The potential of tertiary education and its influence on regional development of Slovakia

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Abstract

One of the factors that affect the fulfilment of regional development programme is the relationship among actors active in it. Among the main subjects in the region, whose activity can influence the attraction of the region, its potential and development, belong institutions of tertiary education (universities, as the representatives of education institutions of university type), businesses, institutions of public administration and self-government, and organizations of third sector. Presented results of the paper represent the application of approaches to evaluate the quality of tertiary education with the help of the Index of quality of regional university environment under the conditions of Slovak municipalities. Although it is the competitiveness and market that play the main role in settling regional differences, both state and self-government can intensify the whole process by creating suitable conditions for increasing the quality of university environment also in less developed regions.

Key words: regional competitiveness, university, Index of quality of regional university environment, quality, tertiary education
JEL classification: R11, I23, O15

1 Introduction

As there are differences among the regions of individual countries, also conditions of both university environment and doing business differ. Each region has its specific characteristics, which makes it either easier or more difficult in the university and business environment. On the regional level it holds too, that less developed regions can get inspired by more developed ones and so can move forward faster while improving individual elements of university and business environment.

Universities[1], with their triple role of the supplier of the highest education level, sophisticated research and discovery innovations, are at the heart of European knowledge triangle. They have the potential to work as the moving force in the ambition of Europe to become the leader in knowledge economy and society in the world scale. This fact has been known in the policy making on the EU level since the summit in Hampton Court in October 2005; if, however, their potential is to be used, the need of change is unambiguous. In the announcement of the Commission "Realisation of the universities' modernisation programme: education, research, innovation" from May 2006[2] has named nine areas of activity [1]. Since then

[1] „Universities" mean all the institutions of tertiary education, regardless their name and position in member states. The Commission of European Communities: The announcement of the Commission of European parliament, Council, European economic and social committee and Committee of the regions. Brussels, 2.4.2009. KOM (2009) 158 in its final version.
[2]KOM (2006) 208 in its final version

the modernisation programme has been the subject of extensive political exchange, while he Council of ministers regularly checks achieved progress[3].

It is the challenge for university education to ensure education environment, which stimulates independence, creativity and business approach towards using pieces of knowledge [2]. Efficient cooperation among businesses and universities is perceived as particularly important for regional development[4]. Success of many innovative regions in the USA and Europe is based on the triangular partnership for political orientation and financing involving universities, businesses and governments. In times of economic recession, when the graduates experience more difficulties while searching for a job and businesses are exposed to higher competition pressure, should the economic and social added value of cooperation among universities and businesses be of even higher importance.

In this context the concept of so called *business university*, which is based mainly on geographical closeness of individual actors of regional development, is important. At the same time, the significance of universities as the actors of directly involved into innovative processes of forms (paradigm of open innovation [3]) is increasing, within the scope of which the biggest flow of knowledge takes place through the mobility of human capital.

The evaluation of quality of all the university activities is a topic which is nowadays paid the most attention to in all the European countries [4] [5]. The importance of this problem is linked in the European context mainly with the Bologna process that issues the assessment and evaluation of the quality of universities as its significant priority [6].

So far in Slovakia, there has not been processed a wider analysis of university environment from the view of the competitiveness in individual regions. Certain examples of the analysis are the reports about the university evaluation in Slovakia which are realised by the agency ARRA[5], Sector report of the European Association of Universities about the university evaluation in Slovakia[6] and realised complex accreditation of universities in Slovakia[7]. Several accreditation agencies involve the representatives of some businesses into its decisive process, such as ACQUIN in Germany, HETAC in Ireland or CTI in France. CTI is responsible for master degree programmes and it involves the same number of academic members as well as industry; transversal skills and student interaction with the industry are the basic requirements for accreditation.

This paper and methods used are based on the results of the dissertation project solution, current state of elaborated problem in bibliography and requirements, or the topicality of its solution in terms of strategic documents in the area of university education and science in the EU

[3]Summary of problems and measures taken can be found in the KOM (2008) 680 from 30 October 2008 the Report of The Commission to the Council about the Council resolution from 23 November 2007 about modernisation of universities for the competitiveness of Europe in global knowledge economy.

