

BENCHMARKING OF THE POSSIBLE IMPACT OF ROMANIAN AND HUNGARIAN UNIVERSITIES TO ECONOMIC DEVELOPMENT

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Abstract

Economic development is associated with innovation, which is why the innovation management practices and systems of the universities became essential. This research aimed to benchmark five Romanian and Hungarian universities close to the Romanian-Hungarian border to identify the strengths and weaknesses of the different approaches. The benchmarking included economic data and indicators connected to the innovation of the five biggest universities along the border regions. The analysis was performed using data derived from The Higher Education World Ranking and Eurostat. For the qualitative part, the web pages of the universities were analyzed. The research found that although the universities on the Hungarian side of the border seem more developed, regional economic development is stronger and more natural on the Romanian side of the border. According to the literature, it is clear that geographical factors play an important role in the development of innovation systems. The closing part of this paper makes an attempt to list the possible causes of the results.

Keywords

economic development; university; Romania, Hungary; cross-border; innovation

JEL Classification

O30; O10; M16

Introduction

During the development of universities, knowledge was always at the center. At first, people got together to transfer knowledge, then in the era of the Humboldtian university, research became the second activity to be performed by higher education. In the last few decades, the utilization of the knowledge produced at universities got emphasis and besides exploitation, while sustainability issues are getting more and more important (Wallin, 2007). This activity is frequently referred to as the third mission of the universities.

As economic development was identified as a must (Solow, 1956) and as innovation was identified as a crucial element of economic development (Porter, 1998), the role and the nature and level of cooperation of the different actors of the innovation ecosystems started to change, sometimes radically.

The end of the 20th century and the beginning of the 21st century are marked by the phenomenon of the entrepreneurial university. The concept started its glamorous career in the United States like many other connecting ones (third mission, technology transfer, or innovation ecosystem) since the Bayh-Dole Act of 1980 (Rector & Thursby, 2016; Siegel & Wessner, 2012), which gave technology transfer from universities to industry a boost. The historical basis for that was, that since the Land-Grant College Acts of 1862 and 1890, US universities were open to collaboration with external parties and to modify education and research according to external events, requests and expectations (Pinheiro, Langa, & Pausits, 2015).

Entrepreneurial universities are in the focus of research and according to the literature, they have to perform several tasks (Compagnucci & Spigarelli, 2020). Although from being a sole supplier of intellectual capital and human resources to being a catalyst the list of the tasks to perform is not the same at different researchers, but there are some, in which almost all can agree (Figure 1).

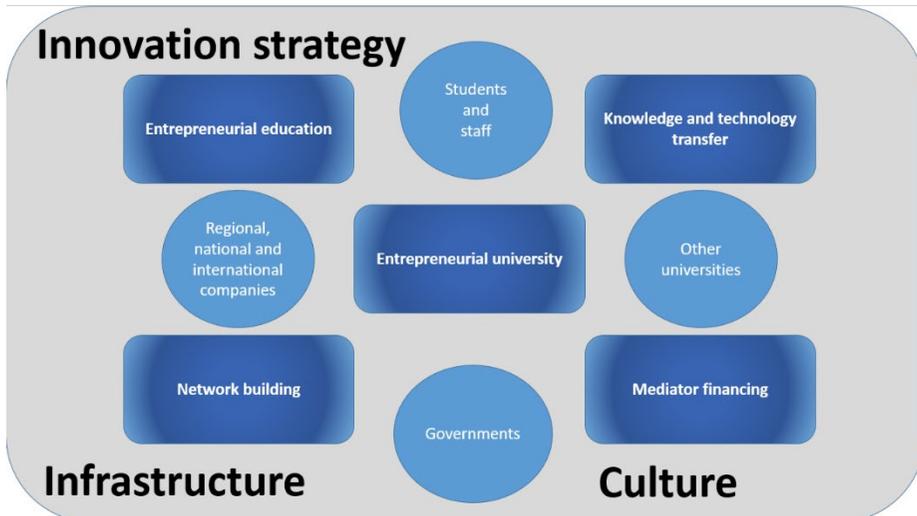


Figure 1 Tasks and stakeholders of entrepreneurial universities (not exhaustive)

Source: Based on the literature review, own compilation

Researchers question from time to time if there is a „one-size-fits-all” approach, and how the third mission can be performed and managed at the universities (Bedő, Erdős, & Pittaway, 2020; Secundo, Giustina, De Beer, Schutte, & Passiante, 2017).

In Figure 1 the dark squares symbolize the main activities of an entrepreneurial university, while the light circles are the main target groups. These are the triple-helix actors complemented with the students and staff as this article’s point of view is the entrepreneurial university’s one.

