Elżbieta Sobczak

Innovative potential of human capital as the criterion for diversification and regional space segmentation in selected European Union countries

Abstract: *The objective of the hereby study is to identify interregional diversification and administrative units NUTS II type segmentation, occurring in selected countries which have recently become the European Union member states: the Czech Republic, Poland, Hungary and Slovakia. The criterion for assessing interregional disproportions becomes the innovative potential of human capital, characterized by the share of university graduates and the share of research and development centre workers, in the total number of professionally active employees (in %).*

Key words: *innovative potential, human capital, educational capital, knowledge based economy, competitive advantage sector, interregional diversification, segmentation of regional space*

1. Introduction

The competitiveness of regions may by referred to as a durable advantage of some regions over others or as a distance which separates one region from the others (see [3]). One may assume that the competitiveness of a region is defined by its capacity to create bigger wealth as compared to that of other regions which are referred to as competitive ones [4, p. 14]. Literature on the topic presents a wide spectrum of qualities characteristic for a region which is highly likely to obtain a competitive advantage. M.E. Porter suggested the following factors which define the, so called, framework of competitive advantage, [5, p. 260 – 265]: production factors, demand enhancing conditions, social and economic climate, related sectors and the supporting ones.

At present, among the conditions of production, the dominating role is played by human capital, which includes qualifications of labor force and innovations connected with creating, spreading and applying knowledge. For many years the growing importance of the, so called, non-material competitive factors has been noticed, among which the key role is played by the factor of knowledge. Economies of particular countries and regions become, to a greater and wider extend, the

economies based on knowledge. These regions which are characterized
by higher level of education in a society become more competitive ones
due to the fact that knowledge is translated to innovativeness. On the
other hand, the capacity to create and apply innovations becomes, at
present, one of the most important determinants responsible for building
up competitive advantage. An increasing significance of knowledge
results from the development of information and communication
technologies, computerization and information oriented societies, the
growing role of technical progress as well as economic processes
spreading in the world. The hereby study takes up an attempt to identify
regional diversification with reference to the level and spreading of
knowledge. The relation between regions' economic development and
the capital related to education of a given society was studied and
analyzed. There have also been distinguished regions of low, medium
and high innovative capacity, based on knowledge.

2. Identification of interregional diversification related to innovative potential of human capital

NUTS II type of regions became the subjects of the study. They
occur in selected countries of the new European Union member
countries: the Czech Republic, Poland, Hungary and in Slovakia. Other
countries related to this group have not been included in the study, since
the identification of disproportions within countries themselves turned
out to be impossible, due to overlapping of divisions into NUTS I and
NUTS II regions. Time span of the study refers to 2002.

Innovative potential of human capital was characterised by means
of the following factors:

 - X1 – share of university graduates in the total number of
   professionally active employees (in %),
 - X2 – share of research and development centres workers in the
   total number of professionally active employees (in %).

Tables 1 – 2 present the comparison of basic parameters, which
characterize regional diversifications within the given country, referring
to variables X1 and X2.

The biggest disproportions related to the percentage of university graduates active professionally, measured by the coefficient of variation, were observed in the Slovak regions (55,2%), next in line were the Czech ones (51,4%). However, the smallest diversification occurred in Polish regions (11,5%).

In all analyzed countries the regions representing the highest values of the studied indicator were the capital ones. The most significant disproportions, with reference to relations of university graduates maximum share as compared to the minimum one, occurred in Czech regions at the level of 3, 6: 1. On the other hand, the smallest disproportions were observed in Polish regions (1, 5:1). In most countries the regions characterized by values lower than the country average constituted the definite majority. Poland was registered as an exception, where precisely half of regions were characterized by the share of university graduates at the level lower than the national average.

Table 1: Descriptive parameters related to the share of university graduates in the total number of professionally active population in 2002 (in %)

No	Regions	(1) Minimum value	(2) Maximum value	(2) / (1)
1.	Czech	7,6 Severozápad	27,5 Praha	3,6
2.	Hungarian	12,8 Dél-Alföld	23,8 Közép-Magyarország	1,9
3.	Polish	11,7 Kujawsko-Pomorskie	17,6 Mazowieckie	1,5
4.	Slovak	9,0 Západné Slovensko	24,1 Bratislavský	2,7

Country average	S	V (in %)	No of regions representing values lower than country average
12,4	6,4	51,4	6 out of 8
15,4	3,8	24,7	6 out of 7
13,6	1,6	11,5	8 out of 16
13,2	7,3	55,2	3 out of 4

Where: S – standard deviation, V – coefficient of variation.
Source: Author's compilation based on Eurostat data.

Interregional disproportions related to the share of research and
development centers employees in the total number of professionally
active population, measured by means of the coefficient of variation,
were characterized by a much grater intensity. The biggest
disproportions occurred in the Slovak regions (146%), next in line were
the Czech ones (100,6%).The diversification of Polish and Hungarian
regions was similar and amounted to 40%. The maximum share of R&D
sector employees in Poland was registered in Małopolskie region, while
in other countries these were the regions at the territory of which capital
cities are situated.