[4] University education and regions: globally competitive, locally involved; OECD 2007

[5] Academic ranking and rating agency, whose aim is to provide the information about the quality of individual university institutions in Slovakia to public, and to adopt a way of evaluation and increasing the quality of education provided by university institution in Slovakia.

[6] Project of two-year evaluation of 24 universities in Slovakia by European association of universities (EUA) has been finished by the conference called „Sector report about the state of university schooling in Slovakia“, which took place in Bratislava between 18 and 19 of February 2008.

[7] Main evaluative organ, that will issue its proposal, is Accreditation Committee, advisory body of the Slovak Government (later only AK). All university materials of all-university package character, or for individual faculties, were processed on the basis of the Regulation of the Government of Slovak Republic, nr. 558/2007 about AK, the resolution of the Ministry of Education about the criteria of assessing the fitness of universities to realise facilitation procedures and procedures to name professors, valid since 15 June 2008, as well as the decision if the minister, who set the criteria for incorporation of certain schools into the category University, High School or Technical High School (KZU 1 to 6, valid from 1 January 2008)

and in Slovakia. The main aim was the identification and evaluation of the mechanism of quality management system creation in the university environment (later only UE) in the context of European trends and on this basis as well as the implication of the problem in regional terms from the view of the competitiveness criteria on the example of selected universities in Slovakia.

2 Materials and methods

The basis for the topic processing was the analysis of current state in the area of UE, application of the quality management system under the conditions of institutions of tertiary education, identification of problems in the priority areas of the topic, chosen criteria, defined indicators and basic framework for research under the conditions of municipalities in Slovakia.

Monitoring regional differences across Slovakia and the evaluation of regional university environment under the conditions of municipalities in Slovakia from the perspective of their quality was realised based on the own evaluative tool, namely *Index of quality of regional university environment* (later only "IK RVŠP"), whose relevance was verified in the dissertation. The choice of regions in the dissertation was done in the way, that from the level of NUTS II (Slovakia – East, Middle and West) were chosen 4 regions with comparable parameters from the perspective of competitiveness criteria (The Municipality of Košice, The Municipality of Prešov, The Municipality of Banská Bystrica and The Municipality of Nitra), whereas in this stage of the research we extend the regional application towards all the municipalities in Slovakia.

Research part of the dissertation consisted of 3 phases:

1) Questionnaire Survey
2) Formulation and testing of hypotheses
3) Construction of the Index of Quality of Regional University Environment

The sources of the data were the materials in relation to the human resources and their quality. We came out of the standard methodology of EU (*Labour Force Survey*), namely by observing the trends in the area of employment in the context with achieved education and trends in the area of tertiary education within the EU. We worked with the standards of ISCO 88 (*International Standard Classification of Occupations*), namely in the class of achieved education, while we accepted the classification ISCED 1997 (*International Standard Classification of Education)*. For individual comparisons in the international context we came out from the methodology ILO (International Labour Organisation), particularly by finding out the rates of employment and unemployment and division of population between economically active and economically inactive. In the framework of institutional quality we relied on the aggregated indicators, which are realised by the World Bank in the Project Governance matters (GM) with the focus on quality of public institutions and legal system. In the area of Innovative Performance we used the basis in the methodology of collection and data reporting according to Frascati manual (structure of science disciplines), which is published by the OECD. The expenses on the research and development (R&D) is observed by GERD (*Gross Expenditure on Research and Development*) as a summary indicator of inputs into the R&D, which helped us in certain sections of development trends evaluation in the tertiary education on international level. We perceive its importance within the background of GERD relationship in the percentage of GDP, which belongs to the EU statistics to the indicators evaluating the realisation of goals of Lisbon strategy.