Knowledge and technology transfer

Knowledge and technology transfer were among the first tasks to be embraced by the universities (Huberman, 1983) in the framework of the third mission, although the success of the technology transfer offices is controversial (Gubitta, Tognazzo, & Destro, 2015). Not solely for this task the university needs to build wide and diverse networks with business / industrial, governmental, and academic stakeholders (triple-helix actors) (Leydesdorff & Etzkowitz, 1996).

Entrepreneurial Education

It is also a must to provide entrepreneurial education for the students and staff. This task contributes to the responsibility of providing educated work staff to the market and to the knowledge transfer activities, too. Moreover the actions following entrepreneurial education - incubation, acceleration, science parks – can be profitable in the long run (Bennett, Yábar, & Saura, 2017) and they are in favor of networking activities.

Universities play an essential - according to some researchers, central - role in the startup ecosystem (Diaconu & Dutu, 2015). Universities’ startup incubators and accelerators provide support and courses for entrepreneurial students and staff. Courses

can include pitch training, Business Model Canvas, prototype building, financials, and marketing, which provide a fast track to entrepreneurship for the startupper. Through mentoring and by filling the gap between research and the market, there is a two-way connection with the local economies.

Network building

Networking is essential in any relationship. For being able to cooperate with other actors, trust and communication are among the basic requirements.

The network includes the students and the staff of the university, but also the industrial and governmental actors and the widest group is the society itself (Bennett et al., 2017). Among the networking activities with external stakeholders mentoring, commercialization (patenting), brainstorming, idea competitions, joint projects, and financing can be mentioned.

Some research even proved that trust within the network of an entrepreneurial team has a significantly positive influence on the likelihood of obtaining seed investment from venture capitalists (Huyh, 2019).

Financing

Universities also have an important role in the financing and early support of startups (pre-seed financing, venture financing, and investing equity in startups). Of course, it is frequently combined with in-kind contributions from the university – like access to research groups and/or infrastructure.

Sometimes literature defines academic entrepreneurship as narrowly as the commercialization of academic research, some argue that a broader conceptualization – focused on the future forms of value – is historically justified. In this sense academic entrepreneurship is a significant driver of institutional change all over the triple-helix (Wadhvani, Galvez-Behar, Mercelis, & Guagnini, 2017).

Strategy, culture and infrastructure

These three factors are binding to be successful as an entrepreneurial university.

The system of Figure 1 works best if the cultural environment is advantageous (Del Giudice, Nicotra, Romano, & Schillaci, 2017; Miller, Alexander, Cunningham, & Albats, 2018; O'Shea, Allen, Morse, O'Gorman, & Roche, 2007), the infrastructure is appropriate (Guerrero, Maribel & Urbano, 2012; Shane, 2004; Wright, 2007) and the innovation strategy supports the objectives of the entrepreneurial university (Guerrero, Maribel, Urbano, & Fayolle, 2016; Guerrero, Maribel & Urbano, 2019; Secundo, G., De Beer, Fai, & Schutte, 2019).

According to Rolfo and Finardi (2014), it was easy for the universities to provide knowledge to be translated into intellectual properties that could be exploited in practical terms. Some universities got high-levels in other activities, like patenting, licencing, building science parks or financing startups (Mariani, Carlesi, & Scarfò, 2018).

These kinds of activities soon became the indicators of the universities' contribution to their regions' economic development (Compagnucci & Spigarelli, 2020).

The concept of a successful third mission depends on three interrelated aspects (i) the institutional framework of the university, (ii) regional factors, like embeddedness and (iii) the activities of the university (Compagnucci & Spigarelli, 2020).

Research method

This research aims to shed a light on a limited geographical area, which is relatively lagged behind in economic development and innovation terms in the European Union.

It is the border area of Romania and Hungary, which countries are both part of the Emerging Innovators group in the European Innovation Scoreboard (2022), although the Hungarian position is the closest to the group of the moderate innovators (Figure 2).

