Doing business and education from the perspective of criteria of qualitative regional competitiveness

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Abstract

Using statistical analysis, this paper identifies both a determinant of doing business as well as a determinant of education in relationship to regional competitiveness. It defines regions (municipalities) as the main users of services which are provided by universities and business subjects. It also diagnoses a reciprocal relationship between regional development and the development of business and educational component in regions, which should result into a concept of new sphere of regional interests of a triad - universities, firms, self government (regions) - as the assumption of innovation culture and thus anchoring the region into the environment of global knowledge society.

JEL Classification: A13, C10, R11

1 Introduction

In the process of acquiring knowledge, the effect of knowledge not only on economic development of the society, but also its regions (municipalities) and in turn how regions contribute to knowledge based development of their country is gradually researched and discovered. Knowledge from the macroeconomic and regional level influence stable economic growth, employment rate, they change economic structure. At present, there is an opinion echoing in the theoretical area, that it is regional level that offers a suitable perspective of such a directive structure which enables the transition towards knowledge based economy. The society and its regions therefore become dependent on the ability to create, develop and use knowledge in the value creating transformation process. Relatively new element of exercising regional policy and economy [1] is in this context the problem of regional competitiveness, mainly the transition from cost (price) competitiveness towards the qualitative one – it is a concept of knowledge based competitive advantage [2]. One of the models of regional typology defines regions as not only manufacturing sites and sources of increasing effects, but also as knowledge centres.

The stimulation of the dynamics of economic and social processes by creating knowledge economy is one of the ways of society and regional development [4][5][6]. Pieces of knowledge transformed into significant technologies are constantly improving – changing by which they influence and change the economy. In turn, the "new", changed economy enforces changes in the

character of its production inputs. In relation with this the new concept of the new economy considers knowledge along with the information technology the key factor of economic development. Acquiring, enforcing and especially using pieces of knowledge can become a significant comparative advantage, because the knowledge needs to be looked at as a primary production factor. [7]

The idea/concept of the knowledge based economy itself in fact determines two levels of researching its development. One level –economy – is represented by businesses that are users of knowledge in form of technologies and innovations, in form of primary inputs (*determinant of doing business*) to ensure development of society and regions. Second level is represented by knowledge, whose creators and circulators are education institutions (*determinant of education*).

The development of society and its regions will thus depend on problem solving for an adequate level of both business system and education system development and its equality with other modern requirements in the framework of new economic paradigms. This will influence the convergence model (or divergence) which determines progress (or regress) of the country and regions.

As a possible use of abovementioned two determinants of knowledge based economy was formulated a concept of learning firm [8] which is based in the research of relationships between organisational structure of firms and knowledge sources used by creation of innovations. The result of this cognition was formulation of two models of learning processes administration: (I) model which uses research resources of a firm (model STI – *science, technology, innovation*) and (II) interactive model based on various sources of knowledge and forms of firm learning: model DUI – *learning by Doing, learning by Using, learning by Interacting* [9].

From the perspective of this paper and situation analysis in the framework of problem application on conditions of Slovak regions it is functional to introduce relatively new approach marked as concept of business university *(Entrepreneurial University)* and its context with regional competitiveness.

Business University (BU) is a concept which comes from the global commencement of knowledge based society, in which frame the knowledge, their creation and usage are the basis for the competitiveness, innovations and economic-social regional development. *The aim of the BU is to promote management and business on the level of profession.* In the global era it is becoming more and more urgent that the practice of management and business should be in its essence a *profession*, as e.g. law practice or medicine practice. Management is not a science as is e.g. economics, but or is it an art or craft, as e.g. music or carpentry. Management is a profession, schools of business and management should thus create professionals, not craftsmen or scientists, not even artists[1].

For rise of BU itself it is inevitable for business, university and self-government (regional) representatives to cooperate. These are presented in the role of investors, shareholders and business people. BU maintains a significant level of autonomy and independence. It is both assumption and condition of ability to decide about own strategic ways and purposes and takeover of respective responsibility for own business results. To the basic norms of BU belong:

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[1] Given concept of BU according to M. Zeleny substitutes the MBA programme, which is considered old fashioned and unsuitable for global era. MBA programme started after WWII as a reaction to the requirements of managerial education of former era. The programme was modelled according to the functional specializations of science, particularly economics, physics, chemistry, and mathematics. MBA programme was successful and brought scientific principles into managerial education. However, it did not bring management to profession [10].