The construction of the Index of quality of regional university environment was based on the methodology of qualitative competitiveness, which is expressed by various indicators. The comparisons of sources and results of knowledge based competitive advantage expresses KAM (*Knowledge Assessment Matrix*) from the World Bank production. In the structure of KAM the innovative performance dominates, and its supply is influenced namely by education in terms of increase in the quality of human resources. And it is the *combination of innovative performance and quality human resources which are the basic condition for the development of knowledge based competitiveness.* Among other significant international evaluations the International Institute for Management Development in Lausanne places the area of the *quality of human resources and research* on the first place. Statistical data were taken particularly from Annual reports of Ministry of Education in Slovakia on the state of university education [7], evaluation reports ARRA [8], Slovak statistical office [9], and from materials from the Institute of information and prognoses for education (UIPS) [10].

3 Results and discussion

IK RVŠP is a summary index which tells us about the quality of university environment in municipalities in Slovakia and it is the combination of values of four chosen statistical indicators. It was constructed from four subindices and each of the subindices has particular indicators. During calculations the weights of the subindices were defined, which were attributed to them by respondents from both external and internal segment of university environment, where we conducted the survey. *The content of respective subindices and indicators was maintained in synchronicity with the content of the questionnaire in order to be able to compare them.* Subindices are the result of calculations obtained based on statistical data from individual indicators in each subindex. This enabled us to compare the data from both internal and external subsystems of UE in each segment of the research paper (i.e. in the questionnaire survey, formulation and testing of hypotheses and calculation of IK RVŠP), both on the basis of assumptions as well as real data obtained and recalculated from statistical data.

Methodology: *Basic formula for the calculation of IK RVŠP on the example of the subindex of Macroeconomic performance and stability (later "MEVS"):*
Subindex: *MEVS*
Indicator: *Regional GDP*
Weight of an indicator in the subindex: *Added based on the results of questionnaire survey in the external subsystem UE*
Calculation: (Figure 1)

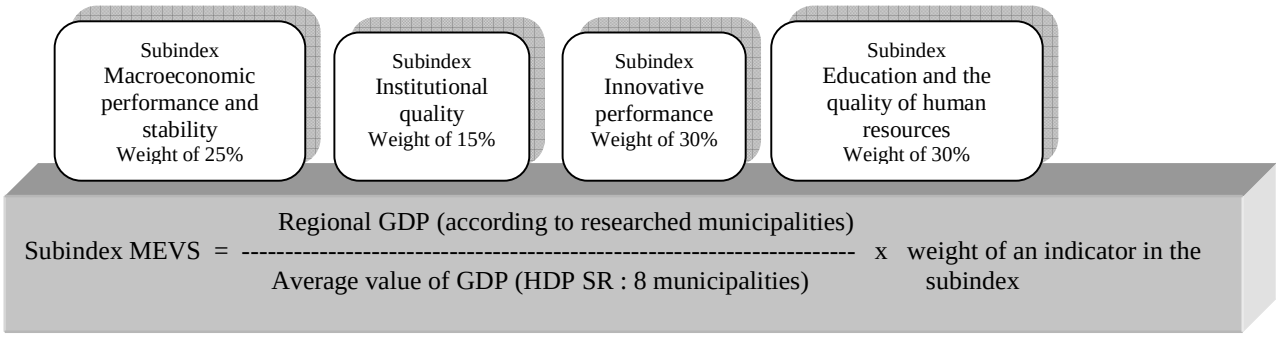

Figure 1 Basic formula for the calculation of IK RVŠP
Source: Own calculations

The data are from 2006, and it is the last year where the statistical data are available in needed indicators. The weights in subindices are attributed on the basis of results from questionnaire survey in the external subsystem of UE (Table 1).

