HUMANS, AS FACTOR OF COMPETITIVENESS

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A b s t r a c t. In our research we study the relationship and inherency of human resources and competitiveness in the regions of the Czech Republic, Hungary, Poland and Slovakia. At present, „knowledge based economy", „economy of knowledge" are more and more frequently used concepts which emphasize the importance of human capital in the process of the development of the society and the economy. The „Europe 2020" strategy, accepted in spring 2010, also focuses on „keeping economic power of the community determining 500 million people's life in competition" [European Committee 2010]. One of the priorities in the strategy is intelligent growth, which means the establishment of a society based on knowledge and innovation. However, building up a knowledge based society is only possible with a healthy and educated population. Improvement of human resources is a definite factor of establishing regional development. The created added value can be higher, if the potential of human capital is higher as well. One of the main goals of our research is to organize indicators which define human development into principal components, to create clusters from the regions of the V4 countries according to the principal components, and to uncover the differences between the clusters. Furthermore, we aimed to explore the connection between the level of development and competitiveness – defined by the principal components - of the human resources of a region.

INTRODUCTION

It is a very important issue nowadays what makes a society, an economy or a region capable of coping with the economic competition in the globalised world. In our research we study the relationship and inherency of human resources and competitiveness in the regions of the Czech Republic, Hungary, Poland and Slovakia. At present „knowledge-based economy", „economy of knowledge" is more and more frequently used concepts which emphasize the importance of human capital in the process of the development of society and economy. The „Europe 2020" strategy accepted in spring 2010 also focuses on „keeping economic power of the community determining 500 million people's life in competition" [European Committee 2010]. One of the priorities in the strategy is intelligent growth which means establishment of a society based on knowledge and innovation. However, building up a knowledge-based society is only possible with a healthy and educated population. Improvement of human resources is a definite factor of establishing

regional development. The created added value can be higher, if the potential of human capital is higher as well. Research development, strengthening of active participation in innovation can be realized only on the basis of high level higher education and scientific training. Taking into account the abovementioned, we consider it important to analyze the regional relationship of competitiveness and human development as well as to reveal whether human resources at regional level are really factors of competitiveness and whether their development contributes to the improvement of competitiveness in the region.

One of the main goals of our research is to organize indicators which define human development into principal components, to create clusters from the regions of the V4 countries according to the principal components, and to uncover the differences between the clusters. Furthermore, we aimed to explore the connection between the level of development and competitiveness - defined by the principal components - of the human resources of a region.

THE THEORY OF HUMAN CAPITAL

It is the behaviour of goods that stands in the focus of interest of economic studies, not people's behavior [Boulding 1956]. Although the classical economists in the 18th century realized already the capital character of the human resources, in the way of thinking the spirit of the above quotation survived for a long time in economics. In the 19th century the social-economic system interpreted and treated the material and human conditions being necessary for the economy in a different way. Analysis regarding human capital involved exclusively exploitation. Human resources were treated as if they were available independent from economic reasons, thus the profit produced by them was free, and it was not the investments spent on humans that earned interest. By this they considered as proved the contrary to the same concept as well, i.e. the investments spent on humans do not earn interest [Garai 1998]. The dominating aspect regarding human potential was like this in the 19th century despite the fact that Adam Smith, belying the era, expressed different views. However, in the 21st century, the intensive social-economic development influenced by the emerging globalization in every field of life opened a new period in the development of humanity. The accelerating scientific technological revolution emphasizes the development of knowledge-based human capital and its effective application. The role and significance of human capital comes in the front. In the previous economic theories the term „capital" was usually used for the means of production or the produced goods. Money earning interest or securities resulting in share were also considered as capital. This way capital in the conventional meaning is investment, material goods, money or securities, i.e. accumulated value which brings profit for its owner so while moving it makes value by itself. On the basis of this interpretation, however, knowledge and ability having been accumulated by training and practical experience also mean capital, as this knowledge makes it possible for people to create value for the economy and produce material goods and services. Acquiring knowledge and qualification demands investment of money, energy and time which recovers only in the long run [Péter 2009]. Therefore it is important that the human potential should be taken into account in figures as well. It is essential because human potential is a driving force to the economy, thus it is reasonable to treat it the same way as the social-economic system does with the available material potential, i.e. it takes into consideration how high expenditure results in how much profit. In our century the human factor became one of the most important factors. With the development of technology, knowledge, which created and operated it, towers above the production factors. Increase in