- *Capitalization of knowledge*: university becomes the basis of economic and social regional development
- *Links between business and state sphere*: as an expression of activation of triad participants – "businesses-universities-self-government (regions)"
- *Independence*: as a condition for stimulation for business behaviour of university subjects
- *Hybridisation*: on the basis of approved global organizational concepts
- *Flexibility*: constant re-evaluation and renovation of inner university structure, retreat from fixed structures [10]

Reciprocal relationship between regional competitiveness and the development of its business and educational dimension is an assumption for formulation of development strategy, which should result in the concept of new sphere of regional interests of the triad "businesses-universities-self-government (regions)" as a determinant of innovation culture and thus "anchoring" the region into the environment of global knowledge society.

Identification of mutual interaction between education, doing business and competitive ability of regions is considered a solution for determining the strategy of their development. The object and aim of researching the paper in given connections are the determinant of doing business and education in Slovak regions, measurement and evaluation of their participation in economic-social development of Slovak regions. Economic performance of regions is measured with the aid of gross domestic product (GDP) with the background in the criteria of competitiveness.

2 Materials and methods

In the economy (regions) exists the interdependence between its state, level/quality of its business environment and the state of its economic (business) and extra-economic (in our paper educational) subjects and also between the state and structure its activities and bonds and real performances of businesses. The economy reacts to changed conditions by change in the structure with the aim in its growth and development. The state and structure of the economy are the results of transformation processes, which take place in sources, factors, subjects and their mutual bonds. The economic structure on the microeconomic level is created by businesses. Higher levels (regions, government) create conditions for business subjects and form the environment.

By analysing and characterizing the structural changes in the economy their verbal description is not sufficient. Structural changes can be quantified, analysed, and evaluated from the perspective of their extent and intensity, their efficacy and contributions, their speed and time dimensions.

Structural bonds in the economy do not change in the short term and therefore it is possible to use the results from the analysis with some time delay [11]. As the main methods of researching the statistical set of business and education dimension[2] in Slovak regions we use the elementary statistical methods: descriptive statistical characteristics, index analysis and correlation analysis.

Elementary statistical characteristics [12] represent the number through which the statistical set can be represented as a whole, and they are suitable for comparing statistical sets

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[2] The component of education in Slovak regions will be represented as its tertiary level, institutionally constituted as universities and institutions of higher education- as they are understood by current legislation.

from the perspective of time, space and type. At the same time, they enable to characterize statistical set as a whole and so characterize its main features of development, structure and performance. From the elementary statistic characteristic of level [13] we apply the arithmetic mean and median, from characteristics of variability[3] standard deviation, range and variation coefficient.

Index analysis [14] will be used to find out the regularity of development of researched phenomena from the perspective of fact, time and space and by identification of participation of business and education dimension in regional competitiveness[4].

Correlation analysis will be used to find out the intensity of mutual relationship among researched data (two quantitative variables, namely determinant of business and determinant of education). To find out the measure of the precision of statistical correlation (the strength of statistical dependence) we will use Pearson coefficient of correlation (Pearson´s product moment, 1896), which is parametric measure of correlation to use which certain prerequisites need to be fulfilled. Observed period are the years 1996-2006, or 2002-2006. As the signs of observed statistical sets we'll use absolute indicators that identify either the side of business subjects or the side of transformation process output taking place in Slovak regions (number of business subjects, formed regional GDP, number of graduates).

As the absolute indicators enable only one-sided expression of the state, development of structure of observed phenomenon – statistical sign, we will use relative indicators which will be used to calculate mutual participation, dependence, mutual positive efficiency and efficiency of businesses and universities by increasing regional competitiveness. As relative indicators, which will link the side of inputs and outputs of regional transformation process, we will use our own designed (intensive/qualitative) ratio indicators – *indices of regional performance* (I_{RV}).

$$I_{RV} = \frac{\textit{Output indicator of regional transformation process}}{\textit{Input indicator of regional transformation process}} \qquad (1)$$

The analysis will focus specially on the area of effects of regional business and education sector in relation to the regional development connected with production (GDP).

3 Results and discussion

The analysis of participation of business determinant on regional competitiveness

Businesses as production units create microeconomic capacity of global, state and regional economies. Business activity in Slovak republic (SR) according to legislation can be performed by either individuals (FO) or legal entities (PO), which fulfil legislative conditions.

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[3] The variation of sign values of certain phenomena arises so, that they are affected by various influences which create various links among them. Standard deviation itself hides this influence of the set of phenomena on changing values. The variability of sign values, as well as the typical characteristics of middle value for certain set is determined by the measures of variation. Measures of variation are used to characterise regularity and rhytmicity of phenomena.

[4] Index is understood as the ratio of two values of the same indicator. Indices are used by relative comparisons, i.e. they determine how much the value on observed indicator has changed in a situation relatively to the other.

Quantitative development of their number and regional structure in 1996-2006 is described below in Table 1.