3.1 Subindices and indicators

Table 1 Subindices of IK RVŠP

Name of subindex	Weight in IK RVŠP
Macroeconomic performance and stability	25 %
Institutional quality	15 %
Innovative performance	30 %
Human resources	30 %

Source: Own calculations

Table 2 Resulting values of indicators in the subindex Macroeconomic performance and stability

Indicators	Municipality							
	BSK	TTSK	TNSK	NRSK	BBSK	ZSK	PSK	KSK
Regional GDP (mill. of Sk)	2,10	1,00	0,83	0,89	0,72	0,83	0,65	0,97
Regional value added (mill. of Sk)	1,88	1,04	0,94	0,82	0,70	0,91	0,68	1,03
Labour productivity (mill. of Sk)	20,36	9,75	4,54	4,19	4,61	5,27	3,57	8,22

Average employment rate (thousands of persons)	1,22	0,87	0,73	0,79	0,68	0,78	0,76	0,79
Disposable number of applicants for a job (thousands of persons)	-0,25	-0,49	-0,51	-1,00	-1,67	-0,74	-1,64	-1,71

Legend: BSK – The Municipality of Bratislava TTSK – The Municipality of Trnava
TNSK – The Municipality of Trenčín NRSK – The Municipality of Nitra
BBSK – The Municipality of Banská Bystrica ZSK – The Municipality of Žilina
PSK – The Municipality of Prešov KSK – The Municipality of Košice

Source: Own calculations

The subindex of Macroeconomic performance and stability is a significant factor influencing the interest in studying at a university in a municipality, and it is also related to the opportunities for getting employed after graduation and characterizes given environment from the economic and social perspective. If the height of regional development and regional added value are domineering in the Municipality of Bratislava and the Municipality of Košice, then it is important to point out the differences in the productivity of labour, where absolutely dominates the Municipality of Bratislava, which is given by the economic structure of the municipality and the share of activities with higher added value. The last place is occupied by the Municipality of Prešov. The Municipality of Bratislava dominates also in the indicator of the number of the employed, which is closely related to the size of the municipality as well as the number of population. The first place belongs to the Municipality of Košice in the indicator of the number of people willing to get employed, and both the Municipality of Banská Bystrica and the Municipality of Prešov are close behind, as it is generally known that these municipalities belong in Slovakia to the ones with relatively high unemployment rate.

Table 3 Resulting values of indicators in the subindex Institutional quality

Indicator	Municipality							
	BSK	TTSK	TNSK	NRSK	BBSK	ZSK	PSK	KSK
Number of universities in the municipality	2,00	0,80	0,40	1,20	1,20	0,80	0,40	1,20
Number of faculties in the municipality	2,29	0,63	0,39	1,12	0,87	0.87	0,63	1,19
The volume of paid social scholarships	2,11	0,42	0,16	1,01	0,78	1,27	0,75	1,51
Economic result of universities in the municipality (mill. of Sk)	2,03	-0,08	0,01	0,52	-0,41	4,46	0,08	0,23
Accommodation capacity of the universities in the municipality (number of beds)	3,74	0,04	0,05	0,75	0,69	0,99	0,32	1,41
Number of business subjects in the	1,52	0,85	0,88	0,95	0,85	1,07	1,02	0,85

municipality								

Source: Own calculations

The subindex of Institutional quality was based on the number of 20 public universities in Slovakia in 2006, other data were calculated based on the data from the Annual report about the state of universities in Slovakia in 2006, the number of business subjects was based on the Report of the statistical office of the Slovak Republic in 2006. In this indicator internal segments of UE are prevalent, while the number of public universities in the municipality and their faculties as well as the capacity of business subjects both are a significant factor for the opportunities for studying for people interested in tertiary education and for getting employed in the labour market. Even in this case the Municipality of Bratislava dominates by the opportunities for studying, accommodation capacities, as well as getting employed in the labour market, which is given by the potential of Bratislava as the capital of Slovakia. After the Municipality of Bratislava the worst social position by the amount of paid social scholarships is occupied by the municipalities of Košice, Žilina and Nitra, respectively. The lowest accommodation capacity for students is in the municipalities of Trnava and Trenčín. In the number of business subjects the first place is occupied by the Municipality of Bratislava, and close behind there are the municipalities of Žilina and Prešov. This signalises that they create comparable conditions for doing business and this could in turn increase the ability of graduates to get employed particularly in these municipalities and thus increase competitiveness as well. It is worth noticing the negative results of the municipalities of Banská Bystrica and Trenčín (thus economic losses) in the area of economic result of universities in the municipality in 2006. Relatively distinctive success in this indicator is in the Municipality of Žilina, and behind it the municipalities of both Bratislava and Nitra. The comparison of the municipalities of Žilina and Banská Bystrica shows a big difference.

