

SZENT ISTVÁN UNIVERSITY, GÖDÖLLŐ



THESES OF DOCTORAL (PhD) DISSERTATION

**MEASURING THE RELATIONSHIP BETWEEN HUMAN CAPITAL AND
COMPETITIVENESS IN THE REGIONS OF VISEGRAD-COUNTRIES**

**Written by:
Lampertné Akócsi Ildikó
Gödöllő, 2013**

DOCTORAL SCHOOL

NAME: Doctoral School for Management and Business Administration

DISCIPLINE: management and business administration

HEAD: Dr. István Szűcs
Professor, Doctor of the Hungarian Academy of Sciences
SZIU, Faculty for Economic and Social Sciences,
Institute for Economic Analysis and Methodology

SUPERVISOR: Dr. Tamás Tóth
Associate Professor, PhD in Economics
SZIU, Faculty for Economic and Social Sciences,
Institute for Regional Economics and Rural Development

.....

Head of School's approval

.....

Supervisor's approval

INTRODUCTION

Nowadays it is an important issue what makes a society, an economy or a region suitable to withstand economic competition in our globalized world. According to our century's economic and sociological researches it becomes clearer and clearer that abilities, skills, knowledge, health condition and values of the human as basic unit of society influence economic processes decisively and determine how successfully certain regions can join in the global competition. My doctoral dissertation examined exactly this, that is, the relationship and connection between human resources and competitiveness in the regions of the Czech Republic, Hungary, Poland and Slovakia.

Currently "knowledge-based society", "knowledge economy" are more and more frequently used concepts which emphasize the importance of human capital in the social-economic development process. Human became the primary value of the society. Lisbon strategy departed in 2000 set as an aim, among others, to create a knowledge-based society, increase the competitiveness of Europe and within the EU member states the importance of investing an increasing share of their GDP in research and development. Europe 2020 strategy accepted in the spring of 2010 focuses on to "keep the economic power of the community determining 500 million people's life in competition" (EUROPEAN COMMISSION, 2010). One of the priorities of the strategy is the intelligent growth, which means the creation of an economy on the basis of knowledge and innovation. To build a knowledge-based society, however, is only possible with a healthy and educated population. Developing human resources is a decisive factor of establishing regional development as well. Through better human capital potential added value creation is bigger. Strengthening the active role of research development and innovation can also be realized on the basis of a high-level higher education and scientific training. For the above reasons I attach importance to the theme of my study, namely the analysis of regional relationship between competitiveness and human development. In addition, the European Union's efforts to reduce regional inequalities in social and economic development, makes it current to carry out a research, which analyses the newly joining countries' regional differences in human development and their changes in the years before and after accession. By writing my doctoral dissertation I wanted to provide contribution to the extensive literature dealing with the regional structure, competitiveness and human development of the European Union, and to direct the attention to the recently joined Visegrad group of countries. I considered as the main purpose of my research to prove that a significant relationship can be shown between the regional competitiveness and development of human resource in the tested countries. In order to attain this comprehensive goal I set myself the following tasks:

- While studying the national and international special literature I endeavoured to give an overall picture of conceptual definitions of competitiveness and human resource. My aim was to present the differences and similarities among competitiveness, development and improvement. I considered my task to outline the practice for measuring competitiveness and human resource's state of development home and abroad.
- In the course of carrying out my study, my aim was to form a system of indexes which properly characterize the human resource's state of development in an individual region and is capable of creating a complex indicator which can express in one single index the human resource development of a region. I set up the task to create an index by which a ranking list of the regions' human resource development can be expressed,

the structure of the human resources can be defined and is suitable to make further comparative analyses with the help of it.

- I wanted to prove with my research expediently that the regions of the studied countries can be grouped on the basis of their human resource's development with the help of cluster analysis, the neighbourhood relationships can be outlined and regional correlation can be discovered.
- In my dissertation I was looking for the answer to the question if there is relationship between the region's competitiveness and the development of its human resources. Are the two dimensions in cause and effect relationship with each other? Can a high level of human development assist the growth of competitiveness?

After reviewing the special literature I set up the following hypotheses to the questions asked in my stated objectives:

- H1 The analysis started from the hypothesis that the regions of the Visegrad-countries can be classified into well-defined clusters on the basis of their human development
- H2 My second hypothesis was that illustrating the formed clusters in a map some kinds of regularities can be observed. It is expected that between the studied regions positive regional autocorrelation prevails, that is a developed region has developed neighbours and an underdeveloped region's neighbours are also backward regions.
- H3 My third hypothesis is that regional differences increased in the countries of my research area since joining the Union, regional cohesion among the analyzed area's regions has not taken place. In fact, I reckon that in the analyzed countries the gap has grown between the developed and the underdeveloped regions. Williamson's hypothesis is valid for the examined countries.
- H4 To express regional human development a complex indicator can be compiled which is able to measure more dimensions than the formerly known indicators.
- H5 Visegrad regions' competitiveness is determined by the development of human resources and territorial units with advanced human capital are achieving better results in global economic competition.

With cluster analysis of the Visegrad Four's regions I carried out such a characterization which makes it possible to recognize the strengths and weaknesses and to formulate proposals for development. My aim was to create an analysis which can assist to discover the necessary conditions for the successful integration in the European Union and the harmonious future development.

I divided my doctoral dissertation into three major parts. In the **first** part I described the theories concerning the correlation between regional competitiveness and human development, by an analyzing study of national and international special literature. The comprehensive study of the special literature made it possible to draw up my hypotheses. In the **second** part I set up the temporal and spatial boundaries of my research, I presented the system of the indexes I used for my analysis and the statistical methods I used for their processing as well as the statistical softwares I applied. The **third** part includes the results of my independent research.

MATERIAL AND METHOD

In my dissertation I studied human resources of Visegrad countries in NUTS2 level. The source of my data was the statistical database of EuroStat. By selection of the indicators the primary consideration was to have the same indicators for all of the 35 regions. Therefore, unfortunately, I cannot use the database of the national statistical offices, because they are calculating and publishing different structured indicators which are collected by different methods. That is why I chose the database of EuroStat, which makes data accessible up to the NUTS3 level about the 27 countries of the European Union and about some member states outside the Union. I collected the regions' data for five years between 2003 and 2008, because I definitely felt it necessary that the analysis should equally include the year of EU-accession of the Visegrad countries and the periods before and after the accession. I would have liked to work with the possibly most current data and to go back in time as far as possible. I did not have possibilities to involve the most current data because the database of EuroStat is very deficient in the years after 2008 and I could not consider data before 2003 for the same reason. The database formed for the period of 2003 to 2008 was unfortunately not entirely complete. In the years of 2003 and 2004 the value of a variable was missing in eight regions, it was less than 1 percent of the whole year's amount of data. The replacement of the data within one year was carried out by averaging neighbouring data, which option was also offered by the chosen PASW statistical program.

My initial database was compiled according to the experiences and edifications of national and international competitiveness measuring models and human development measuring methods and with the limited scarcity of EUROSTAT database. The main frame of my index system by Rechnitzer (2008) was taken over, but it contained different indicators, because at the regional level all of the indicators used by Rechnitzer at county level were not available. Each indicator used was a specific indicator with the application of which it was made possible not to influence the results by the differences arising from the regions' different spatial size. The pre-standardization of the indicators was not necessary, because the chosen multivariate statistical method of principal component analysis standardizes the involved data in the first step (SAJTOS-MITEV, 2007), in this way errors arising from differently measured and different sized data can be avoided. (SOKAL-SNEATH, 1963)

During the preparation of my dissertation descriptive statistical tools, graphical representation, bivariate correlation and regression calculation as well as multivariate statistical methods were used. One of the aims of my analysis was to compress the information content of the 23 indicators in the formed database into lower number of uncorrelated variables to assist the easier presentation of the results, the better clarity and interpretation. Principal component analysis is an outstandingly suitable method for this aim. To carry out the classification of the regions, that is for the data segmentation the method of cluster analysis was applied, whose results were supervised by discriminant analysis. To the testing of the relationship between the regions' human resource development and its competitiveness, bi- and multivariate correlation and regression analysis and path analysis model were used. Neighbourhood relationship was presented by Gaery's autocorrelation coefficient. Regional differences were illustrated by calculation of weighted coefficient variation and Williamson-curve's fitting to the studied area. The analysis of data from the above defined secondary database was carried out by the PASW STATISTICS for Windows program (SPSS), but in certain calculations I used Microsoft Excel program.