Table 1 Development of number of business units in regions of SR in 1996 - 2006

|	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	growth	2006%	1996%
SR	140323	137876	150069	165053	168518	178351	184258	208361	252510	270168	275869	196.6	100,0	100,0
BSK	27738	24676	23582	26250	27625	29304	27600	31550	36088	38569	38221	137.8	14.3	19.8
TTSK	17727	11991	15939	18066	19130	20220	19771	20951	27138	27527	29472	166.3	10.7	12.6
TNSK	13354	18303	17920	18371	18702	19468	21050	23113	27472	30439	30672	229.7	11.1	9.5
NSK	18296	17430	18878	22588	21818	23661	23676	25451	31362	34075	34719	189.8	12.6	13.0
ZSK	15686	15385	19415	21133	22283	22846	25284	29247	33497	39110	39443	251.5	14.3	11.2
BBSK	14810	16318	13489	18062	18373	19148	20236	23636	27090	31332	32288	218.0	11.7	10.6
PSK	15902	15477	21395	21201	21340	22501	24796	28724	37395	36512	37782	237.6	13.7	11.3
KSK	16810	18296	19451	19382	19247	21203	21845	25689	32468	32604	33272	197.9	12.1	12.0

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 from the data from the Statistical Office of Slovak Republic

The number of business units in observed period increased in SR to 196.6 %, maximum was achieved in ZSK (251.5 %) and minimum in BSK (137.8 %). According to the growth indices it can be said that regional structure shows convergence tendency, i.e. interregional differences in the number of business subjects are decreasing.

A significant economic function of business units is the formation of GDP. In Table 2 and Graphs 1 and 2 the dependency is showed and it is calculated and illustrated through Pearson correlation coefficient between the number of business subjects in Slovak regions and regional GDP in 1996-2006.

Graph 1 The dependence of number of business units and GDP in Slovak regions in 1996 - 2006
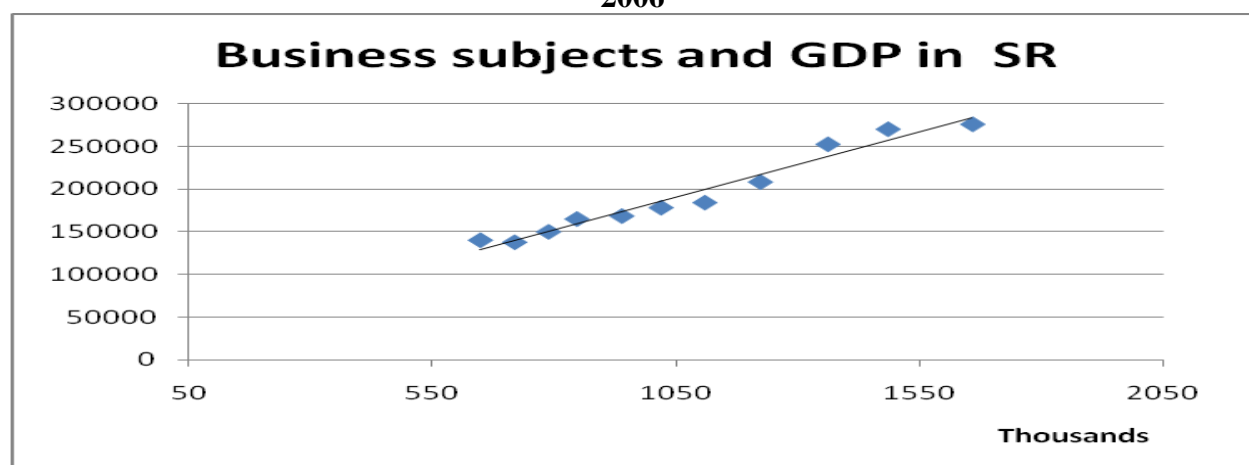

Legend: x axis– GDP SR (mill. of Sk in current prices)
y axis – number of business subjects in SR
Source: own calculations

Table 2 The dependence of number of business units and GDP in Slovak regions in 1996 – 2006 expressed in numbers through Pearson coefficient

	SR	BSK	TTSK	TNSK	NSK	ZSK	BBSK	PSK	KSK
Pearson coefficient	0,981	0,933	0,927	0,957	0,982	0,988	0,916	0,967	0,948