Table 4 Resulting values of indicators in the subindex Innovative performance

Indicators	Municipality							
	BSK	TTSK	TNSK	NRSK	BBSK	ZSK	PSK	KSK
Number of employees in science and research at universities (employees with degree and higher qualifications)	3,70	0,30	0,41	0,72	0,54	0,80	0,33	1,11
Science and research*	33,91	27,59	18,50	33,29	22,18	15,38	16,87	67,33
Expenses for science and research in the municipality(thousands of Sk)	3,91	0,61	0,98	0,64	0,30	0,50	0,17	0,88

* Average value according to the faculties of given university in the municipality, own calculations according to the results of ARRA 2007 evaluation, marked VV1A-VV10

Source: www.arra.sk

Source: Own calculations

In this subindex, the dominant position is occupied by the Municipality of Bratislava in two indicators. A surprising finding among the assessed municipalities is the first place of the

Municipality of Košice in the science and research achieved by the University of veterinary medicine in Košice. As has already been mentioned, achieved values in the indicator of Science and research are the result of 14 data groups that express the potential and results of universities of given municipality in a complex way. The methodology of ARRA was based on the division of universities according to the Frascati manual to sciences: natural sciences, technical sciences, medicine sciences, agricultural sciences, social sciences, humanities. Faculties were assessed according to this division. Given averages from the report were then divided by the number of assessed faculties, so that achieved results would not be distorted by the different number of faculties. Is it surprising to see that the position of a university in the Municipality of Nitra (3rd place from assessed universities and close behind the Municipality of Bratislava). It is also interesting to see, that the best place from all the assessed faculties in the Municipality of Nitra was achieved by The Faculty of European Studies and Regional Development of Slovak agricultural university.

Table 5 Resulting values of indicators in the subindex Human resources

Indicators	Municipality							
	BSK	TTSK	TNSK	NRSK	BBSK	ZSK	PSK	KSK
Population in the municipality with university degree	1,90	0,74	0,92	0,78	0,89	0,90	0,81	1,04
Studying and education*	87,42	47,58	41,66	53,91	52,83	44,43	38,50	67,22
Registered unemployed university graduates (AP 2006*)	-0,51	-0,74	-0,79	-1,26	-0,85	-0,89	-1,63	-1,33

* Average value according to the faculties of given university in the municipality, own calculations according to the results of ARRA 2007 evaluation, marked SV1 –SV8.
Source: www.arra.sk
* AP – arithmetic mean calculated from the values of May and September 2006
Source: statistical results about unemployment of university graduates and youth

Source: Own calculations

Human resources are becoming the most dynamically developing factor of production which enables higher level of innovation and adaptability growth of the economy for new technologies. Sufficiency of qualified labour force is both the assumption and condition for growth of qualitative competitiveness on national and regional level. This was the basis for the construction of the subindex and its indicators. If the position of all the assesses municipalities is the same in the indicator of university graduates, then in the indicator of Studying and education the Municipality of Bratislava achieves the results, followed by the municipalities of Košice, Nitra and Banská Bystrica respectively. This gives the evidence for the fact, that from the perspective of activities structure the universities are orienting equally towards academic activies, as well as towards science and research. The position of the Municipality of Prešov is given by the fact, that there is only one public university. It is important to note, that the results in the indicator of Studying and education were calculated similarly as in the indicator Science and

research from the assumptions of ARRA, from 7 groups marked SV1-SV8. They expresses different aspects of performance of the assessed universities and their faculties and even in this case the average values from the ARRA report were divided by the number of faculties in two blocs of SV1-SV4 and SV6-SV8, so that the different number of faculties would not distort the objective position of given faculty/university/municipality in the assessment.