RESULTS

To conduct the investigation, data matrix related to 23 indexes of 35 regions was available for 6 years. I considered as my first task to compress the indicators describing human development with principal component analysis. The precondition of the procedure is to have more observations than variables. The reason is that the conditional distribution of degrees of freedom ($n - m - 1$) must be bigger than zero in the model used for testing. Consequently, it is sufficient if the number of variables is more than the number of cases with two. However, several researchers formulate as a recommendation to use greater differences than this, because the results' generalization can be raised by increasing the proportion. (SAJTOS-MITEV, 2007)

In my model the initial value of proportion was 1.5, which later improved to 2.2 by excluding the variables, that is why the revealed correlations in my model can only be generalized with reservations. I made my calculations in every year with the same method because the results could only become comparable this way. KMO values showed that not all of the 23 variables were suitable to be involved in the principal component analysis. KMO value was about 0.6 or lower every year, in 2003 it did not even reach 0.5. This means that the complex entirety of data were not suitable to carry out principal component analysis. Data from anti-image covariance-correlation matrix revealed that population density, number of leavers the region per 1,000 inhabitants and fertility rate's indicator have low MSA-value, which means that these indicators are standing in weak connection with the other indicators involved in the study. Since the precondition of conducting the analysis is to have strong correlation among the variables involved in the study, the above indicators did not fit in the factor structure, therefore I excluded them from the analysis. In addition, partial correlation coefficients of the unemployment rate - which are the elements outside the main diagonal of anti-image correlation matrix - showed a high correlation between the activity and employment rates. Because the MSA-value of unemployment rate was lower than that of the other two mentioned indicators', that is, it was in a weaker correlation with the other indicators in the study, it was logical to exclude this indicator from the analysis. In addition, partial correlation coefficient of net migration rate showed a close correlation with three examined indicators (these were Employment rate in services in the percentage of the total employment, R+D investment per inhabitants in EUR per capita, Human resource rate in the percentage of active population in the field of science and technology). As the MSA-value of net migration rate was lower than that of the above mentioned indicators', this indicator had to be excluded from the model. On the basis of this, 19 variables from the initial 23 seemed to be suitable to participate in principal component analysis. According to the re-executed principal component analysis with the 19 variables, communalities of three indicators were low (lower than 0.6) compared to the other variables' value, which were above 0.9, thus I tried to leave them out from the model one by one and this increased every time the growth of the principal components explained variance. These three indicators were number of leavers the region per 1,000 inhabitants, tourist accommodation capacity per 1,000 capita and number of inventions per 1,000,000 inhabitants, which were not included in the final model. Eventually there were 16 indicators, which were suitable for carrying out principal component analysis with.

The results of the principal component analysis carried out again with the remaining 16 variables were as follows: KMO-value was over 0.6 in 2003, in the other years of the study exceeded the 0.7 value, which means that the data this way are suitable for completing the principal component analysis. The significance level of Bartlett-test is 0.000 in every year, by which the null hypothesis of the test, i.e. the uncorrelation of the variables has to be refused,

which is also precondition to complete the principal component analysis. The principal component analysis compressed my variables in four factors in every year so that they explain the largest rate of the total variance of variables. The total variance explained exceeded 91% in each year, so the four factors kept a significant part of the variable variants, i.e. heterogeneity.

In every year of the study the four factors' eigenvalues after rotation exceeded 1, therefore creating four factors in every year was professionally justified. Communality of the 16 indicators – apart from two exceptions – exceeded 0.8 in every studied year. On the basis of all this it can be stated that the four principal components compressed the information content of the 16 indexes. While carrying out the principal component analysis I used the rotation method by which the factor weights necessary for the analysis were created which show the extent of correlation between the original variable and the given factor and they also show with what weights the original variables are combined out of the common factors. These factor weights and the factor index content can be read from the component matrix after rotation.

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, however, the sequence of the first two principal components turned in 2008. It means all in all, that the development of the human resources in the studied regions is determined by the same factors but the focal points in the last year of the study changed. They were transferred to the second principal component. The fact that in all six years the same four factors were created proves that the factor's indexes not only numerically but also in their content and logically belong together. While interpreting the results of the principal component analysis, the most difficult task, however, was to give names to the factors on the basis of their indicator content. (OBÁDOVICS, 2004)

The **first factor** explained an approximately 30% value of all variants of the initial variables in every year. The seven variables in the principal components is in a close positive relation (more than 0.6) with the value of the principal component. So if the value of indicators increases, the region's human resource's characteristics jointly defined by indicators improve. In my opinion, if the income and consumption of a region is high, a significant part of the produced income is spent on research and development, furthermore the service sector's proportion is high, the economy of the region can be called developed. Thus this factor, on the basis of its indicator content expresses *Economic development* of the region's human resource.

The **second factor** explained more than 20% of all variants of the original variables in every year. There is a close positive relation (more than 0.7) between the value of the factor and the four indicators it contains. That is, if the value of the indicators decrease, certain characteristic of the region's human resource declines. This characteristic expresses *Activity* of the region's human resource. In 2008 weight of *Activity factor* was higher than that of the *Economic factor*'s. This means merely that indicators of *Activity* factor explained the bigger part of all variants of variables in 2008 than in the former five years, that is human resource's supporting characteristics by chosen indicators were determined with bigger weights by labour market's activity.

The **third factor** explained more than 20% of all variants of the original variables in every year of the study. The value of the factor rises if proportion of all students and students in higher education increase in the region. If the proportion of all students and students in higher education is high in the region, the region has developed education network and training institutional system. This factor expresses *Education opportunities* of the region's human resource.

The **fourth factor** still explained more than 10 % of variance of the original variables. Both variables in the factor were in close positive relation with the value of the factor during the

whole period of the analysis, that is, if proportion of population with higher education is high and population over 25 years participates in some kind of training in a big proportion, certain characteristic of the region's human resource improves. This factor expresses *Qualification* of human resource.

Since the results of principal component analysis were used in further calculations, according to the original principal component analysis I executed a particular one-dimensional principal component analysis to variables belonging to principal component. This is the so-called total scale method of using principal components. This method is worth using where on the basis of our professional experience it is known that in reality correlation exists between the studied phenomenon's characteristics defined by one particular principal component. There is a close correlation in reality between the human resource characteristics defined by my four principal components. If we look at just some projections, for example a region's economic development determines the volume of resources to be spent on education and training, the education level of region's inhabitants is severely limited by education opportunities of human resource, and activity of labour market and economic development is influenced by the qualification of the region's inhabitants. This way the resulting four principal components kept the whole information content and correlation relationship can be demonstrated between them. For the above reasons I used the created one-dimensional principal components throughout my analyses later on.

According to the first hypothesis of my research, regions of Visegrad group of countries can be organized into well-defined clusters on the basis of their human development. I proved my hypothesis with cluster analysis. The four factors created by the carried out one-dimensional principal component analysis define one particular characteristic of regions' human resource. According to the dendrogram of hierarchical clustering on the basis of principal components it seemed to be a good solution to create four or five clusters. The classification of regions into four clusters was supported by the results of non-hierarchical K-means cluster analysis and discriminant analysis. According to the results of the discriminant analysis the proportion of the correctly categorized cases was 100% in all four clusters in every period of the study. So discriminant analysis supported the justification of the created four clusters in cluster analysis. The location of the created clusters are included in diagram 1.