Graph 2 Pearson coefficient of the dependence of business units and GDP in Slovak regions in 1996 – 2006
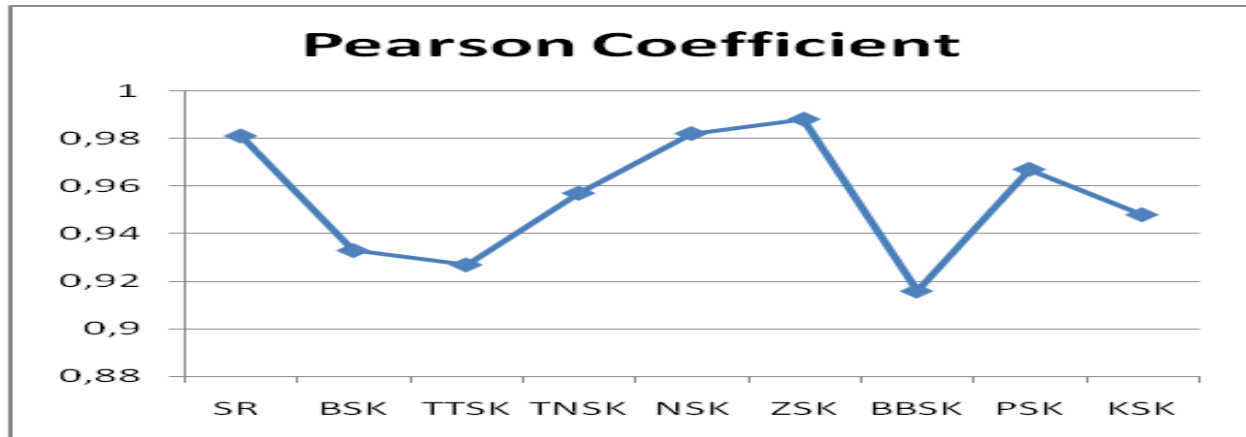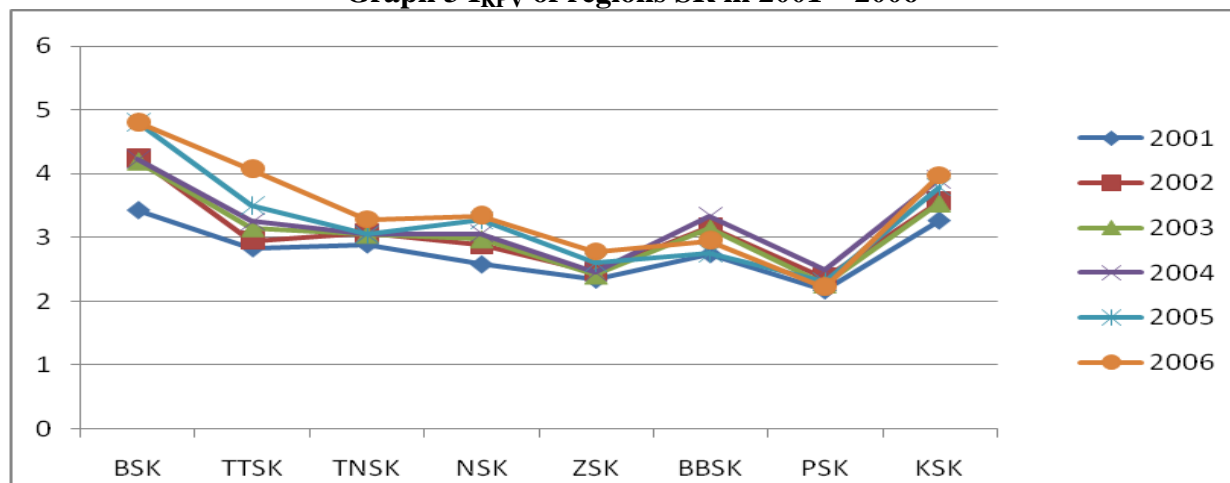

Source: own calculations

From the correlation analysis it can be stated that the number of business units in Slovak regions and regional GDP develop in the same direction – they increase and at the same time the number of businesses in all the regions (municipalities) significantly, if very closely, influences the formation of regional GDP.

The aim of observation of these dependencies is to get deeper insight into the essence of observed phenomena and processes. Real economic dependencies are practically seldom very close. Although we came to higher values of correlation among observed indicators, it is rather an initial phase towards further deeper analysis. Therefore, we will use our own designed ratio indicator to analyse business units as creators of economic performance in regions measured by GDP[5] and it is called *Index of regional business performance (I_{RPV}).*

$$I_{RPV} = \frac{Regional\ GDP\ in\ year\ i}{Number\ of\ businesses\ in\ regions\ in\ year\ i} \qquad (2)$$

Graph 3 represents the values of I_{RPV} in 2001-2006 and at the same time it illustrates the irregularity in regional performance measured by I_{RPV}.