3.2 The summary of results from the Index of Quality of Regional University Environment

If we compared obtained results of IK RVŠP with the results from the questionnaire survey, all the relevant characteristics in the area of quality determinants, problem areas and the direction of UE development in assessed municipalities were confirmed.

Table 6 Resulting values of subindices of IK RVŠP according to municipalities

Indicators	Municipality								Weights in %
	BSK	TTSK	TNSK	NRSK	BBSK	ZSK	PSK	KSK	
Macroeconomic performance and stability	6,33	3,04	1,63	1,42	1,26	1,76	1,01	2.33	25 %
Institutional quality	2,05	0,40	0,28	0,83	0,60	1,42	0,48	0,96	15 %
Innovative performance	12,46	8.55	5.97	10,40	6,91	5,00	5,21	20,80	30 %
Human resources	26,64	14,27	12,54	16,03	15,86	13,32	11,30	20,08	30 %
Summary index	**47,48**	**26,26**	**20,42**	**28,68**	**24,63**	**21,50**	**18,00**	**44,17**	100%

Source: Own calculations

As can be seen in the summary table and graph, the highest values in all subindices are achieved by the Municipality of Bratislava, whereas the biggest differences among assessed municipalities occur in the subindex of macroeconomic performance and stability and Innovation performance. Relatively high value in the subindices of Innovation performance (Indicator of Science and Research) and Human Resources (Indicator Studying and Education) is given by the construction of these subindices, as the data were taken from the ARRA report. There, the areas of Science and Research are complex activities of assessed universities evaluated under marking of VV1A - VV10 and thus relatively high number of data such as number of publications, number of citations, the ratio of PhD. students to lecturers and to the number of other students, the volume of finance obtained for granted programmes etc. Similarly, in the subindex of Human resources in the indicator of Studying and education (marked in the ARRA report by SV1 - SV8 the main sides of activities of assessed universities are expressed by the number of students, ratio of lecturers according to individual categories and in relation to students, the extent of interest in studying at given university from home and international students. The reason for processing such an extensive database is the essence of the Index of Quality of Regional University Environment, as the key characteristics of the UE quality are in the logic of index construction

the areas of Innovation performance and Human resources. This fact is expressed by the weights of subindices in the framework of the IK RVŠP.

Resulting values of IK RVŠP for the assessed time period and on the basis of chosen methodology determined the order of municipalities in such a way, that the highest value is achieved by the Municipality of Bratislava, followed by the municipalities of Košice, Nitra, Trnava, Banská Bystrica, Žilina, Trenčín and Prešov. This is the reflection of reality, that the potential of the municipalities of Bratislava and Košice and universities in the regions have the best results from the perspective of competitiveness. The state of UE in its external and internal segment in the municipalities of Žilina and Trenčín is comparable, while if the Municipality of Žilina shows higher performance in the subindex of Human resources, the Municipality of Trenčín shows the higher value in the subindex of Innovative performance. It is given by the number of business subjects in the municipality. The Municipality of Prešov belongs to regions with highest unemployment rate. Compared to other municipalities, there is only one public university in the Municipality of Prešov containing 8 faculties. Other municipalities have the comparative advantage from the perspective of portfolio of study programmes offered, while in the municipality of Prešov the choice is limited in relation to the standard indicators of the competitiveness.

Table 7 The value of Index of Quality of Regional University Environment according to the municipalities

		IK RVŠP
1.	The Municipality of Bratislava	47,48
2.	The Municipality of Košice	44,17
3.	The Municipality of Nitra	28,68
4.	The Municipality of Trnava	26,26
5.	The Municipality of Banská Bystrica	24,63
6.	The Municipality of Žilina	21,50
7.	The Municipality of Trenčín	20,42
8.	The Municipality of Prešov	18,00

