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Article

A new way of measuring the competitiveness of higher education institutions, their (inter)actions and effects on regions. Empirical evidence from Hungary

Gáborné Nagy[1], István András[2], Márta Konczos Szombathelyi[3,*]

[1] Széchenyi István University, Doctoral School of Regional and Business Administration Sciences, 9026 Győr, Hungary
[2] University of Dunaújváros, 2400 Dunaújváros, Hungary
[3] Department of Leadership and Marketing, Faculty of Economics, Széchenyi István University, 9026 Győr, Hungary
*** Corresponding author:** Márta Konczos Szombathelyi, kszm@sze.hu

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Abstract: The aim of the research is to prove that nowadays the role of higher education, its impact on "territorial capital" and the factors of their competitiveness measurement have changed. Competitiveness should no longer be measured only in terms of rankings between higher education institutions, but also in terms of their role in territorial capital. Examining the extension of a competitiveness measurement model developed for small and medium-sized enterprises to the field of higher education can be exciting because the competitive situation between higher education institutions is strengthening, and its aspects are not limited to winning tender funds and the competition for students. The subject of this study is the Central European higher education in general and the Hungarian higher education specifically. Higher education as it appears in regional strategic documents, and the regional, third mission role of higher education institutions appearing in their strategic documents. In terms of methodology: the first part of the paper is based on document and content analysis. In the second part of the paper, institutional characteristics that may influence competitiveness are identified in the case of a Hungarian higher education institution with SME characteristics. The research concludes that the impact on territorial capital, together with the traditional characteristics of higher education and its third missionary role, may constitute the competitiveness of a given institution. If the impact of higher education institutions on location could be measured uniformly, competition between institutions would be more transparent and the role of the region would be strengthened.

Keywords: competitiveness; higher education; territorial capital; university; region

1. Introduction

The aim of the research is to examine the extension of a competitiveness model in higher education, since their role in territorial capital is significant. All this can be exciting because competition between higher education institutions is increasing. From this comes the relevance of the topic. The solutions, effects and interactions applied in the local aspects of global dilemmas are essential in a world where the measurement areas of reporting and performance (IMF, OECD, WEF, IMD, Eurostat, etc.) are broadened horizontally and vertically and determine economic impressions (investors, stock market expectations, exchange rates, etc.). In a system where performance is expected, higher education becomes an indispensable key player. This leads to the research question of whether higher education appears in strategic documents, and whether the regional, third mission role of higher education institutions appears in strategic documents. The answer to research questions is

served by document and content analysis as a method. With the creation of the KIVI model (Szerb et al., 2023), competitiveness can be measured at regional level, taking into account local characteristics, thus contributing to the strengthening and extension of further research directions in the field. There is currently no practice of examining higher education institutions in this regard. The study is necessary to launch a debate on competition between higher education institutions, its role in economic policy and higher education policy, and to promote measurability and comparability. The model is not the same as higher education rankings, as it is about institutional competitiveness. Its applicability to higher education institutions is verified by identifying the 10 pillars of the model, which means level 0 of the study: Domestic market and competition, Cooperation, Internationalization, Human capital, Product, Production, Marketing, Online presence, Decision-making, and Strategy. The study was conducted in a Hungarian higher education institution with small and medium-sized enterprise characteristics, in order to prove that these features of competition appear at this level of higher education as well.

In the first part of the paper, a literature review helps to work and contextualize the topic, and then the changed role in higher education is reviewed through the Central and Eastern European example, in the case of Hungary. In addition to legal references, the analysis of the National Smart Specializations Strategy (S3) sheds light on the role that Hungarian policy envisages for higher education in economic competition. This is followed by an overview of the strategic document of a rural university of applied sciences, the Institutional Development Plan (IDP) of the University of Dunaújváros. In the last part of the paper, the aim is to identify the ten Competence and Institutional Competitiveness Index (KIVI) (Szerb et al., 2023)—individual competence—in the strategic document of the chosen rural university of applied sciences. The aim then summarizes the conclusions.

2. Materials and methods

The aim of the research is to prove that nowadays the role and impact of higher education on “space” has changed, and competitiveness should be measured not only in rankings between higher education institutions, but also in terms of their role in territorial capital. Another goal of the research is to arouse the interest of the field, to make it open and interested in the uniform and public definition of data that are decisive for comparability and measurability.