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[5] Year 2006 is the last year of published regional GDP, later data are not available

Graph 3 I$_{RPV}$ of regions SR in 2001 – 2006

Source: own calculations

The IRPV values were analysed by descriptive statistical characteristics. According to them it can be stated that an average business performance (measured by arithmetic mean) in Slovak regions has an increasing tendency (graph 4)

Graph 4 The development of an average I$_{RPV}$ in SR in 2001 – 2006
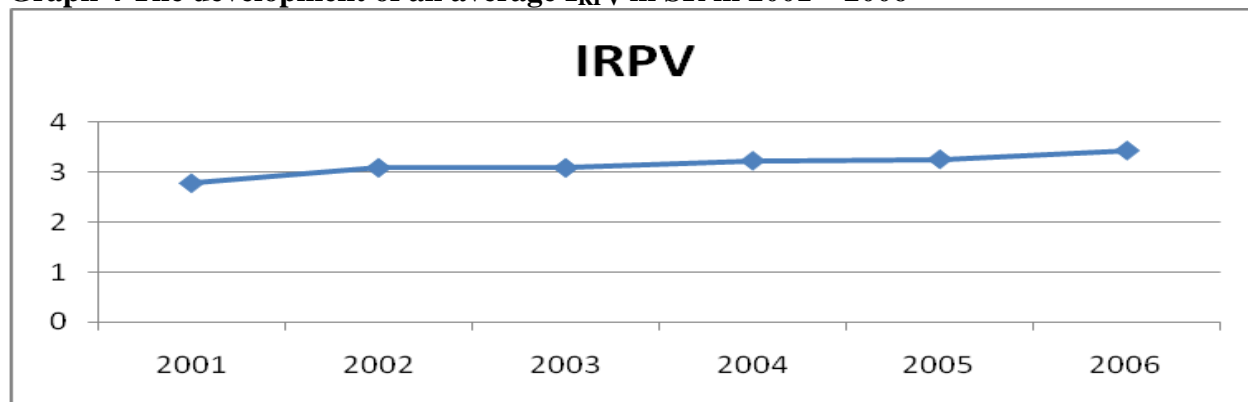
Source: own calculations

Average growth of regional business performance expressed by middle value: *arithmetic mean* was in the observed period +23.5 % (from 2.780557 to 3.4333132). The highest average growth of I$_{RPV}$ is identified in observed period in TTSK (+ 44.1 %) and the lowest in PSK (+ 2.21 %). Given interregional differences have such an effect that middle regional level of I$_{RPV}$ measured by a *median* achieves higher values than the values of arithmetic mean. The highest economic performance attributed to 1 business subject has stably BSK (on average 4.286498) and stably the lowest the PSK (on average 2.304758). The ratio between these two regions achieves an average of 1.85 which shows that the performance of BSK is 1.85 times higher than the one of PSK. *Standard deviation* as an average variance of values from the mean in SR expresses that interregional differences in observed period increased from 0.396518 to the average of 0.7716682, so by 51.2%. Increasing in inconsistencies in I$_{RPV}$ of individual Slovak regions is confirmed by *range* (difference between the maximum and minimum values) which increased between regions in 6 years from 1.2466246 to 2.5919769; but also *variation coefficient*

(the ratio of standard deviation and arithmetic mean), which increased from 0.1426038 to 0.2247591. The measure of variation gives evidence for increasing interregional differences of I$_{RPV}$ (divergence tendency).

According to the median of I$_{RPV}$ it is possible to divide Slovak regions into 2 groups. First regions in which the business performance is under the middle value; namely BBSK, TNSK, ZSK a PSK. Their business activity can be considered insufficient which can in future negatively influence their economic level. BSK, TTSK, ZSK and KSK are regions which achieve higher than middle value of regional business performance.

The analysis of participation of education determinant in regional competitiveness

Economic-social level of both society and regions are getting more and more influences by "intellectual wealth", the level of general education, but mainly the tertiary education (TE). It is possible to increase the intellectual capacity of societies and regions by building quality and flexible education system. Sufficient number of qualified labour force (graduates) is the sign of well-developed education system, on top of which there are universities and institutions of higher education[6].

Along with the *traditional role of education*, in which universities educate specialists in particular professions according to the needs and requirements of society and regions, *the role of universities in innovation process* is getting into the centre of attention. Universities in connection with practice fulfil mainly the role of creators of knowledge; they provide scientific and technological information from basic research of business sector and contribute to an increased efficiency of applied research, which are mainly the interest of firms. Universities should create new prices of knowledge, which are transferred into practice through business sector in form of outputs of basic research, or though spin-off firms. A concept of creative economy and thus creativity of human resources creates the initiative for defining further (third) function of universities – to be a *creative centre of regions*. The ability to catch creative talent, ability to use it and the absorption power of talents (through TV) from the side of given location – this is the chain which provides for attraction of a region with subsequent beneficial economic effects, but also with significant non-economic stimuli, which together influence the quality of life [2].

The combination of innovative performance and quality human resources is the basic condition for the development of knowledge based society and its competitiveness. By analysing the determinant of education and its participation in regional competitiveness we use the indicator of university graduate (Table 3) as a basis, as this data represents the offer of qualified human resources from regional transformation process.