Table 2: *Descriptive parameters related to the share of research and
development centers employees in the total number of professionally active
population in 2002 (in %)*

No	Regions	(1) Minimum value	(2) Maximum value	(2) / (1)
1.	Czech	0 Střední Čechy	1,1 Praha	-
2.	Hungarian	0,3 Nyugat-Dunántúl	1,0 Közép-Magyarország	3,4
3.	Polish	0,2 Podkarpackie	1,0 Małopolskie	5,6
4.	Slovak	0,2 Západné Slovensko	1,5 Bratislavský	7,7

Country average	S	V (in %)	No of regions representing values lower than country average
0,4	0,4	100,6	6 out of 8
0,7	0,3	40,4	4 out of 7
0,5	0,2	40,9	12 out of 16
0,4	0,6	146,0	3 out of 4

Where: S – standard deviation, V – coefficient of variation.
Source: Author's compilation based on Eurostat data.

It should be pointed out that in the Střední Čechy region no R&D
employees were registered at all. Besides, in all countries the regions in
which the value of this indicator is lower than the country average
constitute the majority.

3. Economic and innovative potential of regions

The following variable becomes the region economic potential measure:

Y – GDP share per 1 inhabitant in the EU countries average in PPS (*Purchasing Power Standard*).

Table 3 describes the diversification of economic potential in a region. Significant diversification is observed in Slovak regions (75, 5%) and Czech ones (50, 5%). The highest measure value refers to capital regions of all countries.

The mutual relations of maximum and minimum values represent the level of 2, 2:2 in Polish regions, up to 3, 1:1 in the Slovak ones. The regions representing definitely the lowest potential (country average value) are these located in Poland, while the highest ones are the Czech regions. A significant majority of regions represent the lower, as compared to country average, indicator value.

Table 3: Descriptive parameters of GDP share per 1 inhabitant in the EU countries average in 2002 in PPS (Purchasing Power Standard)

No	Regions	(1) Minimum value	(2) Maximum value	(2) / (1)
1.	Czech	52,4 Střední Morava	152,8 Praha	2,9
2.	Hungarian	37,3 Észak-Magyarország	96 Közép-Magyarország	2,6
3.	Polish	32 Lubelskie	69,5 Mazowieckie	2,2
4.	Slovak	38,7 Východné Slovensko	119,7 Bratislavský	3,1

Country average	S	V (in %)	No of regions representing values lower than country average
67,6	34,2	50,5	7 out of 8
58,6	21,0	35,9	5 out of 7
45,6	9,2	20,2	12 out of 16
51,3	38,7	75,5	3 out of 4

Where: S – standard deviation, V – coefficient of variation.

Source: Author's compilation based on Eurostat data.

As one may conclude, having analyzed figures1 and 2, in 2002, in the researched regions there occurred a strong correlative relation between the educational capital (share of university graduates in the total number of professionally active population) and an economic one (R^2 = 0, 8785). Somewhat smaller, however also very significant dependence (R^2= 0, 5471) was observed in the relation between research and development capital (share of R&D employees in the total number of professionally active population) as compared to the GDP share per 1 inhabitant in the EU countries' average in PPS.
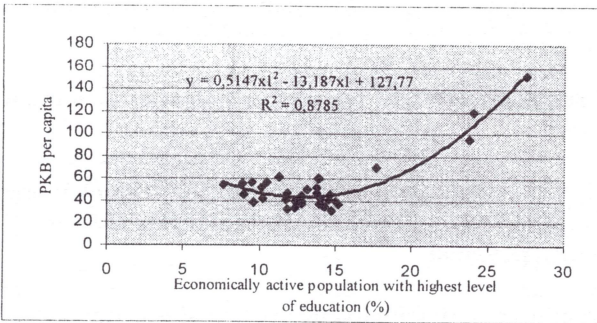

Fig. 1: Educational capital vs. economic potential
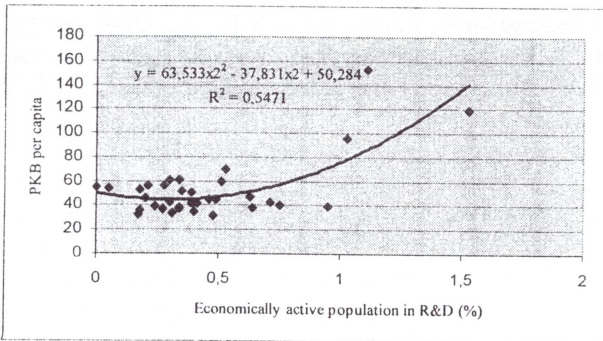Source: Author's compilation

Fig. 2: Research and development capital vs. economic potential
Source: Author's compilation

The results of regression analysis support the hypothesis according to which educational capital explains regional economic potential relatively well. The level of adjusting empirical data to square regression function and the significance of the obtained parameters imply how fundamental this standpoint is. However, in case of research and development capital the level of adjusting empirical data to the square regression line turned out to be insufficient. The reason for such situation became the easily observable distance of both regions from the regression line. One of them was the capital region of Prague, which represented an untypical, occurring definitely above the theoretical curve, economic potential in relation to research and development capital. One of Polish regions also turned out to be untypical (the region of Małopolskie), presenting GDP per 1 inhabitant in the EU countries average expressed in PPS definitely below the regression line.