importance of human factor can be especially demonstrated by the fact that one unit of it is able to move bigger and bigger source of power in the production nowadays than before [Chikán 2006]. Development of human resources play an important role therefore in the performance of an economic unit, a settlement, a region or a country, it influences significantly the extent of the produced value, the development of the examined area and its possibilities for growth. It is the human talent, abilities and brain that give the wealth of a nation, as Széchenyi wrote, and was proved by chronological historical analysis of economics. By now, it is economic triviality that the economic potential of a country is firstly determined by the harmony of educational structure of the labour force, structure of workplaces and education and not by the wealth in mineral and energy resources [Széchenyi 1830].

THE ROLE OF HUMAN CAPITAL IN THE ECONOMIC GROWTH

The theories of growth study what the long term course of growth of an economy is like, what sort of economic and non-economic factors influence its growth or how the effecting factors explain the equilibrium and equal growth course of an economy at a positive pace. Three main eras of growth theories can be separated, as regards the driving force of the economic development. The first era is the post-Keynes, the second is the neoclassic and the third one is the so called era of the endogenous growth theory. One of the best known concepts from among the post-Keynes theories is the the Harrod-Domar model, in which production is featured by a two-factored, at first degree homogeneous Leontief-type function, where capital and labour are perfect complements to each other. In this production model, the rate of production growth equals the rate of natural growth, that is, the growth of the population. This theory considers the quantity of the human resource as the only resource of the economic growth, ignoring the quality aspects. The neoclassic growth models differ from the post-Keynes theories, first of all in respect of the fact that in their equations the capital and the labour can continuously and perfectly be substituted by each other. A model like this was worked out by Robert Solow. In his model he used two inputs, capital and labour, a Cobb-Douglas – type production function. Solow discovers a part in the process of issue which is not resulted by the increase in the quantity of capital and labour. This factor is called Solow-remainder or residuum [Solow 1956]. In Solow-model this remainder is nothing else but the so called neutral technological progress, interpreted in relation of time. According to his findings, the intensive-type economic growth is due to the technological progress and the substitutional effect of production factors, and the necessary coefficient of the technological progress is the human capital, formulated by him as well. Parallel to Solow's research, T.W. Swan also published a similar model. Specialist literature often refers to this model as Solow-Swan model. Swan also attributes an important role to human capital [Swan 1956]. Using both results, E.F. Denison examines the factor of the technological development in details based on statistics in his publications. In his research the technological progress is not treated like mere figures, but he also investigates its resources. He demonstrated that economic growth can only be partly explained by the amount of capital and labour taken in the production, besides the human knowledge or the human capital – referred to by Solow as residuum – plays at least as important role in the development. He proved by his calculations that the economic growth in the North-American states was only 50% due to the amount of the involved production factors, the other 50% called as exogenous was the result of the technological

