding to the GCI and KEI scores of CEE countries in 2012.

Table 2. Results of Descriptive Statistics for the GCI and KEI Score in CEE Countries in 2012

Indicator	Min.	Max.	Mean	Std. Deviation	Variation Coefficient
GCI	3.90	4.60	4.2750	0.21373	4.99
KEI	4.53	8.40	7.3558	1.01998	13.87

Source: prepared by the authors (SPSS Statistics 19).

The coefficient of variation for the KEI and GCI revealed greater variability and heterogeneity of knowledge-economy development (13.87%) among CEE countries when compared with the coefficient of variation (4.99%) noted for their variability and heterogeneity with regard to competitiveness (Table 2).

Examinination of the correlation between GCI and KEI in CEE countries

Correlation analysis was applied to examine the interdependence between competitiveness, as measured by the GCI, and knowledge-economy development, as measured by the KEI (Table 3).

A high, positive correlation (0.720) was found between the GCI and KEI, such that it could be stated that the competitiveness of CEE countries is directly related to their level of knowledge-economy development. Given such a marked correlation, a decision was taken to use a multivariate method – cluster analysis (Kumar) – to examine the heterogeneity of European Union countries with regard to the two indexes. This method serves to classify countries according to their measured characteristics (Hardle & Simar 2003). If the classification is good, "(…) subjects within clusters will

be close together when plotted geometrically, but different clusters will be far apart" (Chandra & Menezes 2001, p. 89).

Table 3. Correlation Coefficient between the GCI Score and KEI Score in CEE Countries in 2012

Specification		GCI	KEI
GCI	Pearson Correlation	1	0.720(**)
	Sig. (2-tailed)	–	0.008
	N	12	12
KEI	Pearson Correlation	0.720(**)	1
	Sig. (2-tailed)	0.008	–
	N	12	12

** correlation is significant at the 0.01 level (2-tailed).

Source: prepared by the authors (SPSS Statistics 19).

The following structure was derived for CEE countries as a result of cluster analysis in relation to the GCI and KEI[4]:

– cluster 1: Bulgaria, Romania,

– cluster 2: Croatia, Latvia, Lithuania, Poland, Slovak Republic,

– cluster 3: Czech Republic, Estonia, Hungary, Slovenia.

If we consider the final cluster centres, which are shown in Table 4, we can see that cluster 3 has the highest values for the GCI and KEI, that lower GCI and KEI values can be observed for the countries in cluster 2, and that cluster 1 is composed of the countries with the lowest values for the GCI and KEI.

Table 4. Final Cluster Centres for the GCI and KEI

Indicator	Cluster		
	1	2	3
GCI	4.20	4.26	4.43
KEI	6.81	7.51	8.14

Source: prepared by the authors (SPSS Statistics 19).

The analysis of variance revealed a significant difference in the average value of the KEI among the clusters which, as the multiple comparisons

[4] Albania was excluded from the cluster analysis because the variables analysed varied significantly from those of the other countries (KEI and GCI values).

displayed in Table 5 show, was valid for all clusters in the case of the KEI. There was no significant difference in the average value of the CGI among the clusters.

Table 5. Multiple Comparisons

Dependent Variable	(I) Cluster Number of Case	(J) Cluster Number of Case	Mean Difference (I–J)	Sig.
GCI	1	2	–0.06000	0.917
		3	–0.22500	0.366
	2	1	0.06000	0.917
		3	–0.16500	0.402
	3	1	0.22500	0.366
		2	0.16500	0.402
KEI	1	2	–0.70000(*)	0.005
		3	–1.33250(*)	0.000
	2	1	0.70000(*)	0.005
		3	–0.63250(*)	0.002
	3	1	1.33250(*)	0.000
		2	0.63250(*)	0.002

* the mean difference is significant at the 0.05 level.

Source: prepared by the authors (SPSS Statistics 19).

Though the clusters formed by the CEE countries were internally homogeneous, there was nevertheless heterogeneity among them due to the value of the KEI. Based on the results of the analyses presented in Table 4 and Table 5, hypothesis H1 is partially confirmed. While it is true that there is no heterogeneity of competitiveness levels among CEE countries, there exists significant heterogeneity among them with regard to levels of knowledge-economy development.

Analysis of the influence of the KEI pillars on the GCI in CEE countries

As a preliminary to analysing the impact of the KEI pillars on the competitiveness of CEE countries, Table 6 provides an overview of the scores for all four pillars (Economic Incentive Regime, Innovation, Education, ICT) for each CEE country and a comparison of their average value with that of the EU countries. The regression analysis set out later is based on the scores presented.

Table 6. Score of Pillars within the KEI in CEE Countries in 2012

Country	Pillars within the KEI			
	Economic Incentive and Institutional Regime	Innovation	Education	ICT
Albania	4.69	3.37	4.81	5.26
Bulgaria	7.35	6.94	6.25	6.66
Croatia	7.35	7.66	6.15	8
Czech Republic	8.53	7.9	8.15	7.96
Estonia	8.81	7.75	8.6	8.44
Hungary	8.28	8.15	8.42	7.23
Latvia	8.21	6.56	7.73	7.16
Lithuania	8.15	6.82	8.64	7.59
Poland	8.01	7.16	7.76	6.7
Romania	7.39	6.14	7.55	6.19
Slovak Republic	8.17	7.3	7.42	7.68
Slovenia	8.31	8.5	7.42	7.8
EU average	8.41	8.15	7.85	8.02

Source: World Bank (2013b).