The subject of the study is higher education in Central Europe and Hungary. In the first part of the research, a literature review related to the topic of the article is carried out, the purpose of which is to draw attention to the complex approach and changed role of higher education.

The second part of the research is document and content analysis. Measures taken to promote the employability of European graduates and the international competitiveness of higher education will be reviewed. This is primarily based on the National Smart Specialization Strategy (S3) in order to highlight that Hungarian policy assigns a strong role to higher education in economic competition.

In the third part of the research, in addition to the overview of S3, it is important to mention the competitiveness-related approach of Act CCIV of 2011 on National

Higher Education, according to which "1. § (1) The purpose of this Act is to create the conditions necessary for raising the quality of higher education, transferring and acquiring competitive knowledge, and to ensure the operation of the national system of higher education institutions within the framework defined by Article X. (3) of the Fundamental Law." (Wolters Kluwer, 2024a) The Law 12. § (1) c) of the Act stipulates that higher education institutions must have a so-called Institutional Development Plan, which includes a research and development innovation strategy. The document is adopted by the governing body of the given higher education institution, the Senate. In the case of a Hungarian higher education institution with small and medium-sized enterprise characteristics, institutional characteristics that may have a role influencing competitiveness are identified through it. The "Act IX. of 2021. on Public Interest Trust Foundations performing Public Service Tasks" and the results of the examination of the chosen case, the Institutional Development Plan adopted by the University of Dunaújváros, provide assistance in this.

The last part of the research based on Szerb et al. (2023). We consulted with the creators of the model prior to the research in order to explore the applicability of the model and competitiveness to higher education institutions. We emphasize that the method and model are adapted from them in the present research. Step 0 of adaptability and future studies is whether the pillars of the model can be identified for a higher education institution similar in size to small and medium-sized enterprises. It aims to identify the ten Competence and Institutional Competitiveness Indexes (KIVI)—individual competencies—in the Institutional Development Plan of the University of Dunaújváros as a strategic document by keyword search: Domestic market and competition, Cooperation, Internationalization, Human capital, Product, Production, Marketing, Online presence, Decision-making, Strategy.

3. Results

3.1. Literature review

The purpose of this paper is not to present the complete literature and models. Related to the topic of the article, it draws attention to the following important milestones. All this in order to achieve an approximation to the topic. The paper presents the literature review divided into three parts. 1) A complex approach to higher education, 2) Changed role in higher education, and 3) New method for measuring the competitiveness of a region.

3.1.1. A complex approach to higher education

Capello (2008) places the beginning of research in regional economics in the 1950s, one of the priority areas of which is the definition of regional competitiveness. Krugman (1994) does not talk about competition, arguing that each country wins due to the international division of labor based on comparative advantages, so the focus of regions is on the rate of productivity growth. Porter (2008) makes competitiveness dependent on productivity, on how human, capital, and natural resources can be utilized locally. According to Meyer-Stamer (2008), regional competitiveness can be interpreted at national economic and regional level. With the emergence of endogenous growth models, studies and research highlights

that the ratio of capital to labor, the differences in knowledge base and knowledge-based businesses, as well as the human capital that carries them, are the main causes of differences between regions (Gennaioli et al., 2013). It is important to emphasize that the endogenous approach considers the human factor to be primary (Capello, 2016). "Among the prominent representatives of this trend, Romer (1986) emphasizes the importance of knowledge capital, while Lucas (1988) emphasizes the importance of learning and human capital (Acs and Sanders, 2021; Varga, 2009). Regional science has also adopted and further developed these fundamental findings, highlighting social capital, entrepreneurship and institutional underpinning, among others (Johansson and Karlsson 2019; Stimson et al., 2009; Westlund and Larsson, 2021) and, in relation to the knowledge base of large cities, the importance of creativity and tolerance (Florida et al., 2008; Lengyel and Ságvári 2009; Lengyel, 2023, p. 53)".