progress [Denison 1962]. According to the endogenous growth theories, human capital is a basically internal – but insuring growing proceeds – production factor the presence of which can promote the development of a given economy to a greater extent whilst its absence can decrease further the chances of an under-developed national economy to close up. The Austrian Schumpeter considered as the founder of the endogenous economic growth published already in the 1920`s about the role of internal factors of development. In his concept the key to the economic growth is the entrepreneur who, by combining the economic factors and performing innovations, establishes the internal conditions of the development [Schumpeter 1911]. In accordance with Schumpeter, P. Romer claims that the marginal product of knowledge is increasing. The explanation of the increasing marginal product is that there is no reason for quitting the accumulation of knowledge at a given level, we try to obtain even more new knowledge by doing more and more research. As a result, he specifies R&D technology as an external factor the effect of which on the production is of decreasing proceeds. As nobody can be excluded from using new achievements, they are positive external resources for every economy. All in all, production in terms of knowledge base is of increasing proceeds. According to Romer, while capital funds increase, the rate of investment and rate of capital recovery also increase, this way closing up is not an inevitable consequence, in fact, the less developed will increase at a slower pace or will not at all increase [Romer 1986]. R.E. Lucas is regarded as another representative of endogenous growth theory. Lucas's theory in which he deduces extension of human capital from the time spent on education by the individuals, and from this he deduces production function and economic growth, that is, the proceeds from the micro level towards macro- economic level, earlier was considered as a pioneer concept. The previous theories used exclusively macro supply functions to model increase [Lucas 1988]. He raises the problem in connection with the neoclassic model that closing up does not happen automatically for the reason that factor prices do not equalize, capital does not flow from the developed country to the developing country. As it reads in Paul Romer's formulation, *From the aspect of the growth it may be an advantage to integrate in a region which is rich in human capital, and not in a region which has a big population* [Romer 1994]. Romer thinks that despite material and capital resources, economic growth can be achieved, using properly qualified, developed human resources. Knowledge based society therefore is not the sole monopoly of the developed states but it can be reached in all countries that joined the process of globalization and invest in education and training. General Director of Rolls-Royce Sir John Rose states with good reason, *Nowadays we can talk about intelligent, more intelligent and highly intelligent countries, rather than developed, developing and under-developed countries* [Friedman 2006]. Although N. Gregory Mankiw, David Romer and David N. Weil think within the neoclassic model, their significant innovation is that they take human capital into consideration beside the physical capital in the production function. They prove by empiric research that convergence can be shown between the countries which do not differ in a significant way regarding investment rate and population growth rate and human capital [Nagy, Káposzta 2010]. The reason why there have been income differences in the developed and the under-developed countries is shown by educational circumstances and population growth indexes, among other things. Their model supports the idea that economic growth can be achieved by developing human capital, therefore improvement of educational and training circumstances is a very important field of economic policy [Mankiw et al. 1990]. Representatives of post-Keynes growth theory acknowledged labour as resource of growth, but they counted with the amount

of work only. Whereas thinkers of the classical trend recognized a part in the economic growth which is not the result of capital or labour but a so called exogenous technological progress which can be considered as development of human capital. According to the representatives of the classical trend, closing up of the poorer countries is automatically carried out as the marginal product of capital is higher than that of the labour, so capital flows into these countries. Representatives of the endogenous growth theory, however, proved that differences between developments will grow in spite of this in the world, and they see the explanation of this in the endogenous human capital [Káposzta et al. 2008].

TERRITORIAL DEFINITION OF THE RESEARCH

The territory of our research is the regions of the Visegrad countries. Regions of the Visegrad cooperating countries (the Czech Republic, Hungary, Poland, Slovakia), lying in the heart of East-Central-Europe show similarities in a lot of respects, but there can be seen significant differences too. The territory studied is not an artificially created group but a cooperation existing for years in economic, cultural, political and commercial fields. The group of countries analysed by us give nearly 13% (12.7%) of the whole population of the Union, nearly 11% (10.7%) of its territory, a bit less than 5% (4.7%) of its produced GDP in 2009. In spite of their relatively modest economic importance, the V4 represent significant share in the territory and population of the Union. Statistics assist to understand what challenges and problems this group of countries has to face during the integration.

DESCRIPTION OF THE DATABASE

Starting database was set up by Rechnitzer's (2008) model. Resource of our data was EuroStat statistic database. When choosing the indicators, our prior aspect was to obtain identical indices from all 35 regions in the years of 2003-2008. From this database we chose 24 indexes from the 35 regions which express the development of human resources. All of the indexes used are specific indicators, the application of which assures that the differences due to the different sizes of territory do not influence the results. There was no need to standardize the indicators beforehand as the multivariant statistical method, the principal component analyses chosen by us standardizes the involved data [Sajtos, Mitev 2007], this way the probability of mistakes due to different units of measurement and measures are avoidable. According to Rechnitzer's model, the factors that mostly influence human resources of the particular regions can be divided into 5 components. The **first** one is the human factor which is characterized by the density of population, the activity-, employment- and unemployment rates, life expectancy, productivity rate indexes as well as the rate of the people with higher qualification and the rate of the people learning lifelong. The **second** area is quality of life. Quality of life is the most subjective one from all the categories as it depends on personal evaluation how to qualify a certain living standard, which can more or less be defined by various income and consumption indexes. In my opinion, attachment to the region can by all means be considered as a sign of evaluation and we caught it through two indicators. They are the net migration rate and the number of people leaving the region per 1,000 inhabitants. Apart from these two indexes, quality of life is reflected by proportion of services and tourism in the region, like number of touristic accommodations per 1,000 inhabitants and proportion