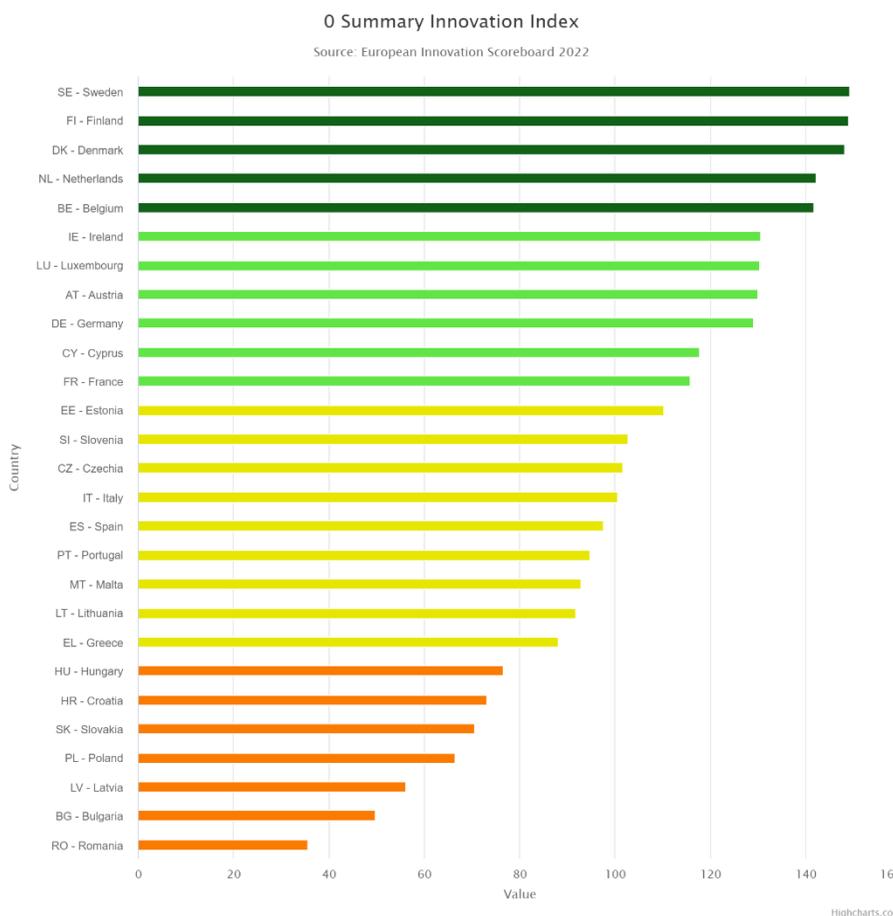


Figure 2a Innovation Index by groups

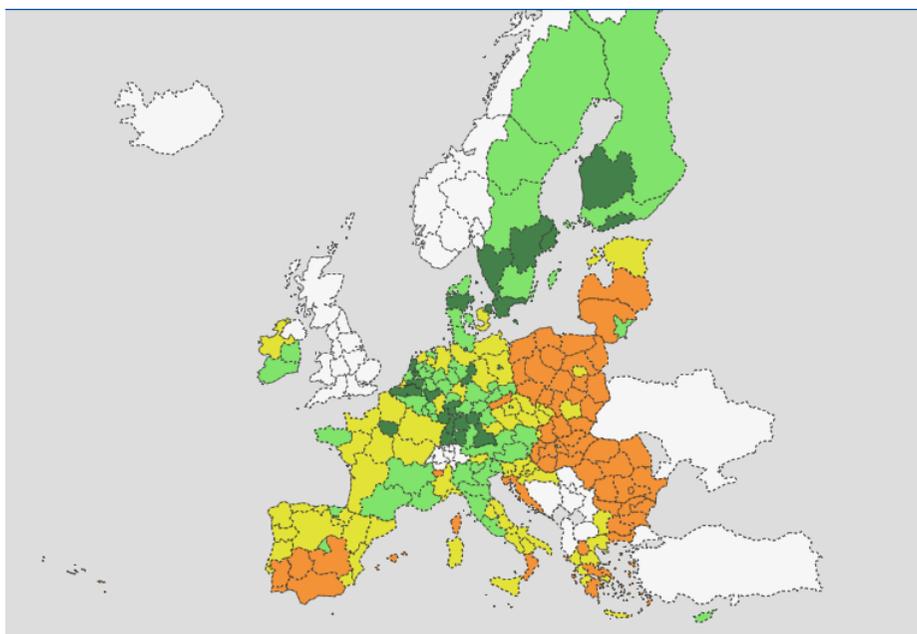
Source: European Innovation Scoreboard (European Commission, 2022a)

Based on the World University Rankings 2023 of The Higher Education (The Higher Education, 2023), there are altogether 35 Romanian and Hungarian Universities on the list.

The list was copied, data was cleared and universities located far from the border of the two countries were eliminated from it. Then from the remainder 10 universities, the ones with less than 10,000 students (3) and the ones at which there was a duplication of a city (2) were also excluded. In the latter cases, the universities with the better rankings and larger student bodies were kept for the analysis.

By the end of the process, five universities became part of the research, which are situated in 4 regions.