The cluster membership of the regions is constant in every studied year with one or two exceptions. We can find in each cluster Czech, Polish, Hungarian and Slovakian regions alike, except the first cluster which consists of only one region. We can observe in maps some kind of regular pattern, namely an East-West split which is so frequent in regional analyses. In addition the inverse of GORZELAK's (1996) "European boomerang" can also be observed as the Visegrad countries surround regions of Western Europe. The focal points of the inner boomerang are Prague and Bratislava and of the outer one are Budapest and Warsaw. My later results proved that we cannot claim that regions located on the inner and outer boomerang have developed or underdeveloped human resources, the only fact is that development of this resource has different composition and structure. The first hypothesis of my research, according to which the regions of Visegrad-countries can be classified into well-defined clusters on the basis of their human development, has been proved.

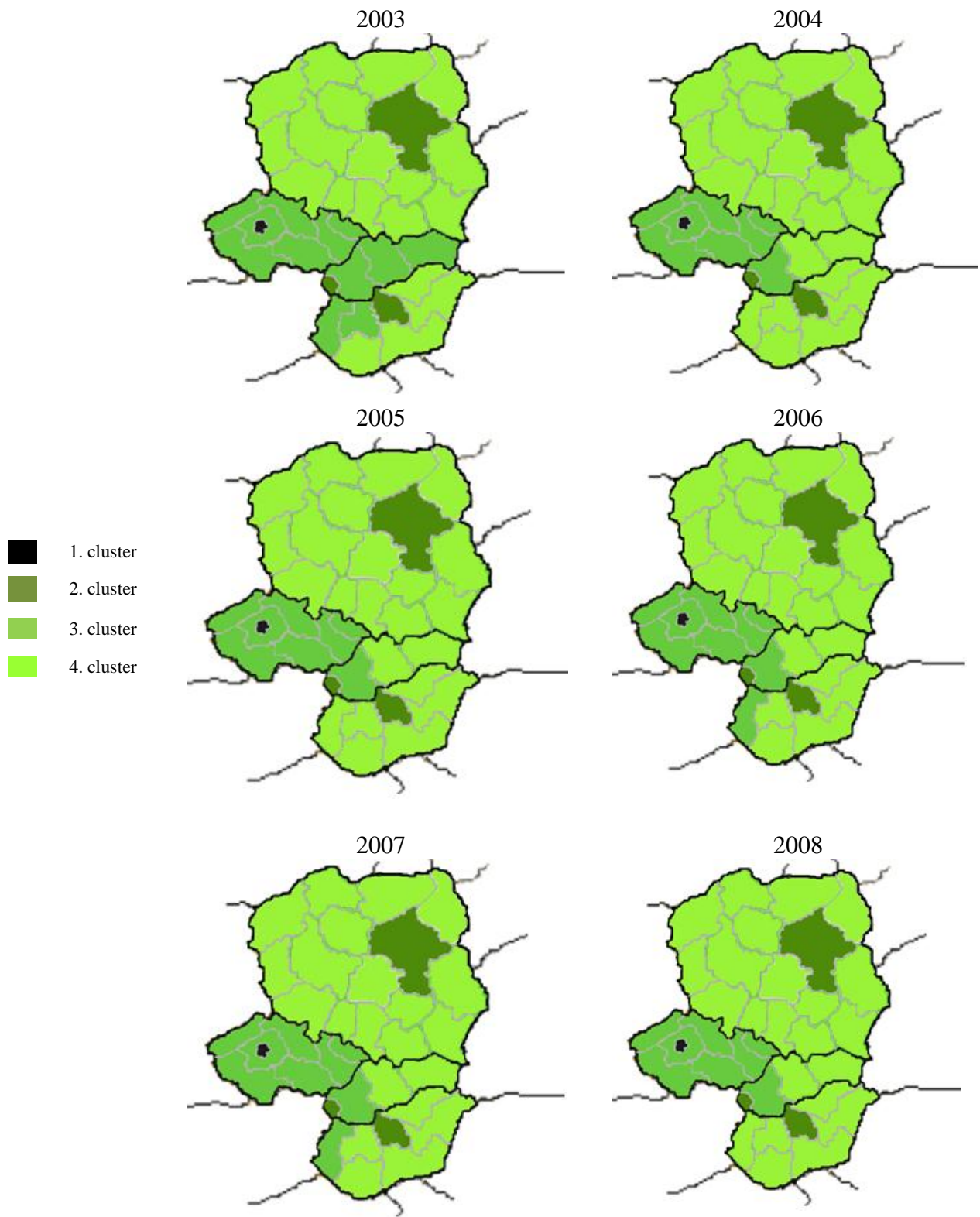


Diagram 1.
Clusters of The Visegrád Countries on the map
 Source: own compilation on the basis of SPSS output tables

According to my H2 hypothesis by illustrating the formed clusters in a map we can observe some kind of regularity. It is expected that between the studied regions positive regional autocorrelation prevails, that is a developed region has developed neighbours and an underdeveloped region's neighbours are also backward regions. According to my H3 hypothesis regional differences between the development of V4 regions are significant and increased during the studied period. To verify my assumptions I calculated regional autocorrelation and I fitted Williamson's well-known hypothesis to the regions of my studied area. The detection of regional co-movements I chose Gaery's c index, because Moran's I index is sensitive to outstanding values and in my studied region data of capital regions are this kind of values.

The c index by Gaery is very sensible to show minor changes, so it is more suitable to examine the regions' co-movements. I tested autocorrelation for both the regions' competitiveness and human development. Its values in the field of human development and competitiveness alike were less than 1 in every year, which expresses a positive regional co-movement. The regions' regional co-movement in human development is more significant than in the field of competitiveness and its extent in the tested period of time slightly increased. The regions' co-movement by their competitiveness was fluctuating in the period of 2003 to 2008. The above written facts confirm the impression that for the Visegrad Four regions, on the basis of their competitiveness and human development, a steady mosaicism and polarization is characteristic. I find it important, however, to direct the attention to the fact, that these co-movements cannot be considered remarkable, as the values of the indexes are very near to 1. The low regional co-movement acknowledges that in my database there is no redundancy and there are no distortions which could question the results of my research.

MANKIW, ROMER and WEIL (1990) proved with their research that convergence can be seen only between the countries which do not differ substantially from each other regarding the investment and population growth rate and human capital. On the basis of all this, as significant differences can be revealed in the regions of Visegrad Four in their human capital development, it is not likely that the desired convergence will be completed. After all, the underdeveloped countries do not possess the appropriate level human capital which serves exactly as a resource for their closing up. I take my H2 hypothesis proved, the positive regional autocorrelation is valid for the field of study but it is so weak that the developed regions do not represent a significant drawing power for the human resource development and competitiveness of the surrounding regions.

According to the Williamson-hypothesis dealing with the well-known correlations of economic closing up, the developed regions reach a faster growth than the underdeveloped ones, because their more developed resources are utilized better and faster. One of the classical, even nowadays frequently quoted theory comes from Jeffrey G. Williamson who created a model of relationship between the countries' economic development and extent of their internal regional inequalities. Depicting internal regional differentiation of a region plotted against its level of development, an inversed U-curve would be obtained. The hypothesis can be adopted when we look at the extent of regional inequality indexes calculated the same way in regions of different development level at a given moment, and also when long time series values of the same indexes are defined to one particular area. (WILLIAMSON, 1965) To prove the hypothesis relating to my own research area I used GDP per capita as income index and logarithmic weighted coefficient of variation index to point out income inequalities. The reason for choosing LWCV index is that (in spite of logarithmisation) it is sensible to the changes of the values at the two sides of the dispersion, as well as to the income displacement in the circle of settlements with below the average and above the average incomes. (NÉMETH-KISS, 2007) One of the characteristic features of the

studied countries is their capital's economic predominance, the other regions dropping back compared to the capital and the regions near the capital (LAMPERTNÉ, 2003). As this drop back can be seen by LWCV better than by any other dispersion index, it is the most suitable index in the field of the study to express regional differentiation. The index weighted with number of population shows the extent of inequalities so its value is determined not only by the regions' income level but also its volume. (LAMPERTNÉ-TÓTH, 2011)