With the strengthening of globalization and the international arena, the methodology of establishing competitiveness rankings has come to the fore, and nowadays various measurement reports have an impact on the economic and political field. Since 1979, The Global Competitiveness Report and since 1989 the Swiss International Institute for Management and Development—World Competitiveness Yearbook (IMD WCY) have published competitiveness analyses and results on countries and regions. Since 2004, the World Economic Forum—Global Competitiveness Index (WEF GCI) has also ranked countries every year. Machková (2016) highlighted the challenge of competing in the global market—also from the point of view of higher education. It also draws attention to the fact that one of the key indicators in the World Economic Forum (WEF) competitiveness ranking is primary education, higher education and training. It highlights that the quality of higher education must play a key role for those who want to succeed in global markets. Cui and Martins (2021) argue that education can contribute to convergence and economic growth by generating important externalities. Among other things, their research shows that spillover effects can slow down with economic development. The spillover effect could be further increased by the dispersal of higher education and educational attainment. Hart and Rodgers (2023) explore the role and impact of competition, competitiveness and competitive advantage in higher education institutions through a comprehensive literature review, citing increasing competition in the sector. In the course of its research, it concludes that in order to mitigate the consequences of competition (external, internal), i.e. challenges, it is proposed to strike a balance between competitiveness and services. In view of the rapid development of China's economy and society, Liu et al. (2024) write in a study that an extensive assessment index system has been developed in China to assess the integration of industry and education into higher education vocational training. Research results show that the integration of industry and education brought consistent improvements in overall development between 2016 and 2022.

3.1.2. Changed role in higher education

Given the trends of the literature selected above and the strengthening of globalization processes, the 1999. Bologna Declaration becomes self-evident, which "29 countries expressed their readiness to enhance the competitiveness of the

European Higher Education Area and emphasize the need to promote the independence and autonomy of all higher education institutions" (Bologna Process, 2024a). The majority of Central and Eastern European countries will already join the European Higher Education Area and thus the Bologna Process (Bologna Process, 2024b). The region's aspiration for competitiveness is also determined by the accession of the European Union in 2004, as in addition to Cyprus and Malta, the Czech Republic, Estonia, Latvia, Lithuania, Poland, Hungary, Slovakia and Slovenia are also members (Európai Unió, 2024). Given that the three cycle system has been introduced everywhere, perhaps the problems of the turbulent, global world have shifted the focus away from the increasingly threatening challenges and the need to carry out possible uniform measures and responses to the changed roles. According to Lee-Davies (2018), some of the challenges related to higher education are identical, as declining student numbers, increasing student debt—also known as student loans or investment in human capital—are decisive throughout Europe, regardless of the region. Stylianou and Milidis (2024) also draw attention to the problem of dropout. In their view, participation in higher education represents a significant investment of time, resources and effort, not only for students, but also for their families and ultimately society as a whole. As a result, the consequence of having a high dropout rate goes beyond the individual level. It affects not only a student's career prospects, economic well-being, but also the overall productivity and innovation potential of nations. In addition to challenges, it is important to remember some of its basic tenets in a turbulent world and to refocus them on the role of higher education institutions, since as time goes on, delays or non-fulfillment of previously defined directions may be a disadvantage during competition. The higher education institution plays an important role not only in training the workforce, but also has an impact on the economic life of the region (Dallago, 2014; Drucker, 2016; Erdős et al., 2021; Lengyel, 2023; Pike et al., 2017; Teperics and Dorogi, 2014; Varga and Erdős 2019). The teaching and research function is expanded to include a third missionary role, which means the role played by the institution in economic, social development and social responsibility as the "second academic revolution" (Benneworth et al., 2017; Etzkowitz, 2004; Gal, 2016; Lengyel, 2023; Lukovics and Zuti, 2014). Researchers also draw attention to the EU Smart Specialization Strategy, where they state "local higher education institutions play a prominent role as key elements of the regional innovation system, innovation ecosystems (Calza et al., 2022; Foray, et al., 2018; Lengyel, 2023, p. 53; Vas, 2017)". Hungary, the National Smart Specialization Strategy (S3) for the years 2021-2027 was adopted by Government Decision 1428/2021 (VII.2) (S3, 2021).