The University of Oradea (Oradea) and Babes-Bolyai University (Cluj-Napoca) are located in the NUTS 2 region of Nord-Vest, which encompasses six counties in northwestern Romania (Bihor, Satu Mare, Maramureş, Sălaj, Cluj, and Bistriţa-Năsăud).



Legend:
■ Innovation leader
■ Strong innovator
■ Moderate innovator
■ Emerging innovator

Figure 2b Innovation Index by regions

Source: European Innovation Scoreboard (European Commission, 2022a)

The Western Timisoara University (Timisoara) is situated in the NUTS 2 region of Vest, which includes four counties (Timiș, Arad, Caraș-Severin, and Hunedoara).

The University of Debrecen (Debrecen) is in the Észak-Alföld region (Szabolcs-Szatmár-Bereg, Hajdú-Bihar, and Jász-Nagykun-Szolnok counties), while Szeged - the biggest city of the Dél-Alföld (Bács-Kiskun, Békés, and Csongrád-Csanád counties) – is the where the University of Szeged is situated.

As the role of universities in economic development is still not totally understood (Bramwell & Wolfe, 2008), previous studies examined the impacts of university entrepreneurship and technology transfer. As information is difficult to obtain most of the researchers did case studies (Chrisman, Hynes, & Fraser, 1995; Guerrero, M., Urbano, Cunningham, & Organ, 2014; Iacobucci & Micozzi, 2012; Mesny, Pinget, & Mailhot, 2016) or input–output analysis of specific regions or countries and their universities (Goldstein, Harvey & Drucker, 2006; Goldstein, Harvey A., 1990) (Goldstein 1990) or more sophisticated methods (Carree, Della Malva, & Santarelli, 2014).

Literature found evidence that there is a positive relationship between the universities' activity and the economic growth of their regions (Guerrero, Maribel, Cunningham, & Urbano, 2015; Russo, van den Berg, & Lavanga, 2007).

Based on the literature review and the available data, the research question was formulated as do entrepreneurial universities have a positive impact on the economic development of their regions in a lagged-behind area?

H1: Universities' innovation indicators have a positive effect on the regional economic development

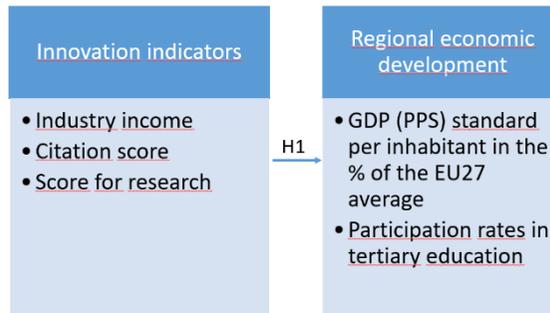


Figure 3 Proposed conceptual framework

Source: own compilation

Table 1 summarizes the most important indicators of the analyzed universities.

For the level of economic development, we have analyzed the four cross-border regions. Economic data is derived from the EUROSTAT (European Commission, 2023), while for the data of the universities, the World Ranking of the Times Higher Education (The Higher Education, 2023) data were used.

As a first step, the data from the World Ranking 2023 was collected and organized, including the scores of industry income, citation and research as these indicators are in close correlation with the development level of the university.

Research excellence is the most prominent indicator of a university, it reflects a university's reputation for research excellence among its peers, based on the responses to the annual Academic Reputation Survey. Research income is scaled against academic staff numbers and adjusted for purchasing-power parity (PPP). While the productivity of the research is measured by the number of publications published in the academic journals indexed by Elsevier's Scopus database per scholar, scaled for institutional size and normalized for subject.

Citations shows universities' role in spreading new knowledge and ideas.

To measure knowledge transfer - a university's ability to help industry with innovations, inventions and consultancy - the indicator of how much research income an institution earns from industry (adjusted for PPP), is scaled against the number of academic staff it employs is used.

Table 1 Data of the filtered universities and their regions

Name	Region	Number of students	International students (%)	World University Ranking (2023)	Impact Ranking (2022)	Number of faculties	Industry income	Citation score	Score for research
Oradea University	Nord-Vest	15840	6	1501+	na	15	37.1	16.3	12.2
West University of Timișoara	Vest	14527	6	1501+	na	11	37.7	16.8	13.4
Babeș-Bolyai University	Nord-Vest	39811	4	1001-1200	301-400	6	37.5	37.6	16
University of Szeged	Dél-Alföld	20023	22	1001-1200	401-600	12	39.6	33.3	15.5
University of Debrecen	Észak-Alföld	29045	22	1001-1200	401-600	13	41.9	29.8	14.3

Source: THE World University Ranking and EUROSTAT (European Commission, 2023; The Higher Education, 2023)

Results and discussion

Gross domestic product (GDP) is the most commonly used measure for the economic output in spite of all of its limitations (Dowrick, Dunlop, & Quiggin, 2003).