A lot of national and international research dealt with proving Williamson's hypothesis (KISS-NÉMETH 2006, DAVIES-HALLET 2002, SZÖRFI 2007, NEMES NAGY 2005, LAMPERTNÉ 2011). The previous empirical tests studied Williamson's hypothesis on long time series of a given area or at a given moment in different areas. I dealt with both dimensions in my dissertation. Longitudinal, that is long time series (1995-2007 year) and cross-section, i.e. national, country-group and EU analysis were also carried out. At first I studied the regional differentiation in countries one by one, in the country-group of V4 and then in the European Union as a whole. To express regional differentiation inner a country I calculated and interpreted LWCV index by the following:

$$V_i = \sqrt{\frac{\sum_{j=1}^n \left(\log \frac{y_{ij}}{\bar{y}_i} \right)^2 f_{ij}}{\sum_{j=1}^n f_{ij}}}$$

Wherein

V_i the i-th year's dispersion index

y_{ij} the i-th year's j-th region's GDP per capita

f_{ij} the i-th year's j-th region's population

\bar{y}_i the i-th year's average GDP per capita weighted with the given country's population

The index calculated with this method shows how much the particular region's GDP per capita differs on the average from the country's GDP per capita in the particular years. I stated on the basis of the regional inequality indexes calculated separately for the four member countries, that in each four countries regional differences increased. In the first four years the largest regional differences were in Hungary. However, after 1997 regional differences among the Slovakian regions started a dramatic growth, therefore in 2007 it became significantly higher than the value of the Hungarian calculated index. High, increasing regional differentiation of Slovakia can be traced back to two reasons. One of the reasons can be that the advantage of development in Bratislava increased remarkably during the studied period, therefore LWCV index, which has sensitive reaction to the movements of these outstanding values, shows significant growth. The other reason can be Slovakia's quick accession to EU. In 1997 Slovakia (because of political causes) did not take part in the round of EU enlargement as the other V4 member states. The change of government in 1998, however, accelerated the accession negotiations, the formation of government led by Mikulas Dzurinda resolved political considerations against EU accession and Slovakia's quick pace soon caught up with the countries joining in the first round. The increased inner regional differentiation could be the price of this huge pace. The smallest differences of regions were in Poland in the studied period. The explanation of the low regional differentiation experienced in Poland was that due to its large territory, it is not capital-centric compared to the other three countries, the population of the country has relatively more balanced regional dispersion. Along with

Warsaw there are several cities with similar features, for example Gdansk, Cracow and Poznan. By illustrating the calculated dispersion index by countries in the function of regional development expressive average GDP per capita, the left side arm of Williamson's curve was drawn up. In the countries involved in the study regional development, i.e. increasing income was associated with increasing but varying degrees of regional differentiation. According to AMOS (1988), development starts in regions with lots of resources, which later attracts more and more labour force and capital from the underdeveloped regions, and this leads to further growth of inequalities in a self-generating way. These developed regions are the capital regions in all four countries, whose development accelerated during the analysed period, and generated more and more regional differentiation inner countries. All that was even enhanced by national politics, which primarily targeted the acceleration of national development in order to meet the criteria of the accession. (Diagram2.)

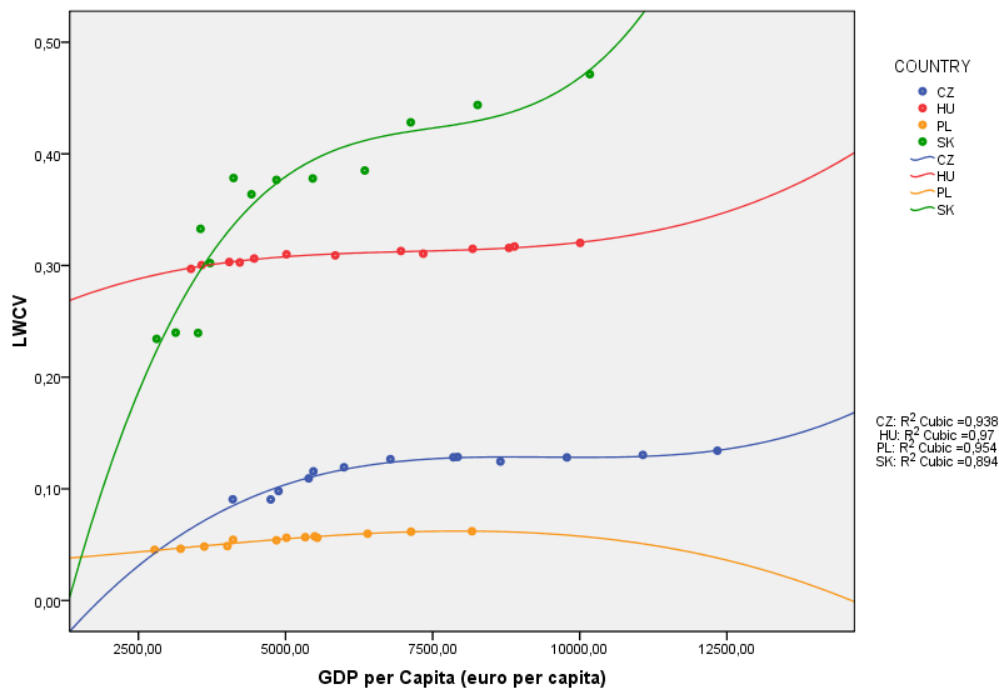


Diagram 2.
Williamson's curve in the Countries of Visegrád
 Source: own compilation on the basis of <http://epp.eurostat.ec>

LWCV index, calculated to express regional differentiation in Visegrad group of countries indicates how the given region's GDP per capita differs on the average in particular years from average GDP per capita in Visegrad group of countries. Regional differences in the country groups have increased steadily in the first ten years of the studied period. From the year of 2004 – the year of the countries' EU-accession – differences among the studied regions decrease slightly, that is the convergence efforts to the European Union led to reduction of regional differences inside the area. The opinion of KERTÉSZ (2004) , that if a backward economy begins to converge to the international average, within the national economy differences among the regions either become larger and larger or catching up with each other slows down, can be proved in V4 countries separately, but in the country-group as a whole we can observe the opposite trend. Closing up efforts increased regional differences between 1997 and 2004, but after the accession convergence started. By fitting exponential

regression function to the country- group's GDP average per capita and the relationship of regional differences, the Williamson's curve left, ascending arm stood out.

LWCV index, calculated to express regional differentiation in the European Union indicates how the given region's GDP per capita differ on the average from the average GDP per capita in the European Union in the particular years. In the whole European Union development differences among regions decreased during the studied period. The reduction of regional differences was resulted by the European Union's consistent cohesion policy, whose aim is to strengthen the economical and social cohesion from 1986. The Treaty of Lisbon and the new strategy of the EU (Europe 2020) introduced a third dimension as well, the regional cohesion. Regional cohesion took place from the early 1990s, which resulted in significant reduction of regional differences in the EU in the studied period, in spite of the expansion in 2004 and in 2010. By illustrating the calculated dispersion index in the function of regional differentiation expressing average GDP per capita and by fitting exponential (third exponential) regression to the points, the Williamson's curve right arm stood out. In the whole European Union increasing income results in decreasing regional differentiation in the studied period.

On the basis of the time-series data of regional inequality index it can be stated that regional differences increased in the studied countries, but in the whole country-group a cohesion process started from the year of accession. Regional differentiation in the European Union decreased in the studied period, even though the state of development of the joining countries during the last two accession is under the average of the Union. Therefore my H3 hypothesis proved to be true only partially.

I examined the human resource characteristics of my cluster and their changes one by one, this way depicting the common features of the regions' human resources belonging to the same cluster. In all six years studied, one single region, Prague belongs to **cluster 1**. All characteristic features of its human resource is outstanding. On the basis of its characteristics I named it ***prominent, knowledge producing*** cluster. Generally it can be formulated that the produced income is prominently high, the large proportion of which is spent on research-development activity, employment rate is high but stagnating, the educational opportunities of the inhabitants are excellent and the population has high level qualification in this cluster. Prague has kept and increased its leading economic role in this region in the course of its historical development.