of employees in the services, counted from all employees in percentage. The **third** group of the indexes is to measure the living conditions of the people living on that area. As a rule, living conditions are defined by income and consumption. In our calculations we took GDP per capita, and household income and consumption per capita into consideration. The **fourth** area of indices featuring development of human resource according to Rechnitzer [2008] is the network of communication and transfer of knowledge. Proportion of people with high qualification, rate of all students, employees in the field of research development are the indicators that measure in a suitable way this characteristic of the human resource. The **fifth** is the indexes of innovation environment of settlements, the number of innovations, the size of R&D investments, proportion of employees in the technology and knowledge intensive sector, and the proportion of employees in the field of science and technology. Thus, we got 24 indices in 35 regions, data matrix for 6 years. Calculations were made the same way every year, as the results are comparable only this way. After checking the database, 16 variables were suitable to run the principal component analysis. The principal component analysis annually compressed the variables into four factors so that it explained the largest proportion of variance of the sum of variables. The sum of variance explained every year exceeded 91%, so the four factors kept significant part of variance of variables, i.e. heterogenity, also the four factors represent the information content of the chosen 16 indexes in the right way. During the first four years of the research the own value of the four factors exceeded 1, so this year it seemed suitable to establish four factors. However, in the last two years of the examined period the own value of just three factors exceeded 1, the fourth factor reached 0.989 and 0.961. As the own value was very near to 1, and leaving the factor out would have decreased the demonstrative power of the model significantly, it seemed reasonable to take them into consideration in these two years as well. Communality of the 16 indicators, except two of them, exceeds 0.8 in all years studied. Communality of the life expectancy at birth is lower than 0.8 in the last two years, but it exceeds 0.6. On the basis of all this it can be stated that the four principal components compress the information content of the 16 indexes in the right way. During the principal component analysis we used the rotation process, in the course of which the necessary factor loadings were stated which show the degree of correlation between the original variables and the given factor, and they also demonstrate the extent of the combination of original variables from the mutual factors. These factor loadings, the factor index content can be seen after rotation from the component matrix (Tab. 1).

In all six years of the study four principal components were created with the same indicator content, in the first five years in the same sequence, in 2008, however, the sequence of the first two principal components reversed. It means that the development of human resources in the regions studied are determined by the same factors, but in the last two years of the research the centre of gravity changed, they were transferred to the second principal component. The fact that in all 6 years the same four factors were established, proves that indexes of the factors belong together not only in content but logically as well. In the course of the interpretation of the results of the principle component analysis the hardest task was to name the factors on the basis of their content [Obádovics 2004].

The **first factor** explains approximately 30% of all variances of the starting variables every year. In this factor there are the following indexes:
– proportion of employees in services from all employees (in %),
– income of households (Euro/capita),
– GDP per capita (Euro/capita),
– number of employees in research development (in % of all employees),

Table 1. Rotated component matrix

Indexes	2003			
	component			
	1	2	3	4
Proportion of employees in services from all employees [%]	0.905	-0.080	0.253	0.030
Income of households [Euro/capita]	0.832	0.391	0.128	0.183
GDP per capita [Euro/capita]	0.832	0.427	0.179	0.263
Consumption of households [PPS/capita]	0.797	0.492	0.182	0.134
Human resources employed in science and technology, from the active population [%]	0.745	0.434	0.369	0.200
R&D investment per capita [Euro/capita]	0.740	0.473	0.151	0.265
Number of employees in research development [% of all employees]	0.737	0.308	0.511	0.145
Rate of activity [%]	0.134	0.915	-0.007	0.089
Rate of employees in the technology and knowledge intensive sector [% of the whole population]	0.401	0.787	-0.219	0.257
Life expectation at birth [year]	-0.123	0.771	0.489	-0.037
Rate of employment	0.480	0.759	-0.280	0.224
Number of all students [% of the population]	-0.095	-0.079	0.959	0.048
Students in high education [% of all students]	0.372	-0.008	0.889	0.153
Rate of participants in higher training [% of population aged 20-24 years]	0.402	0.030	0.871	0.221
Rate of higher qualification [% of population order than 15 years]	0.002	0.042	0.048	0.956
Lifelong learning participation of population aged 25-64 years in education and training [%]	0.082	0.099	0.166	0.918