Table 3 The number of university graduates in Slovak regions in 1996-2006

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	1996%	2006%	Growth %
SR	11636	15139	15264	17516	19363	22684	23904	26594	28974	30798	35026	100,0	100,0	301,0
BSK	6289	8776	7622	9089	8880	10719	10301	11116	11553	11760	13185	54,0	37,6	209,7

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[6] According to the international classification of ISCED 97 is the initial education structured into 3 stages: *primary*, *secondary* and *tertiary education (TE)* and *further education*. According to the methodology of ISCED is TE divided and by code 5B is marked bachelor degree course, by 5A master degree course, and by code 6 postgraduate (PhD.) course. As the TE institution is regarded every institution which provides it, particularly *universities/institutions of higher education* in the standard meaning, as they are presented in current legislation.

TTSK	84	197	272	686	827	859	1574	1645	1862	1973	1674	0,7	4,8	1992,9
TNSK	0	0	0	21	0	59	317	477	919	733	798	0,0	2,3	798,0
NSK	1436	1662	2008	2599	3036	3314	3230	3937	3879	4579	5339	12,3	15,2	371,8
ZSK	897	1046	998	1025	1219	1270	1461	1409	1724	2523	3263	7,7	9,3	363,8
BBSK	755	940	1726	1775	2404	2992	3571	3785	4533	4276	4952	6,5	13,9	655,9
PSK	0	695	952	110	918	1178	1108	1510	1688	1500	3594	0,0	10,3	3594,0
KSK	2175	1823	1686	2211	2079	2293	2342	2715	2816	3454	2221	18,7	6,3	102,1

*Source: Own calculations according to the www.statistics.sk*

The number of graduates in SR has tripled in the last 11 years. The biggest increase was experienced by regions whose universities opened after 1996 (TNSK, PSK).

A more significant indicator for measuring the contribution of TV to the development of society and regions is the indicator, which not only quantitatively, but also qualitatively objectivises the essence and character of these socio-economic processes and the contribution of TV for regional development. To identify TV as a determinant of regional competitiveness we suggest using the ratio indicator of *Index of regional education performance* (I_{REV})

$$I_{REV} = \frac{\textit{Regional GDP in year i}}{\textit{The number of university graduates in regions in year i}} \qquad (3)$$

Detailed regularities of regional development identified through I_{REV} will be found out according to its analysis by elementary statistical characteristics in between 2002-2006[7]. The values of I_{REV} are documented in graph 5.

Graph 5 The Development of I_{REV} in Slovak regions
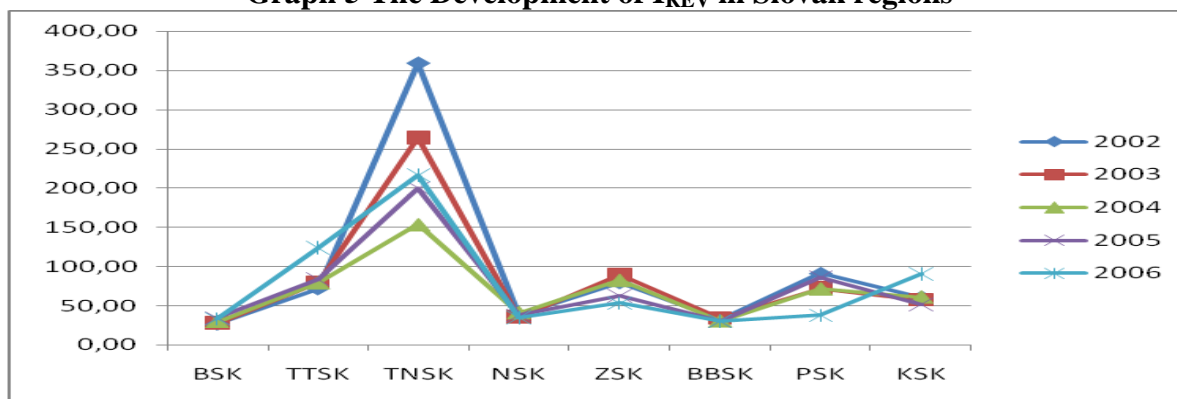
Legend: BSK – The Municipality of Bratislava   TTSK – The Municipality of Trnava
        TNSK – The Municipality of Trenčín   NRSK – The Municipality of Nitra
        BBSK – The Municipality of Banská Bystrica   ZSK – The Municipality of Žilina
        PSK – The Municipality of Prešov   KSK – The Municipality of Košice
Y axis - values of I_{REV} in regions and individual observed periods

Source: own calculations

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[7] In 1996, after the public administration reform 8 self-administered municipalities/regions were created. Since 1996 regional institutes of higher education started to be established, until each region established their own universities/ institutes of higher education. First graduates of newly established education institutions got to the labour market first in years 2001/2002.