Members of **cluster 2** are Central-Hungary, Bratislava and the Mazowian Voivodeship. Regarding economic development, qualification and educational opportunities, the human resource of this cluster is in the second place, on the basis of the labour market activity, however, is in the third place in the clusters. The group of the cluster's regions was named ***lagging behind, knowledge producing*** cluster on the basis of its characteristics. In general it can be stated that the lagging behind, knowledge producing cluster is characterized by high but decreasing income, activity of its human resource is low, it has developed educational network and qualified human resource, but it spends less and less proportion of its income on research-development activity which can also be one of the reasons why it is lagging behind the prominent, knowledge producing cluster. Three regions of this cluster together with Prague form the focal points of the so- called human-boomerangs.

Permanent members of **cluster 3** are seven regions of the Czech Republic and West-Slovakia. In 2003 Central-Slovakia, East-Slovakia and Central-Transdanubian belonged to this cluster. These regions got into cluster 4 in 2004. Besides, the West-Transdanubian region was also a member of cluster 3 in 2006-2007, but in the next four years of the study it got into

cluster 4. Activity of the cluster's human resource is the second highest, its training opportunities are the weakest and qualification of its human resource is the lowest, its economic development is in the third place among the studied clusters. I named this cluster ***knowledge adapting, attractive area*** which is characterized by underdeveloped educational network, the population living in the cluster's regions is active, with low qualification. Knowledge adapting, because it is unable or not compelled to produce knowledge by itself, so it adapts ready-made knowledge, benefitting from the developed regions' closeness. These regions are situated on the so-called inner boomerang, near the developed Austrian and German areas. The income produced in the cluster is low, but it is characterized by an outstanding rise.

Most regions belong to **cluster 4**. Permanent members of the cluster are 15 voivodeships of Poland and four Hungarian regions. Training opportunities of the human resource are better, qualification of human resource is higher than that of cluster 3, nevertheless its economic development and activity is lagging behind it. I named the cluster ***knowledge drawn, closing up*** cluster the characteristic feature of which is the very low but dynamically growing produced income. In spite of its developed educational network and educated population the level of employment is low. The regions of the cluster are located on the outer boomerang, far away from the developed Austrian and German areas, they are compelled to build up an own educational and research network, but their economy is not so developed to be able to employ the qualified labour force at a suitable level. In my view, the chance for development in these regions is to build up a knowledge-based economy which will be able to ensure for them a "knowledge drawn" closing up.

According to my H4 hypothesis, there is a complex index which can demonstrate the development of human resource, with the help of which development of human resource can be defined and enables to set up a ranking list between the studied regions. The well-known methods adapted for measuring the development of human resource (HDI, MHFI) characterize the development of human resource only by some dimensions. In my dissertation I worked out a human index which takes several dimensions of human resource into consideration. This index was created with the help of principal components of human development. The factors created by one-dimensional principal component analysis compress four characteristics of human resource, namely *economic development, activity, educational opportunities* and *qualification*. My aim was to work out a complex index which takes all four characteristics of human resource development into consideration. However, all four principal components cannot figure in the index with equal weight, as the principal component analysis conducted by me proved that the principal components do not explain the selected human resource characteristics with the same weights. The weighted average of the four factors should be considered as the human development's indicator. For calculating the index, I used as weight the eigenvalues of the one-dimensional principal component analysis. This value shows what part is kept from total variance of the standardized variables belonging to the given principal component by the principal component itself. By this method I achieved that the principal component which incorporates several indexes and/or keeps bigger part of the original variables' heterogeneity, takes a bigger weight in the index. On the basis of this the calculation of my index is built on the following formula:

$$HI = \frac{EV_1 \cdot FAC_1 + EV_2 \cdot FAC_2 + EV_3 \cdot FAC_3 + EV_4 \cdot FAC_4}{EV_1 + EV_2 + EV_3 + EV_4}$$

FAC_1	Factor score of Economic Development	EV_1	Eigenvalues of Economic Development
FAC_2	Factor score of Activity	EV_2	Eigenvalues of Activity
FAC_3	Factor score of Education Opportunities	EV_3	Eigenvalues of Education Opportunities
FAC_4	Factor score of Qualification	EV_4	Eigenvalues of Qualification

The ranking list of the regions can be set up on the basis of the four years' factor scores as well but this way we get three different orders. Between the rank numbers by the four factors there is a relation which is medium or weaker than that. Among the *activity* and *economic development* as well as *education opportunity* and *qualification* of regions there is medium level rank correlation. Less than 0.3 strength rank correlation can be detected on the basis of the order according to the other factors.. This means that different characteristics of human resources are developed in different regions. To take out a couple of examples, Bratislava's *economic development*, *activity* and *education opportunities* of its human resources are the second most developed after Prague. Its human resources' *qualification*, however, is only in the fourth place. The human resources' *qualification* of the region of Podlaskie in Poland is the second highest, but with its *economic development* it belongs to the laggards. *Economic development* and *activity* of the Czech Stredni Chechy's human resources is outstanding, but *education opportunities* of the region are bad and its human capital's *qualification* is very low. Swietokrzyskie region's inhabitants in Poland have outstanding *education opportunities* and *qualified* human resources, but its *economic development* and labour market's *activity* are low.

We can define the structure of human resource and the direction of development with the assistance of the factors, but we cannot make a general development order with its help. Human Index is suitable to compile general development rank list. My H4 hypothesis, according to which such a complex producing factor's development as human resource can be expressed with only one indicator, was proved. Human Index is exactly such an indicator, which compressed characteristics of human resource featured with 16 indexes into one single indicator.

If we compare the ranking list of regions with the created clusters, it could be stated that clusters 1 and 2 stand on the top of Human Index's ranking list as well. The reason for this is that all of the characteristics of human resource in both clusters are outstanding. The values of clusters 3 and 4, however, are mixed up. This proved that the boundary line between the two clusters are not so sharp, the groups are not so homogenous on the basis of their human development as cluster 1 or cluster 2. We cannot state that cluster 4's human resource is more developed or underdeveloped than cluster 3's, we can only say that they have different resource facilities.

After studying special literature I revealed that different indicators can be used to measure regional competitiveness: emission, emission per employee and emission per capita. The three indicators interpret the given region's growth performance in different ways. We often use emission per capita as the indicator of the region's competitiveness, because it indicates the productivity and its changes. The H5 hypothesis of my research was that the region's competitiveness is determined by the development of its human resource, that is, significant relationship can be expressed between Human Index and GDP per employee. According to my calculations there is a close linear correlation ($r > 0,8$) between the two indicators, that is 65-75 % of differences between the regions in competitiveness are determined by the differences between human development.

Because GDP per capita is the variable of the first principal component with one of the highest weight, therefore concern arouse that the principal component has a significant effect

on the indicator of competitiveness through this index. But it is not the cause of the close relationship. LENGYEL and RECHNITZER also stated (2004) that generally high correlation can be observed between emission and emission per capita, but among emission per employee and the other two indicators much lower correlations were observed. I had the same experience in my research area as well. There is weak correlation relationship between GDP per capita and GDP per employee ($r \leq 0,2$), so through the first principal component's indicator its indirect effect is very low.

The steepness of fitted regression function of the six years increased, which means that increase per unit in human development resulted in increasingly competitive growth, that is, human resource has an increasingly significant role in the formation of competitiveness. The clusters' separation can also be observed on regression points. The regions of clusters 1 and 2 are well-separated, the regions of clusters 3 and 4 are mixed as I already stated in the last chapter, by the definition of the regions' order. That is, there is no significant difference in the complex human development of the regions of clusters 3 and 4.

The results of correlation and regression calculations proved that there is close positive-trended relationship between human resource's development and one of the indicators of its competitiveness. That means, if human resource of the region is developed, its competitiveness grows. Therefore my H5 hypothesis according to which development and competitiveness of the region's human resource are closely related, that is territorial units with developed human capital achieved better results in global economic competition, is proved.