According to the score for the Economic Incentive and Institutional Regime pillar, the three leading CEE countries were Estonia, the Czech Republic, and Slovenia, while Albania, Bulgaria, and Croatia were ranked lowest. Of the CEE countries, only Estonia and the Czech Republic returned scores higher than the EU average for the Economic Incentive and Institutional Regime pillar. Turning to the Innovation pillar, Slovenia, Hungary, and the Czech Republic recorded the highest scores, and Albania, Romania, and Latvia the lowest. Only Slovenia recorded a value higher than the EU average for this pillar. With regard to the Education pillar, the highest-ranked CEE countries were Lithuania, Estonia, and Hungary, and the lowest Albania, Bulgaria, and Croatia. The CEE countries reported relatively favourable results for the Education pillar when compared to the remaining KEI pillars. Here, four of the CEE countries, Lithuania, Hungary, Estonia, and the Czech Republic, returned values higher than the EU average. Addressing the scores for the last of the pillars, ICT, Estonia and Croatia had the highest scores and Albania and Romania the lowest. With the exception of Estonia, the scores of all of the CEE countries were

below the EU average for this pillar. This detailed analysis of the KEI pillars supports the conclusion that Estonia has the leading knowledge economy among the CEE countries and that Albania occupies last place with regard to the development of all of the segments of the knowledge economy considered.

The results of the regression analysis employed to investigate the influence of the KEI pillars on the GCI are presented in Table 7.

Table 7. Influence of Pillars within the KEI on the GCI in CEE Countries in 2012

Indicator	Unstandardised Coefficients		Standardised Coefficients	*t*	Sig.
	B	Std. Error	Beta		
(Constant)	3.096	0.460	–	6.726	0.000
Economic Incentive and Institutional Regime	0.136	0.210	0.684	0.647	0.538
Innovation	–0.031	0.102	–0.196	–0.308	0.767
Education	0.064	0.117	0.345	0.550	0.599
ICT	–0.018	0.108	–0.076	–0.169	0.870

Dependent Variable: GCI; *R* Square = 0.629.

Source: prepared by the authors.

Of the four pillars analysed in respect of the CEE countries, the Economic Incentive and Institutional Regime pillar had a modest, yet still the highest, influence on their GCIs (0.136), while the Education pillar had a somewhat positive influence. Both the Innovation and ICT pillars were found to have a negative influence on the GCI within the CEE countries. Hypothesis H2 was therefore rejected. The competitiveness of the CEE countries is still not based on knowledge, which means that they are either not using, or are underusing, a whole raft of resources associated with knowledge – innovation, education, ICT, communications technology, and economic and institutional support in knowledge use – to improve their competitiveness.

5. Conclusion

The creation of greater value for customers and shareholders, as well as higher gross domestic product for EU countries, should be based on reaping the benefits of the knowledge economy. The desirable elements required

to underpin the creation, dissemination, transfer, and effective use of knowledge in the EU countries are innovative policies, greater investment in education and training, the introduction of original products and services, the expansion and refinement of technological competences, the extension of the information infrastructure, and the stimulation of the economic environment and institutional regime.

All of the CEE countries, except Albania, Croatia, and Romania, find themselves in the top half of the GCI, which this paper has taken as the measure of countries' competitiveness. We find a similar state of affairs when we turn to the development of the knowledge economy, which has been measured here by the KEI. In this case, all of the CEE countries except Albania are in the top half of the world rankings. What we are seeing here is the strong positive correlation (0.720) between the GCI and the KEI identified in the paper's statistical analysis.

In the matter of the interdependence between levels of knowledge--economy development and national competitiveness, the cluster analysis produced three quite homogeneous CEE country groups and identified a high heterogeneity of knowledge-economy development for these three separate clusters.

Moreover, the regression analysis demonstrated that the level of knowledge-economy development did not have a significant impact on the competitiveness level of CEE countries. Of the four pillars of the KEI index, therefore, the Economic Incentive and Institutional Regime pillar had a modest, yet still the highest, positive impact on competitiveness and the Education pillar had a somewhat positive impact. The remaining pillars, Innovation and ICT, were found to have a negative impact on competitiveness. It can be concluded from our investigation and analysis, then, that knowledge is a critical, yet underused, factor in improving the competitiveness of CEE countries.

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Abstract

Rozwój gospodarki opartej na wiedzy jako czynnik konkurencyjności krajów Europy Środkowo-Wschodniej

Przedmiotem badań jest analiza wpływu zasobów wiedzy na konkurencyjność krajów Europy Środkowo-Wschodniej. Celem jest określenie korelacji pomiędzy osiągniętym poziomem rozwoju gospodarki opartej na wiedzy, mierzonym za pomocą indeksu gospodarki opartej na wiedzy (*Knowledge Economy Index* – KEI), a poziomem konkurencyjności, mierzonym za pomocą globalnego indeksu konkurencyjności (*Global Competitiveness Index* – GCI). Badania przeprowadzono, wykorzystując metody statystyki opisowej, analizę korelacji, skupień i regresji. Artykuł składa się z następujących części: a) analizy konkurencyjności krajów Europy Środkowo-Wschodniej za pomocą indeksów GCI i KEI; b) badania korelacji pomiędzy indeksami GCI i KEI w krajach Europy Środkowo-Wschodniej; c) analizy wpływu filarów KEI na indeks GCI w krajach Europy Środkowo-Wschodniej. Wyniki badań wskazują, że istnieje silna dodatnia korelacja pomiędzy indeksami GCI i KEI. Otrzymane rezultaty mogą być użyteczne dla decydentów w badanych krajach i potwierdzają znaczenie dalszego rozwoju gospodarki opartej na wiedzy w przyszłości.

Słowa kluczowe: gospodarka oparta na wiedzy, konkurencyjność, kraje Europy Środkowo-Wschodniej.