3.1.3. New method for measuring the competitiveness of Hungarian urban regions

With the help of the Competence and Institutional Competitiveness Index (KIVI) model of competitiveness measurement developed for small and medium-sized enterprises, the competitiveness of small and medium-sized enterprises can be measured in a complex way at regional level as well, taking into account such characteristics as internal competences and operating environment (Hornyák, 2019). Szerb et al. (2023) presented the Competence and Institutional Competitiveness

Index (KIVI) as a new composite indicator for examining the competitiveness of small businesses in connection with measuring and analyzing the competitiveness of Hungarian urban regions. "KIVI is a unique, complex indicator which, unlike all previous competitiveness indexes, measures the competences of the chosen territorial unit at institutional, industrial and corporate, micro, small and medium-sized enterprise level. … By decomposing KIVI, the unique features, strengths and weaknesses of each territorial unit can also be identified. With the help of a complex approach, an economic policy mix can thus be developed at urban agglomeration level, taking into account individual characteristics" (Szerb et al., 2023, p. 121).

The examination of the extension of the model to the field of higher education may be exciting because the competitive situation between higher education institutions is intensifying, and its aspects are not limited to winning funding and competing for students.

3.2. Strategy and higher education

In order to promote the employability of European graduates and the international competitiveness of higher education, presumably in Hungary, the field of higher education in the public economic and policy system is assigned to the Ministry of Culture and Innovation, which refers to the importance of its role in competition. In Government Decision 1428/2021 (VII.2.), the Government decided on the adoption of the National Smart Specialization Strategy (S3) for the years 2021-2027 and its continuous implementation. For this reason, the National Smart Specialization Strategy (S3) for the years 2021-2027 was reviewed from the aspect of higher education in document and content analysis. The document considers the application of the entrepreneurial discovery process to be one of the most important elements in the formation of specialization directions. In its review, it can be noted that the keyword "higher education" appears 47 times. The executive summary underlines that Territorial Innovation Platforms (TIPs) "provide opportunities at regional level for cooperation between higher education, industry, central and local government, civil society, dissemination of the innovation process across sectors and organization of activities related to the implementation of S3" (S3, 2021:6). National economic priorities and horizontal priorities are defined, on which competitiveness is to be strengthened by concentrating resources. Horizontal priorities include training, education; and innovation in the public sector and universities, whose mission is to 'provide sectors interested in national economic priorities with the skills development and business environment necessary for smart specialization' (S3, 2021, p. 7). In line with training and education, it is emphasized "the successful application of smart specialization in Hungary requires the availability of a sufficient number of workforces with expertise to achieve the goals of national economic priorities. During the implementation of S3, in addition to retaining the R&D staff and strengthening the next generation of researchers, the availability and skills development of a workforce with skills that meet the needs of the local economy are also essential" (S3, 2021, p.70). In relation to innovation in the public sector and universities, the objective is to "strengthen innovation capacities, since innovation in this sector is also necessary to improve the efficiency and competitiveness of the

national economy as a whole" (S3, 2021, p. 72).

In addition, it should be mentioned that when examining the document, the result of filtering for the keyword "competition" was 100 results, of which 7 times in the introduction it is mentioned as competitiveness, competitor and competitive advantage.

3.3. The case of the University of Dunaújváros

In the case of a Hungarian higher education institution with SME characteristics, the research focuses on identifying institutional characteristics that may influence competitiveness. Dunaújváros is a town with county rights (NUTS2) located in Fejér County in the Central Transdanubian region of Hungary. The University of Dunaújváros is a state-recognized higher education institution—university of applied sciences—maintained by a public interest trust foundation performing public tasks, which operates as a public benefit organization. Act IX of 2021 on Public Interest Trust Foundations performing public tasks states that the Foundation for the University of Dunaújváros, as maintainer, through the University of Dunaújváros "contributes to the social and economic development of its region by promoting and economically utilizing the intellectual values derived from the core activities of the higher education institution for community purposes" (Wolters Kluwer, 2024b).

When reviewing the current Institutional Development Plan of the University of Dunaújváros, the following can be established. It is important to underline that they are moving towards a regional role from an institutional point of view. The document is structured along three dimensions:

- education-training dimension,
- R&D-innovation dimension,
- third missionary dimension.

With regard to the education-training dimension, it can be stated that it is categorized along 11 strategic objectives, which record 45 actions. Of the 45 actions, nine actions are classified as strategic objectives of "regional role", i.e. 20% of the total actions. The value can be considered highlighted, since in addition to this, one strategic goal fulfilment includes several actions, and that is digitalization: in terms of number, it contains 12 actions, accounting for 26.6% of all actions in total.