Nevertheless, human resource is a complex production factor and the regions' available resources are usually limited, it is important to know to which area's development should more attention be paid. To work out regional development strategy we have to know which area needs intervention, which development expenditures bring the maximum expected profit. I found it important to study what kind of relation exists between the different factors of human resources and the region's competitiveness. At first, bivariate linear correlation models were set up, according to which I stated that there is the closest, stronger than 0.9 relationship between GDP per employee and the principal component of economic development. It means that in the regions the growth of human resource's economic development is associated with the growth of its competitiveness. Activity, education opportunity and qualification factors are in a weaker, but medium level positive-trended relation with the indicator of GDP per employee. (Table 1.)

Table 1. Binary linear correlation coefficients

Factor	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
Education Opportunities	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

We cannot draw clear conclusions on the basis of the correlation indexes' values about the closeness of the bivariate relationship and cause and effect relations. It is also possible that correlations are only apparent, the influence of third variable(s) could strengthen or even weaken the relation between the two variables. These indirect effects can be expressed by partial correlational coefficients. Partial correlational coefficients express the closeness of the relation between a principal component and competitiveness, so that in the mean time the effect of the other three principal components is filtered out. (Table 2.) The principal

component of education opportunity and qualification itself has a really insignificant effect on the competitiveness. There is small difference between correlational and partial correlational coefficient of economic development, which means, economic development has a significant effect on competitiveness on its own. But the direction of the relationship between activity principal component and competitiveness reversed. If we filter out the effect of economic development, education opportunity and qualification, competitiveness decreases by the influence of activity's growth. The explanation to this arises by itself. The activity factor includes with a significant weight the indicators of activity rate and employment rate, whose value, if it rises so that the income generated in the economy (economic development factor) is unchanged, then this entails reduction in the competitiveness (GDP per employee). That is, the region with higher human capital produces the same income.

Table 2. Partial correlation coefficients of the Competitiveness and the Humanfactor

Year	2003	2004	2005	2006	2007	2008
Economic Development	0,938	0,930	0,925	0,926	0,946	0,934
Activity	-0,582	-0,487	-0,394	-0,276	-0,406	-0,377
Education Opportunities	0,142	0,119	-0,013	-0,108	-0,172	-0,126
Qualification	-0,166	-0,254	0,063	0,092	0,084	0,052

Source: own compilation on the basis of SPSS output tables

In the correlation analysis it is not necessary to define what I 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 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 its human potential. Therefore I find it important to stipulate that I examine the direction of the relationship how the human state of development influences the competitiveness of the region. In the calculation of the multivariate linear regression I 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 the 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. The results of regression analysis demonstrated the results of the correlation calculation. In the multivariate regression function, negative slope is typical of the relationship of activity factor and competitiveness, 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 fact, that activity factor in bivariate relationship stands in positive, in multivariate relationship in negative relationship with the index of productivity can be caused by two things. One of them is the multicollinearity between the explanatory variables. But in my model multicollinearity did not prevail. The other is the direct and indirect effects of explanatory variables on the outcome

variable (LAMPERTNÉ – PETRES – KOVÁCS, 2004). 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). I 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.

Correlation coefficient between index of competitiveness and the factor of economic development equals the sum of direct and indirect effects.

$$R = \beta_1 + \beta_2\gamma$$

Table 3. Data of Path Analysis

Year	R	Direct Effects β_1	Indirect Effects	
			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. (Table 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 the regions of the four clusters are well separated from each other. The regions of clusters 3 and 4 are not merged, so according to activity and economic development the region groups are homogenous, but in educational opportunities and in qualification they are heterogenous. 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, the East-West split is growing stronger in the region of Visegrad Country Group. (Diagram 3.)

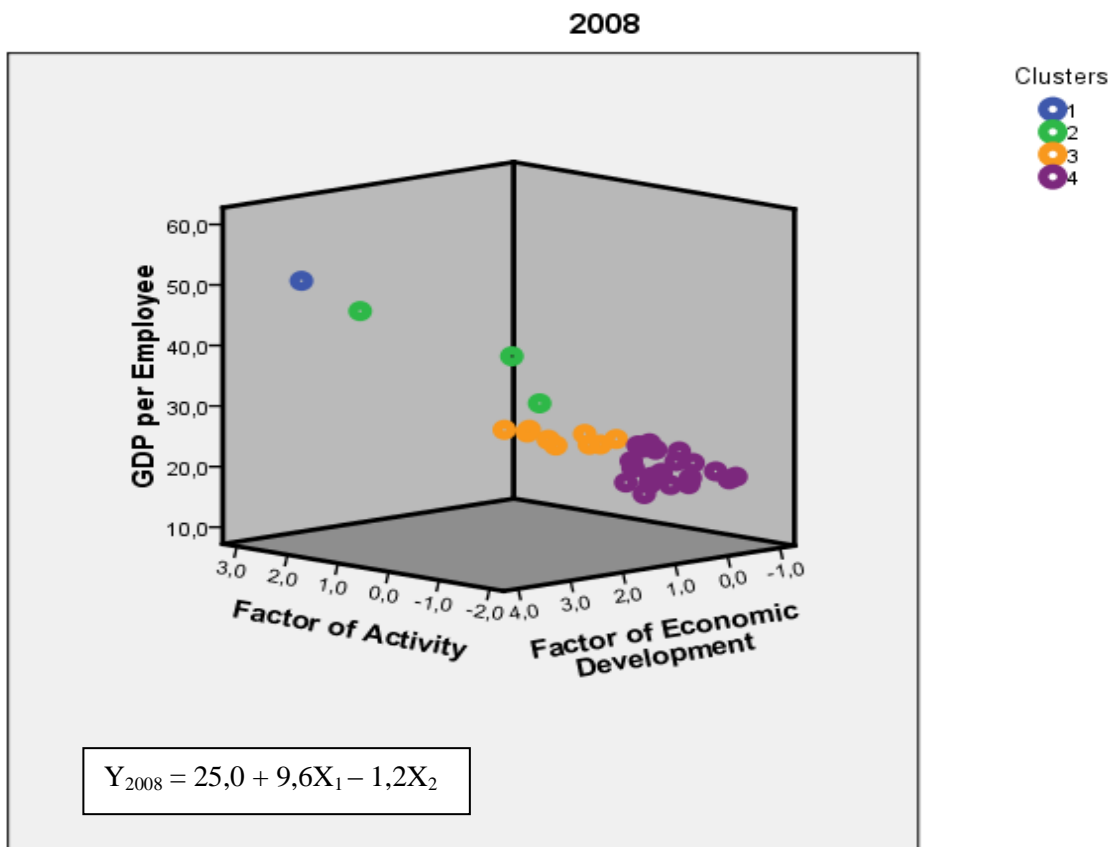
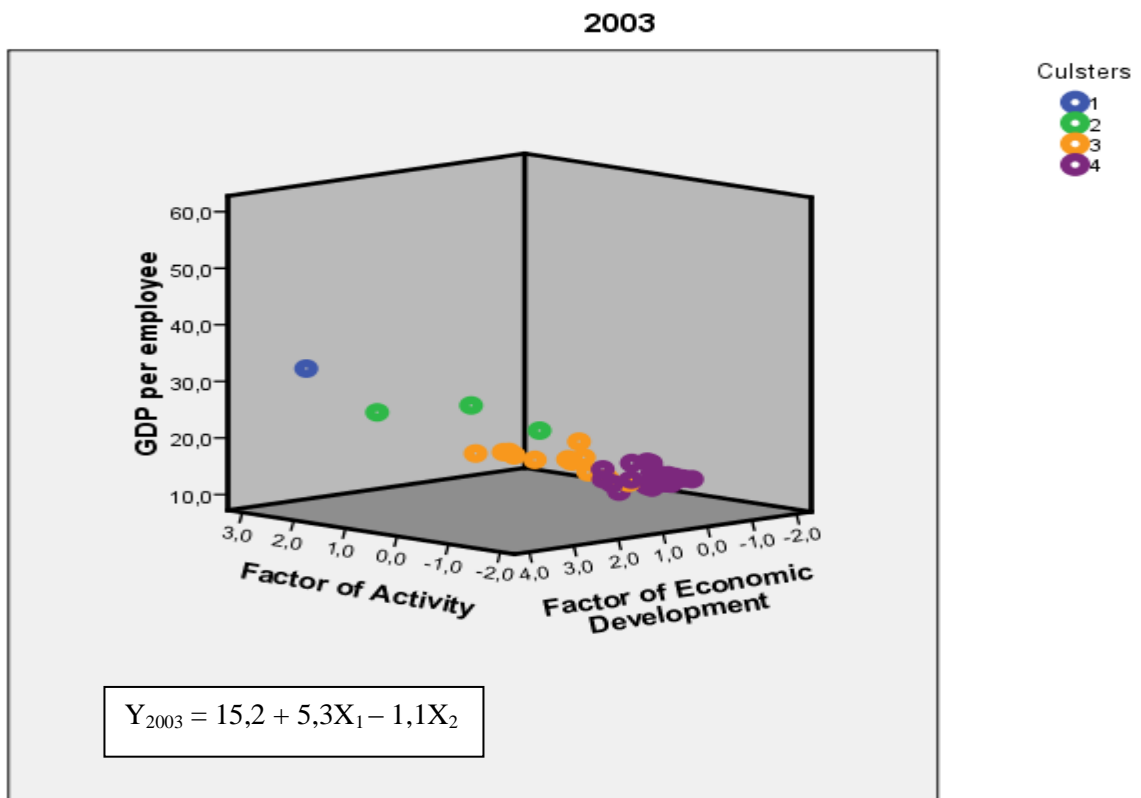