The Purchasing Power Standard per inhabitant in the % of the EU27 average shows the relevant position of a region in the list of the EU countries, as PPS is a common currency that eliminates the differences in price levels between countries allowing meaningful volume comparisons of GDP between countries. Calculations on a per inhabitant basis allow for the comparison of economies and regions significantly different in absolute size. GDP per inhabitant in PPS is the key variable for determining the eligibility of NUTS 2 regions in the framework of the European Union's structural policy (European Commission, 2023).

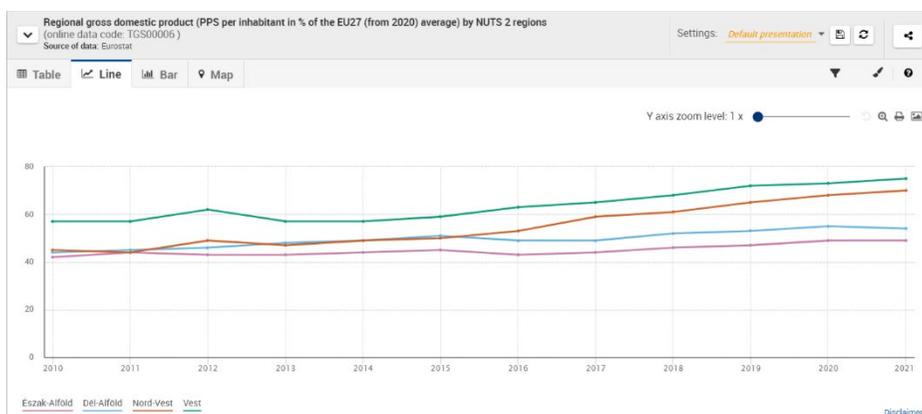


Figure 3 Regional gross domestic product (PPS per inhabitant in % of the EU27 average)

Source: EUROSTAT (European Commission, 2023)

It is visible on the chart of the Eurostat that three of the regions – home of 4 of the 5 analyzed universities - were on the almost exactly same level (44 and 45%) in 2011 regarding the regional GDP (PPS per inhabitant in % of the EU27). While Észak-Alföld's line is almost steady in the ten years to 2021, and Dél-Alföld is only slightly above it, Nord-Vest was able to develop from 44 to 70% and Vest – which was the most developed in this indicator in 2011 - from 57 to 75%. The year 2016 was a turning point for the Hungarian regions, when their values were even decreasing.

It is clear that all of these regions are lagged behind regarding the economic terms in the EU, but the two analyzed Romanian regions could reach continuous development. If we analyze participation rates in tertiary education at the regional level, the most shocking fact is that Hungary performed better than Romania, but the two Romanian regions were much above the national numbers, while the situation is the opposite in the case of the two Hungarian regions. For this data 2020 was the last year for which all the data were available.

It is also true that the four regions of the research are lagged behind the EU27 average, but while both of the Romanian regions are highly above the Romanian average, the two Hungarian regions performed even worse than the Romanian average (which is slightly behind the Hungarian average).

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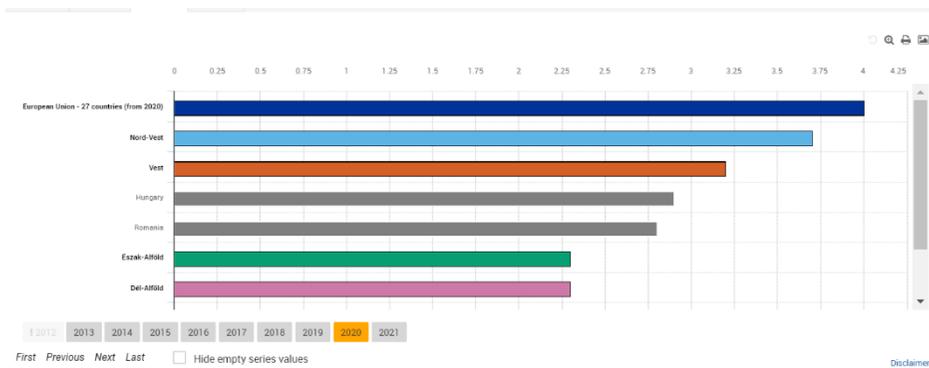


Figure 4 Participation rates in tertiary education at regional level 2020

Source: EUROSTAT (European Commission, 2023)

We can state that the economic development of the Romanian regions is faster than the Hungarian ones, moreover, the regional participation rates in tertiary education are also higher in Nord-Vest and Vest than in Dél-Alföld and Észak-Alföld.