Source: own compilation on the basis of SPSS output tables.

– consumption of households (PPS/capita),
– human resources employed in science and technology, from the active population (in %),
– R&D investment per capita (Euro/capita).

All the seven variables are in close (higher than 0.6) positive trend connection with the value of the factor. Thus, if the value of the indexes increase, the characteristic of the region's human resource, determined by all the indexes together, improves. In our opinion, if a region's income and consumption is high, a significant part of the income produced goes on research and development, furthermore if the proportion of service sector is high, then the economy of the region can be considered developed. So this factor, on the basis of the index content, expresses the economic development of the region's human resources.

The **second factor** explains more than 20% of the whole variance of the original variables every year. In this factor there are the following indexes:

– rate of activity (in %),
– rate of employees in the technology and knowledge intensive sector (in % of the whole population),
– life expectation at birth (year),
– rate of employment.

There is a close positive trend correlational connection (higher than 0.7) between the value of the factor and all the four indicators. That is, if the value of the indexes decrease, certain characteristic of the region's human resource worsens. This characteristic expresses the *Activity* of the region's human resources. In 2008 the importance of activity factor is higher than that of the economic factor. It means that the indexes of the activity factor explain bigger part of all variances of the variables in 2008 than the preceding 5 years, that is, the characteristic of human resources carried by the chosen indexes are determined by the activity of the labour force market to a greater extent.

The **third factor** explains more than 20% of the variances of the original variable every year. In this factor there are the following indices:
–   number of all students (in % of the population),
–   students in high education (in % of all students),
–   rate of participants in higher training (in % of population aged 20-24 years).

Value of the factor increases if the proportion of all students and students in the higher education grows in the region. If the number of the students and students in the higher education is high in the region, this region has a developed educational network and training institutional system. This factor expresses the educational opportunities of the region's human resources.

The **fourth factor** explains more than 10% of the variance of the original variables. There are the following indicators in this factor:
–   rate of higher qualification (in % of population order than 15 years),
–   lifelong learning participation of population aged 25-64 years in education and training (in %).

Both variables were in close positive trend relationship with the value of the factor during the whole period of the study, that is, if the proportion of the population with high qualification is high and the population older than 25 years takes part in a sort of training in large numbers, then certain characteristic of the region's human resources improves. This factor shows the qualification of the human resources.

As we used the results of the principal component analyses for further calculations, for the variables belonging to the mutual principal component, according to the original principal component analyses, we have run a one-dimensional principal component analysis for each. This is the so called total scale method of using principal components. It is worth using this method, on the basis of our professional experience, it is known that in reality between the characteristics determined by a principal component of the studied phenomenon there is correlation. Between the human resource characteristics determined by our four principal components, there is a close correlation in reality. If we look at just some projections, eg. economic development of a region determines the volume of the resources which can be spent on education and training, educational level of the people living in the region is greatly limited by the human resource training possibilities, the activity of the labour force market as well as the economic development is influenced by the fact how qualified the people living in the region are. This way the established four principal components kept their entire information content and correlational relationship can be shown between them.

The four factors established on the basis of the one-dimension principal component analysis determine one particular feature of the regions' human resources. On the grounds of the dendogram of hierarchical clustering carried out with the consideration of the principal components, it seemed to be a good solution to form four or five clusters. Classification of the regions into four clusters was confirmed by the results of the non-hierarchical K-means cluster analysis and discriminant analysis. On the basis of the discriminant analysis in all periods of

the research, rate of properly categorized cases in all four clusters is 100%. Thus, discriminant analysis supports the competence of the four groups formed in the course of cluster analysis.