Positive increase in I_{REV} in 5 years is achieved by TTSK (1.72), KSK (1.42) and BK (1.22), which documents increasing productivity of labour by university graduates in these regions. In other regions has the I_{REV} a decreasing trend (0.91 in NSK; 0.6 in TNSK; 0.91 in ZSK; 0.91 in BBSK; 0.41 in PSK), which enables us to state insufficient usage of education capacity of university graduates in these regions and thus decreases in regional productivity of labour measured by I_{REV}. On this basis it is possible to assume a surplus of university graduates in these regions in the next few years, as the increase in contingent of students does not guarantee their usage by regional production in the industry and services adequately to their achieved education. The absorption of graduates could be solved by a change in regional businesses, or education structure by strengthening of technologically and intellectually more demanding industries and degree programmes. BSK has a special position, because it concentrates graduates from other regions as well, which distorts its $I_{REV.}$

From the perspective of development in Slovakia, I_{REV} is decreasing (in regional productivity of university graduates). From 2002 to 2006 the average I_{REV} decreased to 68% which could express a certain tendency of insufficiency of using created intellectual capital in Slovak regions as well as a possibility of stating that the rate of GDP growth in Slovak regions is not particularly increasing with an increase in university graduates (Graph 6).

Graph 6 The development of an average I_{REV} in Slovak regions
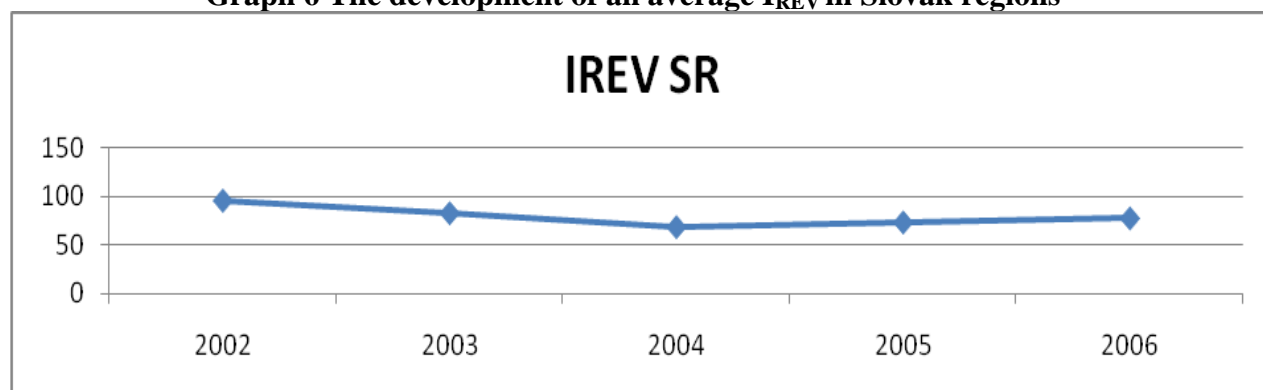
Source: own calculations

The measures of variability of I_{REV} have in observed period 2002-2006 decreasing tendency: range (from 332.5 to 186.13), variation coefficient (from 1.07 to 0.79), and standard deviation (from 102.18 to 61.4) which shows the decrease in average interregional differences (convergence tendency).

Using correlation analysis and Pearson coefficient we can identify the participation of university graduates in regional competitiveness with the aid of indicator of GDP (Table 4)

Table 4 The dependence of the number of university graduates in Slovak regions and formed GDP measured by Pearson coefficient

Pearson	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
coefficient	0,967	0,981	0,957	0,974	0,946	0,9461	0,951	0,9487	0,9366	0,9281	0,846

Source: own calculations

Pearson coefficient gives evidence for a very significant and close power of dependence between observed variables. However, its values show decreasing trend (Graph 7)

Graph 7 The dependence between the number of university graduates in Slovak regions and formed GDP measured by Pearson coefficient in 1996 – 2006
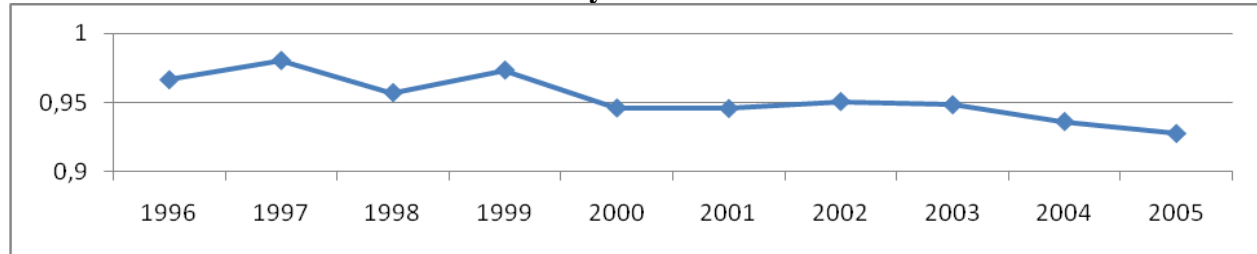
Source: own calculations

According to the cumulation of I_{RPV} and I_{REV} in analysed time period we can gain a certain overall view on using the business determinant and education determinant while increasing the competitiveness of individual regions of SR (Table 5 and Graph 8).