Having in mind these facts, and the literature analysis according to which there is a correlation between the university's performance and the regional economic development, it is surprising that regarding the analyzed area there is no real correlation between the indicators of the university and the regional economic indicators (Table 2). Correlation was found among the % of international students and the industry income, the impact ranking and the GDP in % of the EU average and among the citation score and score for research and world university ranking (negative correlation).

One of the limitations of the research is the size of the sample.

In Figures 5a, 5b, 5c it is visible that the two Hungarian universities (blue circles) have a much more massive international student body (size of the circle), and they scored higher in the industry income (Figure 5a). In the citation score (Figure 5b) and the score for research (Figure 5c) the biggest university of the five – Babes-Bolyai University got the highest ranking. It can be stated based on these facts, that Babes-Bolyai is the best of the analyzed universities regarding research and its impact.

Based on the results, the hypothesis of the research is rejected, which means that no correlation was found between the innovation indicators of the universities and the economic indicators of their regions.

Table 2 Correlations of the indicators

Correlations									
		Number of Students	% of international students	Industry income score	Citation score	Scores for research	World university ranking	Impact ranking	GDP in % of EU
Number of Students	Pearson Correlation	1	-.026	,191	,828	,731	-.748	-.890	-.196
	Sig. (2-tailed)		,967	,758	,084	,161	,146	,301	,751
	N	5	5	5	5	5	5	3	5
% of international students	Pearson Correlation	-.026	1	,902 [*]	,369	,290	-.598	1,000 ^{**}	-.960 ^{**}
	Sig. (2-tailed)	,967		,036	,541	,637	,287	,000	,010
	N	5	5	5	5	5	5	3	5
Industry income score	Pearson Correlation	,191	,902 [*]	1	,376	,267	-.620	,853	-.930 [*]
	Sig. (2-tailed)	,758	,036		,532	,664	,264	,350	,022
	N	5	5	5	5	5	5	3	5
Citation score	Pearson Correlation	,828	,369	,376	1	,952 [*]	-.959 [*]	-.894	-.494
	Sig. (2-tailed)	,084	,541	,532		,013	,010	,296	,398
	N	5	5	5	5	5	5	3	5
Scores for research	Pearson Correlation	,731	,290	,267	,952 [*]	1	-.874	-.727	-.346
	Sig. (2-tailed)	,161	,637	,664	,013		,052	,482	,568
	N	5	5	5	5	5	5	3	5
World university ranking	Pearson Correlation	-.748	-.598	-.620	-.959 [*]	-.874	1	. ^c	,714
	Sig. (2-tailed)	,146	,287	,264	,010	,052		,000	,175
	N	5	5	5	5	5	5	3	5
Impact ranking	Pearson Correlation	-.890	1,000 ^{**}	,853	-.894	-.727	. ^c	1	-.974
	Sig. (2-tailed)	,301	,000	,350	,296	,482	,000		,146
	N	3	3	3	3	3	3	3	3
GDP in % of EU	Pearson Correlation	-.196	-.960 ^{**}	-.930 [*]	-.494	-.346	,714	-.974	1
	Sig. (2-tailed)	,751	,010	,022	,398	,568	,175	,146	
	N	5	5	5	5	5	5	3	5

*. Correlation is significant at the 0.05 level (2-tailed).

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

Source: SPSS

Chart Legend Information

Settings	Value
Color by	Country
Size by	% of international students
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Legend Settings for the charts that follow. Some settings do not apply to categorical charts.