Cluster 1 in all six years studied involves one single region, Prague. Every feature of human resource is outstanding. Generally speaking, in this cluster the income produced is extremely high, the significant proportion of which is invested in research and development activity; standard of employment is high but stagnating, training facilities of the inhabitants are excellent, the population is highly qualified. On the basis of its characteristics, we named this cluster **as the most advanced, knowledge producing** cluster.

Central-Hungary, Bratislava and the Mazowieckie Voivodeship belong to **Cluster 2.** Regarding economic development, qualification and training facilities, human resources of this cluster take the second place, regarding its labour market activity, however, it takes only the third place among the clusters. The group of regions involved in the cluster – considering its characteristics – is **named lagging behind, knowledge producing** cluster. This cluster is characterized by high but decreasing income, activity of human resources is low, owns a developed educational network and qualified human resources, but less and less proportion of its income is invested in research and development activity, which can be one of the reasons why it is lagging behind the most advanced, knowledge producing cluster. Three regions of the cluster together with Prague form the focal point of the so-called human boomerangs.

The constant members of **Cluster 3** are the seven regions of the Czech Republic and West-Slovakia. In 2003 Central-Slovakia, East-Slovakia and Central-Transdanubia also belonged to this cluster. Besides, the West-Transdanubian region was part of the cluster in 2006 and 2007. Activity of human resources is the second highest, training facilities are the weakest and qualification of human capital is the lowest, economic state of development is on the third place among the studied clusters. We named the cluster **knowledge adopting, attractive zone,** which is characterized by under-developed educational network, in the regions of the cluster the population is active but of low qualification. The income produced is low but remarkable growth is typical. These regions are situated on the so-called inner boomerang, near the developed Austrian and German areas.

Most regions belong to **Cluster 4.** Constant members of the cluster are the 15 voivodeships of Poland and four regions of Hungary. The training facilities of the cluster's human resources are better, qualification of human resource is higher than that of Cluster 3, but its economic state of development and activity are behind. We named this cluster **knowledge dragging, closing up** cluster, the characteristic feature of which is the very low but dynamically growing produced income. Despite of its developed educational network and educated population, the standard of employment is low. The regions of the cluster are situated on the outer boomerang, far away from the developed Austrian and German regions, so they are compelled to build up an educational and research network of their own, nevertheless, their economy is not so developed to be able to employ the qualified labour force at a suitable extent.

We can see a sort of regular outline on the maps, that is, the so frequent Easter-western division in the area analysis, and we can discover a dual human boomerang as well. On the inner boomerang the regions of Cluster 3 are situated, with the focal points of Prague and Bratislava, on the outer boomerang the regions of Cluster 4, with the centre of Budapest – Warsaw. Our results proved that the regions situated on the inner or outer boomerang cannot be stated as having more developed or under-developed human resources. The pure truth is that the state of development of their human resource is of different composition and structure (Fig. 1).

When working out a development strategy of an area it is necessary to know which field needs intervention, which development expenditure is expected to bring the greatest

Figure 1. Clusters of the Visegrád Countries on the map
Source: own compilation on the basis of SPSS output tables.

possible result. That is why we found it important to examine what the relationship is between the different factors of the human resources and the competitiveness of the region. First we set up binary linear correlation models, on the basis of which we stated that the closest relationship is between the GDP per one employee and the principal component of economic development, stronger than 0.9. It means that growth in economic development of the human resource in the regions goes together with the rise in their competitiveness. Activity, training possibilities and quality factors have weaker but medium-strength positive trend connections with the GDP index per one employee (Tab. 2).