4. Segmentation of regions related to innovative potential of human capital

Linear ordering and classification of the researched regions in the European Union was carried out on the basis of on aggregate measure of human capital innovative potential.

The measure of human capital innovative potential was defined as an arithmetic mean of statistical attributes X_1 and X_2 values which were analyzed. The range of defined measure values was used and the division into 4 groups of regions was suggested: representing very high, high, medium and low innovative potential (see table 4). Three capital regions were included in the group of the ones representing the highest innovative capital: Praha, Bratislavský and Közép-Magyarország

Table 4: Segmentation results of EU regions related to human capital innovative potential

No	Region	Measure value	No	Region	Measure value
1	Cz Praha	0,143171	19	Pl Śląskie	0,067578
2	Sk Bratislavský	0,128062	20	Pl Zachodniopomorskie	0,066172
3	Hu Közép-Magyarország	0,124165	21	Pl Opolskie	0,065227
4	Pl Mazowieckie	0,090813	22	Pl Warmińsko-Mazurskie	0,063076
5	Pl Małopolskie	0,079728	23	Pl Lubuskie	0,062766
6	Hu Észak-Alföld	0,079244	24	Pl Wielkopolskie	0,062296
7	Pl Lubelskie	0,076046	25	Pl Kujawsko-Pomorskie	0,060643
8	Pl Pomorskie	0,075494	26	Pl Podkarpackie	0,060094
9	Pl Łódzkie	0,074679	27	Cz Jihozápad	0,058081
10	Hu Dél-Dunántúl	0,073846	28	Cz Moravskoslezko	0,053641
11	Pl Podlaskie	0,073415	29	Sk Stredné Slovensko	0,052337
12	Cz Jihovýchod	0,071869	30	Cz Strední Morava	0,051309
13	Pl Dolnośląskie	0,071749	31	Sk Východné Slovensko	0,049455
14	Pl Świętokrzyskie	0,071358	32	Cz Severovýchod	0,048588
15	Hu Észak-Magyarország	0,071344	33	Sk Západné Slovensko	0,045778
16	Hu □ugat-Dunántúl	0,070981	34	Cz Strední Cechy	0,044332
17	Hu Közép-Dunántúl	0,070683	35	Cz Severozápad	0,038418
18	Hu Dél-Alföld	0,067666			

Source: Author's compilation

Only one Polish region Mazowieckie was in the group of high level innovative potential of human capital among the regions characterized by the medium level of educational and research and development capital there were included 15 Polish regions with and Małopolskie occupying leading positions, as well as six Hungarian regions. The group made up of 9 elements, is represented by the regions characterized by low innovative potential. It includes 6 Czech and 3 Slovak ones. The lowest assessment referred to the regions of: Severozápad, Střední Čechy and Západné Slovensko.

5. Conclusions

On the basis of the analysis of variables, which define innovative and economic potential of regions, one may conclude that interregional disproportions in each of the analyzed countries are quite significant. However, the biggest diversification, measured by the coefficient of variability, occurred in Slovak and Czech regions. The share of employees involved in research and development activities definitely becomes the most significant differentiating factor for Slovak (146%) and Czech (100, 6%) regions. The regions representing the highest human capital innovative potential are, as one could expect it, the capital regions referring to each of the studied countries.

Significant correlation interrelations occurring between the share of university graduates and the share of research and development sector employees, in the total number of professionally active population as compared to economic potential, were proven.

The educational capital in the analyzed period was relatively well explained by economic potential of regions, which was further supported by the regression analysis.

Literatura:
[1] GORZELAK, G., JAŁOWIECKI, B.: *Konkurencyjność regionów*, Studia Regionalne i Lokalne 2000, z. 1.
[2] GORZELAK, G., OLECHNICKA, A.: *Innowacyjny potencjał polskich regionów*, W: Wiedza a wzrost gospodarczy. Red. L. Zienkowski. Warszawa: Wydawnictwo Naukowe Scholar 2003, s. 122-152.
[3] KLASIK, A.: *Analiza konkurencyjności i strategie konkurencyjne miast*, W: Konkurencyjność miast i regionów Polski południowo-zachodniej. Red. nauk. R. Broszkiewicz. Wrocław: Wydawnictwo AE, Prace Naukowe 821, 1999.
[4] Międzynarodowa konkurencyjność gospodarki Polski – uwarunkowania i perspektywy. Studia nad konkurencyjnością. Warszawa: IRiSS 1995.
[5] PORTER, M., E.: *Porter o konkurencji*, Warszawa: PWE 2001.

Dr. Elżbieta Sobczak
Akademia Ekonomiczna we Wrocławiu
sobczak@oscar.ae.jgora.pl