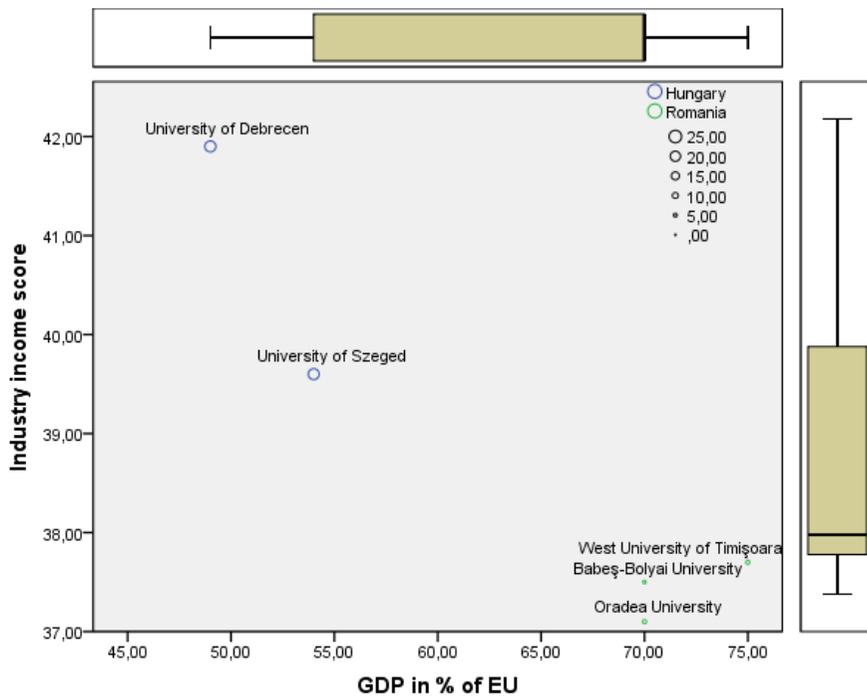


Figure 5a Industry income score (2023) and GDP in % of the EU average (2021)

Source: EUROSTAT and THE with the use of SPSS

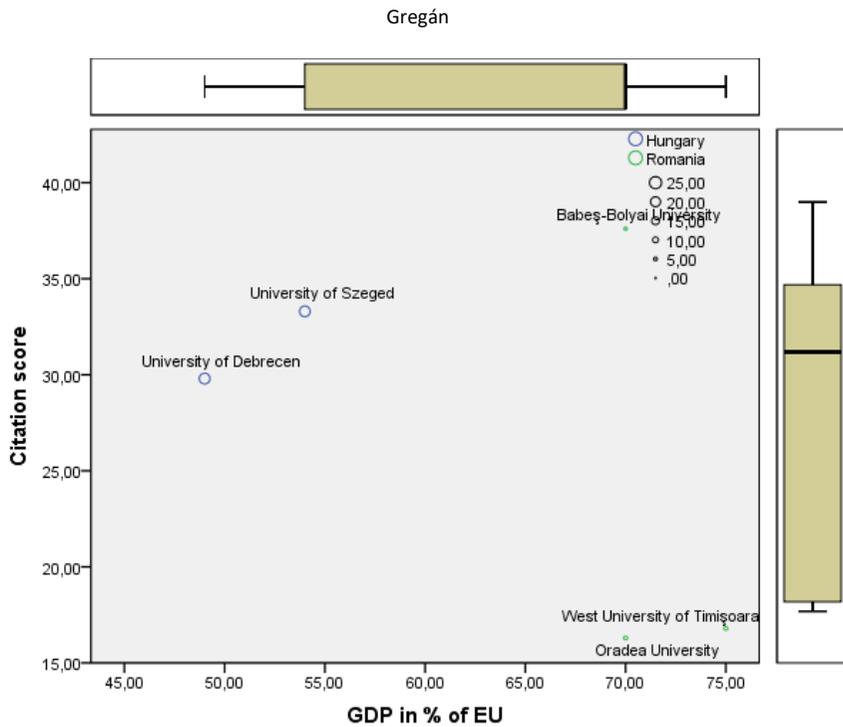


Figure 5b Citation score (2023) and GDP in %of the EU average (2021)