Table 5 I_{RPV} and I_{REV} in regions of SR in 2002 - 2006

Growth index 2002 - 2006	BSK	TTSK	TNSK	NSK	ZSK	BBSK	PSK	KSK
IRPV	1,41	1,44	1,14	1,3	1,19	1,08	1,02	I.22
IREV	1,22	1,72	0,6	0,91	0,66	0,91	0,41	1,48
together	**2,63**	**3,16**	**1,74**	**2,21**	**1,85**	**1,99**	**1,43**	**2,7**
Order of regions in Slovakia	**3**	**1**	**7**	**4**	**6**	**5**	**8**	**2**

Source: own calculations

The best condition of being prepared for conditions of knowledge based economy can be identified in TTSK, KSK, and BSK.

4 Conclusions

Nowadays, knowledge represents the key source of the competitiveness of countries, firms, but also regions. In the process of creation, spreading of knowledge the primary place belongs to institutions of tertiary education (institutions of higher education, universities) and in process of using them primary place belongs to business units. Linking these two institutions with public administration and their participation in national and regional politics is expressed as Triple Helix [15]. The result of this link is organisational re-structuralisation and rise of e.g. contact centre, centres for technology transfer, strategic alliances of societies and universities, networks of academic, private and government research institutes, business incubators etc.

Identification of mutual interaction between education, doing business and regional development can be considered as a solution for determining development strategy. Besides, it is important to quantify the reaction of regions towards requirements of knowledge economy in

form of creating regional business and intellectual capacity, to identify business units and university/institutes of higher education as a factor of socio-economic development of regions in knowledge based economy and to find out and evaluate the participation of both business and education determinants in socio-economic development of regions in the area of economic performance measured by gross domestic product.

Possible strategic solution and resort from understanding the basis of business university is the application of the content of the term of knowledge in both education and value-creating processes. Piece of knowledge is not only a piece of information. Acquiring knowledge is not only acquiring information. Knowledge is action. The richest are those countries which focus on knowledge and skills in doing business, not only on equipment, labour and natural resources. At business university, students are looking for knowledge and its usage in real action: workshop, project, business [10].

One of the first is the University of Zilina, which starts to be prepared in autumn 2009 and IPA Slovakia Zilina[8] is its sponsor. The aim is to prepare two groups in complex studies for business people and managers of smaller and medium businesses from Slovakia and Czech Republic. It is supposed to be elite studying with international faculty (business people, professors from foreign universities, financial experts, consultants and couches) who are practice-oriented. It is designed for people who want their firms to be better than their competitors, who want to use modern procedures which are innovative and productive at the same time. The main pillars of this university are considered:

1. university (lectures, consultations, projects, training, couching),
2. practice (immediate realization and testing of learnt in own of university firms)
3. research and development (new methods, procedures, practices, ideas),
4. innovative centre (change of ideas and innovative projects into business)

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[8] **Fraunhofer IPA Slovakia** is the alliance of individuals and legal entities and it was established in 2000 as the result of longlasting cooperation of Slovak consultants, designers and researchers with Fraunhofer IPA Stuttgart. At present, Fraunhofer IPA Slovakia alliance members are Univ. Prof.Dr.-Ing. Wilfried Sihn, Univ.-Prof. Dr.-Ing. Prof.e.h.Dr.-Ing. E.h. Dr.h.c. mult. Engelbert Westkämper, Prof.Dr.-Ing. Kurt Matyas, Prof. Ing. Ján Košturiak, PhD., Doc. Ing. Róbert Debnár, Fraunhofer Gesellschaft and University of Zilina. **Fraunhofer IPA Slovakia** belongs to leading groups in consultancy, design, research and education for industries in Central Europe, professional services are based on long-lasting bulding of know-how both in Germany and Slovakia, knowledge of local environment and long-lasting experience Fraunhofer IPA Slovakia of employees directly from industries. Team of internal employees of Fraunhofer IPA Slovakia is completed by external specialists from important companies, but also by a group of internationally known experts from Europe, USA and Japan (according to www.ipaslovakia.sk)

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