In the correlation analysis it is not necessary to define what we consider as outcome variable and explanatory variable, i.e. there is no need to define the trend of the relationship. However, it is the researcher's duty to determine it in the regression analysis on the basis

Table 2. Binary linear correlation coefficiencies

Principal component	2003	2004	2005	2006	2007	2008
Economic development	0.954	0.958	0.963	0.973	0.974	0.971
Activity	0.454	0.501	0.522	0.579	0.548	0.573
Training possibilities	0.511	0.508	0.598	0.592	0.640	0.663
Qualification	0.668	0.641	0.691	0.702	0.601	0.582

Source: own compilation on the basis of SPSS output tables.

of his/her professional experience. There is a two-directional relationship between the competitiveness and the human development, because it is possible to create a competitive economy with developed human resources whilst a competitive economy can provide resources for development of human resources. Therefore we find it important to stipulate that we examine the direction of the relationship how the human state of development influences the competitiveness of the region. In the calculation of the multivariant linear regression we considered the competitiveness index as outcome variable, and four components of human resource as explanatory variable. Regression calculation was done by backward method, the point of which is that at the beginning of the study there are all explanatory variables in the regression model and the variables are deducted one by one on the basis of the increasing sequence of F values until the best fitting model is found. Value of the F trial function examines the fitting of our regression model on the basis of quotient of variance explained by regression and the quotient of not explained variance. In all years of the study, effect of two explanatory variables can be considered significant on the outcome variable, namely the factor of economic state of development and activity of human resource. In the multivariant regression function, relationship of activity factor and competitiveness is typically steep, which means, if we consider the economic state of development unchanged, the increase of activity on its own decreases the competitiveness of the region. That is, if the employment is increased in the economy so that the economic performance does not change, it goes together with decrease in productivity and the usage of human factor cannot be regarded as effective, which leads to the decrease of competitiveness. The change of the sign of the activity factor's regression coefficient can be caused by two things. One of them is the multicollinearity between the explanatory variables, the other is the direct and indirect effects of explanatory variables on the outcome variable. Independent variables can directly define the value of the outcome variable, or the effect of one explanatory variable can be strengthened or weakened by the effect of another explanatory variable (indirect effect). We demonstrated the direct and indirect effects of the independent variables on the outcome variable by path analysis. The economic state of development directly affects the competitiveness, and affects the GDP per one employee through the labour force market activity as well (Fig. 2).

Correlation coefficient between index of competitiveness and the two explanatory variables (economic state of development factor and activity factor) equals the sum of direct and indirect effects, which should be equal to the value of the correlation coefficient of the economic state of development and competitiveness: $R = \beta_1 + \beta_2 \gamma$
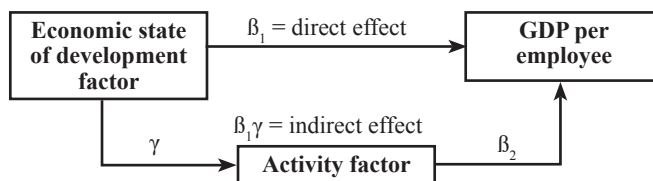

Figure 2. Scheme of path analysis in the V4 regions
Source: own compilation.

Table 3. Direct and indirect effects
in the multivariant linear correlation
(data of path analysis)

Year	R	Direct effect β_1	Indirect effect	
			β_2	γ
2003	0.954	1.090	-0.221	0.619
2004	0.958	1.057	-0.158	0.624
2005	0.963	1.066	-0.161	0.641
2006	0.973	1.041	-0.105	0.657
2007	0.974	1.058	-0.131	0.642
2008	0.971	1.055	-0.128	0.664

Source: own compilation on the basis
of SPSS output tables.

The direct effect of the economic state of development on competitiveness is very strong (β_1), this effect is weakened by the indirect effect, that is, the medium-strength positive trend relationship (γ) between the economic state of development and the activity through the effect of activity principal component (β_2) decreases the competitiveness (Tab. 3). The most important influencing factor of regional competitiveness is the economic development of human resource, which on the one hand directly increases, and through increasing activity it decreases the competitiveness of the region so that the direct
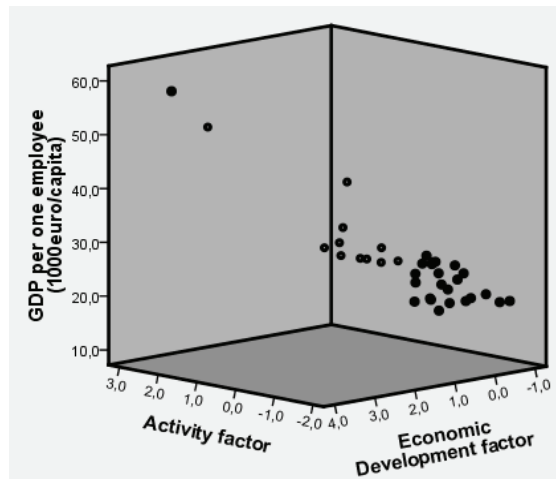
positive trend effect is always stronger. Featuring the relationship of competitiveness, economic state of development and activity in a three-dimensional coordinate system it is prominent that Prague and Bratislava, using development of their human resources, increase their advance in competition to an ever growing extent compared to the other two regions, between the two capital cities and the other regions the gap is getting deeper and deeper. Territory cohesion does not exist, differentiation is even bigger and bigger (Fig. 3).