Source: EUROSTAT and THE with the use of SPSS

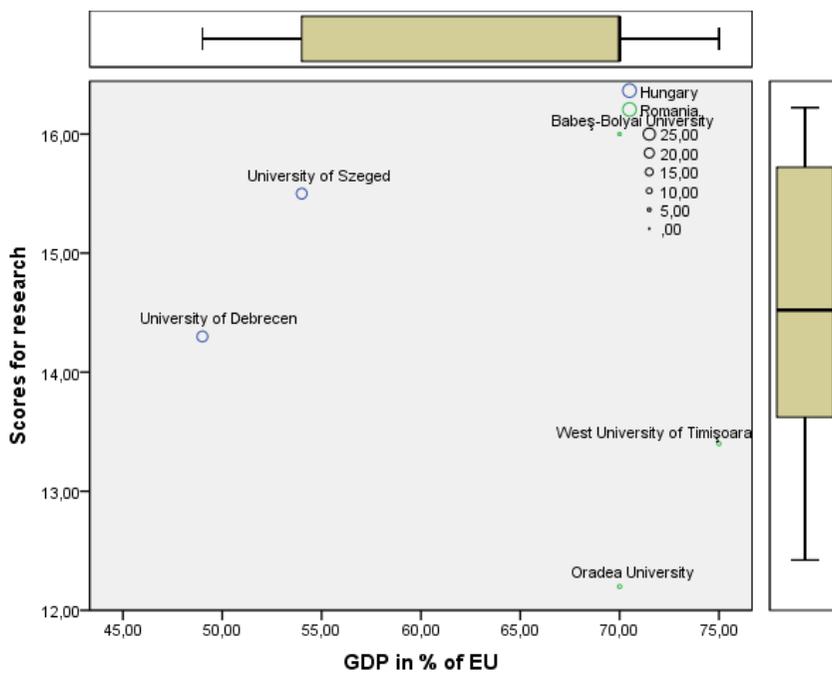


Figure 5c Score for research (2023) and GDP in %of the EU average (2021)

Source: EUROSTAT and THE with the use of SPSS

Through qualitative research of the publicly available webpages of the universities, this research aimed to identify the specialties of the universities in entrepreneurial activities. The explanatory research was looking for the signs of the third mission with keywords like „innovation*“, „technology transfer*“, „knowledge transfer“, and „science park*“ to get different types of secondary data (like the published websites, publicly available strategic documents, published conference proceedings available in the public domain). Not only in English but in Hungarian and Romanian, too where it was necessary to get access to the information by using translators (DeepL and Google Translate). The most important peculiarities are listed in Table 2.

Table 2 Some qualitative data of the filtered universities

Name	Region	EUN partnership	TTO	Entrepreneurial activity
University of Oradea	Nord-Vest	EUNICAS	Centre for Management and Technological and Cognitive Transfer	Societatea Antreprenorială Studențească
West University of Timisoara	Vest	UNITA	Center for Technological Transfer and Innovation (CTT-UVT)	MyUVT
Babes-Bolyai University	Nord-Vest	EUTOPIA	UBB Tech Transfer	UBB4Society&Economy program
University of Szeged	Dél-Alföld	EUGLOH	Directorate for R&D and Innovation	Joint Innovation Challenges
University of Debrecen	Észak-Alföld	NeurotechEU	Center for Technology Transfer and Research Commercialization	iDEa bUDs Innovation Idea Development Program

Source: The webpages of the universities and other public sources

During the qualitative analysis the fact that these universities develop similarly regarding innovative activities became evident. All of them are partners in a European University Network (EUN), which can ensure their long-term embeddedness into an innovative partnership. According to the New European Innovation Agenda, EUNs are expert facilitators, which increase collaboration between industry, academia, and research organizations, and help match the supply of knowledge with the requirements of industry for innovation (European Commission, 2022b). Technology Transfer Offices are working, although at different levels of the organizational structure. All of these universities are committed to supporting their students and sometimes staff with entrepreneurial activities.

Conclusions

“Throughout history universities have enabled their local communities to thrive due to the free and dynamic circulation of people and ideas.” (Sergiu-Matei Lucaci)

Although most universities have their innovation strategies, these – most of the time – do not cover the issue of the different points of views of the different stakeholders.

The European University Association's (EUA) newly published Innovation Agenda 2026 argues that universities should more prominently embody their role as honest brokers (European University Association, 2023).

The report defines innovation as knowledge co-creation. This involves bringing together perspectives from ethics, politics, technology and regulation and devising independent advice to mediate between different interests and communities. The role of the universities is to ensure that ideas and applications fulfill the expectations of both their developers and users and showing that market exchange does not fully capture the value of impact of innovation (European University Association, 2023).

Seeing the results of our research we have to agree with Cooke (1992), who found that geographical location is important in innovation capacity. Located near an innovation hub, supports the development, while networking can help a bit for the other actors.

Neither Romania, nor Hungary are closed to innovation hubs, which means that networking is a key for them in development. All the analyzed universities are partners in European University Alliances, which represents their commitments for building networks.

In the latter years, the emerging importance of sustainability as a topic to be addressed boosted even in less developed regions of the European Union (Compagnucci & Spigarelli, 2020), which can be a way forward for the lagged behind regions, too.

It is a strong hope for all the people living in less developed areas that as Manuel Stagaris (2014) stated most of the universities have all the elements to build a strong entrepreneurial ecosystem, which is an ideal launch pad for startups. The task is to remove the barriers that prevent the ecosystem from growing.

Limitations of the research

This research focused on a limited geographical area and a limited number of universities. All of these universities have already made steps to be innovative, although no justifiable impact on the economic development was found.

For future research

Based on the results of this research it would be interesting to have a deeper view of the universities programs and their results on the regional economic development. Other data can be analyzed and even other regions can be included to get a clearer view about the role of location, the different indicators and the strategy for the future.

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