Diagram 3. Relationship between Competitiveness, Economic Development and Activity
 Source: own compilation on the basis of <http://epp.eurostat.ec>

NEW SCIENTIFIC RESULTS

My new and innovative research results can be summarized as follows:

1. Former research works considered the indicators of human development as results indicator, alternative indicator of human development, means of expressions of social welfare. I find it important to emphasize that the human resource as a factor of production is one of the basic conditions for regional competitiveness, the analyses for its development are equally important. The innovation in my research is that the analysis of human resource was carried out uniquely from this side. By studying the special literature of measuring human development I compiled an indicator system, from which - by selection of 16 indicators and applying the results of principal component analysis - I created a **complex human development index**, with the help of which a region's human resource's development and development ranking list can be defined. Through the index complex human development of regions can become comparable, and in addition it provides an opportunity to examine temporal evolution of the development. By analysis of the relationship between human development and competitiveness I stated that both in the field of the development of human resources, and in the field of competitiveness, among the studied 35 regions **weak positive regional autocorrelation** can be observed. I demonstrated that the extent of neighbourhood assimilation is so weak that it does not result in grapes-like pattern which is so typical in the regional analyses. Studying the relationship of complex human development index and GDP per employee with correlation analysis, I stated that there is a strong, positive direction relationship. By using linear regression analysis I proved the fact that as time goes by **human development has an increasingly important role in formation of regional competitiveness**.

2. Along the principal components of human development with using cluster analysis I carried out classifying of the Visegrad Fours' regions on the basis of human development, supplying new and innovative additions to the extended special literature in connection with the spatial structure of the European Union. The created four clusters determined particular types of regions according to the features of human development. With this I stated that the so established spatial structure formed a regular pattern, as a **double human-boomerang** surrounding the developed regions of Europe. The focal points of the defined inner boomerang are Prague and Bratislava, the focal points of the outer boomerang are Budapest and Warsaw. By using the four principal components created during principal component analysis, I analyzed with descriptive statistical methods the human clusters' structure of human resource in detail, I stated the strong and weak sides of human development. With this I gave the characteristics of the human-boomerang's regions. I established that the created double-boomerang's spatial structure does not mean a clear ranking list of human development, certain groups' regions are not developed or underdeveloped, but they have human resources of different composition.

3. To express regional differentiation **I used the index of logarithmic weighted coefficient of variation (LWCV) in a new way**. Dispersion of regions' income was studied not only in countries, but in the country group of V4 and also in the European Union. By illustrating the indicators expressing the studied regions' income and regional differentiation, I stated that the **Williamson-curve's drawing depends on which regional unit relation we demonstrated it in**. I established that the studied countries separately fitted in the curve's positive slope line, that is, increasing income associated with increasing, but different levels of regional differentiation. I demonstrated in the V4 country group that besides the curve's positive slope line, negative section is also outlined from the year of the countries' EU-

accession. I proved with this that the Visegrad countries' convergence efforts to the European Union led to the reduction of regional differences within the region. The slope of the curve which illustrated the European Union as a whole was, however, negative, that is, development differences among the regions decreased during the studied period. The consistent economic, social and regional cohesion policy of the European Union resulted in the reduction of regional differences.

4. In an individual way I proved with multivariate linear regression analysis that ***economic development of human resources has the most significant role in forming competitiveness***. Nevertheless, it was found that the educational opportunities and human resource's qualification have no significant impact on the competitiveness of a region. With a method called ***path analysis***, which has not been used by others, I showed that economic development of human resources takes part in forming competitiveness twofold. On the one hand, it increases directly the region's competitiveness, on the other hand through the growth of the region's activity it decreases the competitiveness by weakening the direct effect. This supported the theory that the increase in employment and activity can only increase the region's competitiveness, if it is associated with the increase in economic performance.

CONCLUSIONS AND SUGGESTIONS

1. Extension of the European Union in 2004 and 2007 laid stress on establishing economic, social and regional cohesion, „contribution” to this became a responsibility of overriding importance. By writing my dissertation, processing special literature and the results of my own study I provide useful knowledge for this task. Research up to now considered the indexes of the human development as results indicators, alternative indicator of economic development and means of expressing social welfare. It is important to emphasize that human resource as production factor is a basic factor of regional competitiveness and the study of its development is of the same importance. I find it necessary that analyses of this kind should be carried out as well and I am planning to expand my research temporally and regionally.

2. The human development index worked out during my research is suitable to measure complex development of human resource at regional level. The method applied is the principal component analysis which is not only capable of measuring one region's human resources but also provides an opportunity to define human capital's development structure, supplying by this figures for working out the trend and content of the prospective development strategies for the particular regions. In future I am planning to test the suitability of the index at small regional and settlement level, as well as in the whole European Union.

3. I suggest creating cooperational strategies between the individual regions in the field of human resource development, too. In my opinion, properly working regional relations can increase the chance of winning development sources, working out cooperational projects can contribute to improving the chances of closing up and decreasing the differentiation between regions. I specified the mutual development directions by clusters as follows:

- a) For the capitals' regions (clusters 1 and 2), extension of R + D activity being of primary importance for income production and competitiveness and further extension of innovation capacities both in the field of infrastructure and human resource. It should be an especially outstanding issue in the *„lagging behind, knowledge producing”* cluster.
- b) Improvement of the regional competitiveness can be reached by developing human capital and educational network as well as by establishing knowledge-intensive manufacture and productive investments – mainly processing industry – in the *„knowledge adapting, attractive”* cluster.
- c) In the regions of *„knowledge-drawn, closing up”* cluster conditions of labour market, activity of economy and rising employment should have priority. To complete this, establishing labour force demanding production branches and increasing the competitiveness of the agriculture and the country would be of assistance.

4. On the basis of regression analysis of relationship between complex human resource development and GDP per one employee I came to the conclusion that human factor takes an important part in forming the regions' competitiveness but the various components are not included in this activity with an equal weight. In Visegrad countries' regions one of the most important competitiveness factors is economic development of human resource. In this case I mean by economic development – beside the income and consumption of households – the proportional rate of the existing knowledge-intensive and service sectors, being suitable to

employ highly qualified labour power as well. According to my results, qualification of population and their training opportunities are not relevant to increase competitiveness on their own. Development of knowledge-economy means competitiveness advantage only in case the region's economy can ensure the existence of sectors which employ highly qualified labour power and suitable level of consumption. Otherwise the highly qualified labour power will migrate from the region. On the other hand, low consumption level does not provide the necessary sources for developing human resource. The objective of Europe 2010 for creating intelligent growth should not be treated equally for the whole Union as the regions are not of the same level of development. In V4 regions the development of human resource is the major drive the increase of which can result in increasing the labour force market activity, the improvement of educational network and qualification of human resource.