With regard to the R&D-innovation dimension, it can be stated that it is categorized along 11 strategic goal lines, which record 32 actions. Of the 32 actions, 6 actions are classified as strategic objectives of the "regional role", i.e. 18.75% of the total number of actions. The value can be said to be highlighted, since no strategic goal fulfilment includes more actions.

Along the third missionary dimension, it can be stated that it is categorized along 10 strategic objectives, which record 33 actions. Of the 33 actions, six actions are classified as strategic objectives of the "regional role", i.e. 18.18% of the total number of actions. The value can be considered highlighted, as in addition to this, one strategic goal fulfilment includes several actions, and that is social inclusion: in terms of number, it contains 7 actions, accounting for 21.21% of all actions overall (University of Dunaújváros—IDP, 2021).

According to Szerb et al. (2023), "Small business competitiveness is determined by the interaction of internal corporate competencies that form a system that are closely interconnected and the external environmental factors influencing them. The ten individual competencies—domestic market and competition, cooperation, internationalization, human capital, product/service offered, production, sales method (marketing), online presence, decision-making and administrative routines, and strategy—together with factors of the broad institutional environment, enable the company to compete effectively with other companies and provide products/services which is highly valued by consumers. Competitiveness is a key element of corporate performance—profitability, efficiency, growth. Regional competitiveness can be defined as the average of the competitiveness of companies operating in a given area" (Szerb et al., 2023, p. 130). Given that the overview presented above highlights that most higher education institutions should have an institutional development plan, the case presented proves that actions and indicators are formulated in it, indicating education training, research-development-innovation and a third missionary dimension. It seems that Szerb et al. (2023) ten individual competences' keywords are identifiable in the Institutional Development Plan (**Table 1**).

Table 1. Identification of individual competencies based on the institutional development plan of the University of Dunaújváros.

Pillar	IDP identification keyword	IDP identification keyword hits
Domestic market and competition	market, competition	25, 8
Cooperation	cooperation	64
Internationalization	internationalization	7
Human capital	human	8
Product	product	10
Production	production	1
Marketing	marketing	1
Online presence	online	43
Decision-making	decision	3
Strategy	strategy	137

4. Discussion

The main aim of the research was to shed light on the changed role of higher education. The measures of the Bologna Declaration have contributed to the unification of higher education systems across Europe, the comparability and adaptability of diplomas. Members of the Visegrad countries were particularly involved in the process, as the higher education system was developed in relation to Central Europe.

In order to promote the international competitiveness of higher education, it represents significant added value in innovation and competition in the national economy. This leads to the conclusion that competitiveness should no longer be measured not only by ranking between higher education institutions, but also by their role in territorial capital.

The impact on territorial capital, combined with the traditional characteristics of higher education and its third missionary role, can constitute the competitiveness of a given institution. If the impact of higher education institutions on location could be measured in a uniform way, competition between institutions would be more transparent and the role of the region could be strengthened. All this would greatly support the development of higher education policy and contribute to stimulating competition between institutions and regions.

It can be stated that it plays an important role in the life of education and higher education in terms of competitiveness, and the policy sets expectations towards institutions in connection with this.

The research question of whether higher education appears in strategic documents and whether the regional, third mission role appears in higher education institution strategic documents can be determined.

The limitations of the research method are due to the diverse system of institutional characteristics and their public availability. In order to solve this, it may be necessary to examine whether it is worth categorizing them due to the diversity of higher education institutions.

5. Conclusion

The first half of the research, attention was drowned to the complex approach of higher education and its changed role in economic competition. This approach was identified in the literature, the S3 strategy and the Institutional Development Plan of the University of Dunaújváros, participating in the research. Based on the KIVI model (Szerb et al., 2023), the basic pillars were identified in the case of a Hungarian higher education institution with small and medium-sized enterprise characteristics. This case proved that it is possible to transfer the model developed for measuring the competitiveness of small and medium-sized enterprises, and its applicability has been proven at level 0. In future research, it would be important to investigate the competitiveness of higher education institutions in different countries and regions in order to increase the universality and applicability. The future studies in other countries could serve the aim highlighting the uniqueness and universality of Hungarian higher education institutions. It would be important to examine whether the pillars of the KIVI model (Szerb et al., 2023) can be identified and to explore the concrete consequences of further results for higher education decision-makers and practitioners, as well as how these results can be applied to actual policies and practices.

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