Figure 3. Relationship between competitiveness,
economic development and activity
Source: an own compilation on the basis of http://epp.
eurostat.ec.europa.eu/portal/page/portal/statistics/search_
database 2003-2008

CONCLUSIONS

As a result of our research we stated that the most important role in competitiveness on the examined territories can be attributed to the economic development of the human resources. Parallel to this it is also stated that training possibilities and qualification of human resource are not of significant effect on the competitiveness of the region. Economic development of human resource takes double part in forming competitiveness. On the one hand, it directly increases the competitiveness of the region, on the other hand, through the increase of activity of the region, decreases the competitiveness of the region by weakening the direct effect. This result proves the theory that increase in employment and activity strengthen the competitiveness of a region only if it goes together with increase in economic performance, i.e. productivity of living labour increases in the region.

On the basis of regression analysis of the relationship between human development and GDP per one employee we came to the conclusion that the means of increasing competitiveness in the studied regions is the increase of the living standard and consumption (economic development principal component), and not the development of knowledge economy. Therefore the targets of Europe 2020 for creating intelligent growth cannot be treated uniformly on the whole territory of the Union as its regions are not of the same degree of development. In the regions of V4 the most important driving force is economic development of human resource, the increase of which could be followed by increase of labour force market activity, development of educational network and higher qualification of human resource. According to our results, qualification, training possibilities are not relevant from the point of view of competitiveness. In the recently joined countries development of low income and consumption level should be focused on; until they reach the sufficient level there is no point in investing resources in the development of education, as they do not raise competitiveness. As Vörösmarty wrote, „Brain is unable to work while body suffers, stomach rumbles of hunger, mind is fettered by worries."

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LUDZIE JAKO CZYNNIK KONKURENCYJNOŚCI

Streszczenie

    W dzisiejszych czasach ważną kwestią jest ustalenie co sprawia, że społeczeństwo, gospodarka lub region
potrafi poradzić sobie z konkurencją w zglobalizowanym świecie. Badaniami zostały objęte aspekty relacji i
inherentności zasobów ludzkich oraz konkurencyjność w Republice Czeskiej, Polsce, na Słowacji i na Węgrzech.
Obecnie pojęcia „gospodarka oparta na wiedzy" i „gospodarka wiedzy" są coraz częściej używane i podkreślają
znaczenie kapitału ludzkiego w procesie rozwoju społeczeństwa i gospodarki. Jednym z priorytetów ustalonych
w strategii „Europa 2020" jest inteligentny rozwój, który oznacza budowanie społeczeństwa opartego na wiedzy
i innowacjach. Doskonalenie zasobów ludzkich jest określane jako czynnik stymulowania rozwoju regionalnego.
Tworzenie wyższej wartości dodanej jest możliwe przez poprawę potencjału kapitału ludzkiego. Rozwój badań,
zwiększenie aktywnego udziału w tworzeniu innowacji może być realizowane wyłącznie na podstawie wysokiego
poziomu szkolnictwa wyższego i kształcenia naukowego. Na podstawie powyższych informacji autorzy uważają,
że należy przeanalizować zależność pomiędzy regionalną karencyjnością a poziomem kapitału ludzkiego, a także
zweryfikować czy zasoby ludzkie na poziomie regionalnym mogą być czynnikami konkurencyjności w regionie.

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