Source: Own calculations

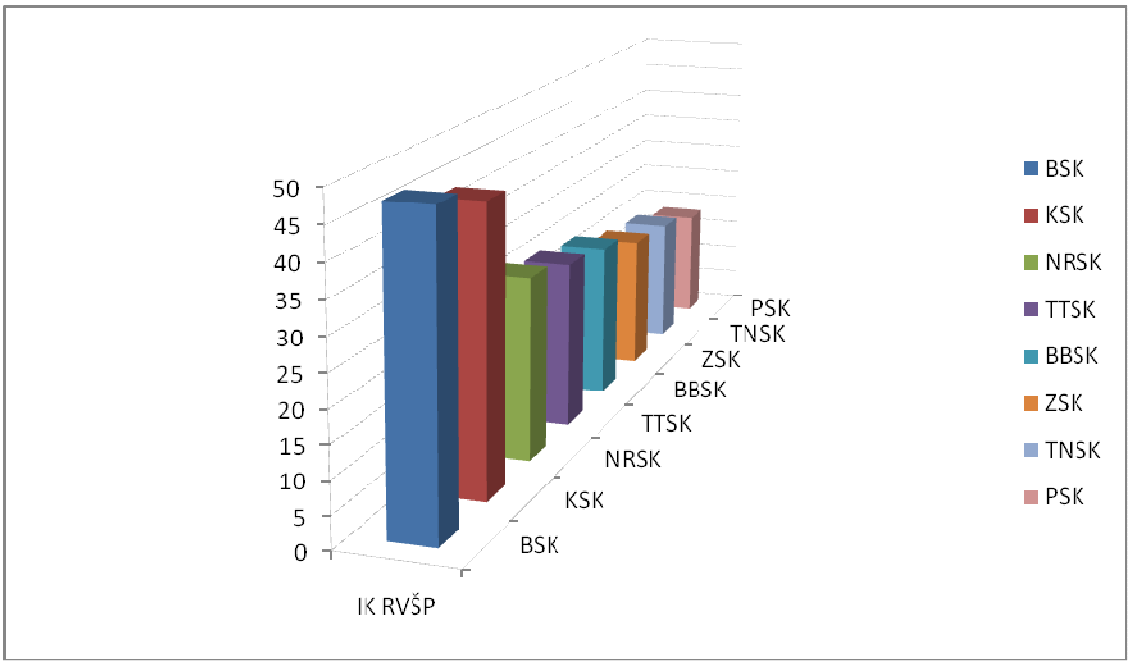

Figure 7 Resulting values of IK RVŠP

Source: Own calculations

4 Conclusions

IK RVŠP should have mapped the UE in selected municipalities of Slovakia and identify its strengths and weaknesses from the perspective of quality evaluation. To illustrate the extent of background material we note, that 17 indicators in all the 8 Slovak municipalities have been defined in the framework of 4 subindices of IK RVŠP with the background in the statistical data on regional and national level. This helped to achieve its resulting values. T

he results can help the competent representatives of universities in Slovakia with their work focused on the development of qualitative growth of UE in Slovak municipalities. Although the main role by offsetting the regional differences is played by the market and competition, state and self-government can intensify the whole process by creating suitable conditions for increasing the quality of UE in less developed regions, too. This paper represents an open system and cyclically, the research can be repeated and done into more depth in coming years. The time series of the most important indicators related to the evaluation and development of quality of UE in regions would be created.

Research has shown the weaknesses in the UE in selected municipalities from the perspective of offered education, science and research, link to practice, etc., which disadvantage the individual universities in front of competition. Their elimination should not only be in the interest of individual universities, but also of the whole society, as the growth of the competitiveness of Slovak UE will intensify the overall economic growth, which in turn will cause the standard of living to increase.

Obtained results of the evaluation of quality of regional UE has confirmed the correct construction and usefulness of the IK RVŠP for the identification of conditions in both external and internal segment of UE in the context of criteria of qualitative competitiveness. Used methodology can be used for this purpose in observing development trends in the framework of long-term time horizon and in the framework of all Slovak municipalities. The results can thus serve for decision-making processes in the development of tertiary education on national and regional level and by creating the strategy of regional development on both national and regional level.

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