5. Regional processes and phenomena of the present are partly determined by the past. The present regional division of Visegrad-countries exists up to now due to the inherited political and economic differentiation which evolved during the history. The difference between development in the east and west, the single-pole, capital-centric economy, leading economic role of the Czech Republic and especially Prague, the backwardness of Polish and North-Eastern Hungarian regions can be traced back to historic precedents. I would consider it appropriate if the studied countries worked out a mutual cohesion policy beside their present cooperation or in the framework of it so that they could put an end to the regional inequalities and the underdeveloped regions could close up.

REFERENCES MENTIONED IN THE THESES

1. AMOS, O. M. (1988): Unbalanced regional growth and regional income inequality in the latter stage of development. „Regional Science and Urban Economics”, vol. 18., 4. sz., 549-566. o.
2. DAVIES, S.–HALLETT, M. (2002): Interactions between National and Regional Development. Hamburg Institute of Regional Economics, Hamburg, 26 p.
<http://ageconsearch.umn.edu/bitstream/26187/1/dp020207.pdf> (letöltés ideje:2011.06.30)
3. EURÓPAI BIZOTTSÁG(2010): EURÓPA2020 Az intelligens, fenntartható és inkluzív növekedés stratégiája/* COM/2010/2020 végleges */, Brüsszel, <http://eur-lex.europa.eu/>(letöltés ideje:2012.06.10.)
4. GORZELAK, G. (1996): The Regional Dimension of Transformation in Central Europe. – Regional Studies Association, London, 160 p.
5. KERTÉSZ K.(2004): A nemzeti és a regionális felzárkózás váltómozgása az EU országokban és Magyarországon, *Külgazdaság* 47. évfolyam 2. 65-76. p.
6. KISS J. P.–NÉMETH N. (2006): Fejlettség és egyenlőtlenségek: Magyarország megyéinek és kistérségeinek esete. Budapesti Munkagazdaságtani Füzetek, MTA Közgazdaságtudományi Intézete, Budapest. 40. p.
7. LAMPERTNÉ A. I. – PETRES T. – KOVÁCS P.(2004): A multikollinearitás mérése lineáris regressziós modellekben, *Dunaújvárosi Főiskola, Magyar Tudomány Napja*, ISSN 1586-8567
8. LAMPERTNÉ A. I. – TÓTH T. (2011): Regionális egyenlőtlenségek a visegrádi ország-csoportban. *Gazdaság és társadalom* 3:(2), 60-73. p.
9. LAMPERTNÉ A. I. (2009): Competitiveness of Human Capital in the countries of Visegrád, *Challenges for Analysis of the Economy, the Businesses*. International Scientific Conference, Szeged, ISBN 978-963-069-558-9, 1069-1083 p.
10. LAMPERTNÉ, A. I.(2011): Területi különbségek alakulása a visegrádi országok régióiban 1995-től 2007-ig. Budapesti Gazdasági Főiskola, Magyar Tudomány Ünnepe 2011. évi tudományos konferencia: „Útkeresés és növekedés”
11. LENGYEL I.–RECHNITZER J. (2004): Regionális gazdaságtan, Dialóg Campus Kiadó, Budapest-Pécs, 391. p.
12. MANKIW, G.–ROMER, D.–WEIL, D. N. (1990): A Contribution to the Empirics of Economic Growth. NBER Working Papers, 407-437. p.
<http://www.econ.cam.ac.uk/faculty/cavalcanti/MRW92.pdf> (letöltés ideje:2012.07.10.)
13. NEMES NAGY, J. (2005): Fordulatra várva – a regionális egyenlőtlenségek hullámai. In: Dövényi Zoltán–Schweitzer Ferenc: A földrajz dimenziói. MTA Földrajztudományi Kutatóintézet, Budapest, 141-158. p.

14. NÉMETH, N.–KISS, J. P. (2007): Megyéink és kistérségeink belső jövedelmi tagoltsága. *Területi Statisztika* 10.(47.) évf. 1. szám, 20-45. p.
15. OBÁDOVICS CS. (2004): A vidéki munkanélküliség térségi eloszlásának elemzése. Doktori (Ph.D.) értekezés, Gödöllő, 156. p.
16. RECHNITZER J.(2008): A regionális fejlődés erőforrásainak átrendeződése, új súlypont: a tudás, Lengyel I.–Lukovics M. (szerk.): *Kérdőjelek a régiók gazdasági fejlődésében*. JATEPress, Szeged, 13-25. p.
17. SAJTOS L.–MITEV A. (2007): SPSS kutatási és adatelemzési kézikönyv. Alinea Kiadó, Budapest, 402 p.
18. SOKAL, P.P.–SNEATH, P.H.(1963): *Principles of numerical taxonomy*. Freeman, SaN Francisco, London, 359 p.
19. SZÖRFI, B. (2007): *Development and regional disparities. Testing the Williamson-curve hypothesis in the European Union*. Central European University, Economic Development, Budapest. 34 p.
20. WILLIAMSON, J. G. (1965): *Regional Inequality and the Process of National Development: A Description of the Patterns,*”*Economic Development and Cultural Change*, vol. XIII, no. 4, Part II (July 1965), 1-84. p.

PUBLICATIONS RELATED TO THE TOPIC OF THE THESES

Scientific articles

Published in foreign language

1. Lampertné Akócsi I., Tóth T., Csonka T. (2012): Humans, as Factors of Competitiveness. Roczniki Ekonomii Rolnictwa I Rozwoju Obszarów Wiejskich, T. 99, z. 3, 2012. , Warsaw (2/g. melléklet)
2. Lampertné Akócsi I., Bokorné Kitanics T., Lampert L. (2013): Human Capital in the Agricultural Regions. Regional and Business Studies (2012) vol 1 no 1, 1-9, Kaposvár University, Faculty of Economic Science, Kaposvár (2/f. melléklet)
3. Lampertné Akócsi I., Bencze Sz., Tóth T.(2012): New determination of Human Development at Regional level in the Visegrád Countries. Selye e-studies, Komárno, <http://selyeuni.sk/gtk/e-studies/en.html?start=5> (2/a. melléklet)

Published in Hungarian

1. Lampertné Akócsi I., Tóth T.(2011): Regionális egyenlőtlenségek a visegrádi ország-csoportban. Gazdaság és társadalom 3:(2), 60-73. p. (2/c. melléklet)
2. Lampertné Akócsi I.(2010): A humántőke versenyképessége a visegrádi ország-csoport régióiban, Területi Statisztika, 13.(50.) évf. 6. szám, 2010. november, ISSN 0018-7828, 659-673. p.
<http://www.ksh.hu/docs/hun/xftp/terstat/2010/06/lampert.pdf>
(2/e.melléklet)

Presentations given at scientific conferences and published in conference manuals

Published in foreign language

1. Goda P.-Lampertné Akócsi I-Péli L.- Prohászka V.- Tóth T. (2011):The Evaluation Success Of The Cohesion Funds In The Visegrad Group Countries With The Assistance Of The New Modified Human Development Index. WHAT FUTURE FOR COHESION POLICY? AN ACADEMIC AND POLICY DEBATE, BLED, SLOVENIA
2. Tóth T.-Goda P.-Lampertné Akócsi I. (2009): Theoretically Reachable Fortunes in the Spatial and Regional Development. 10th International Scientific Conference,UM Millennium Development Goals: Challenges and Perspectives Delhi-Gödöllő, 2009. ISBN 978-963-269-102-2

Published in Hungarian

1. Lampertné Akócsi I.(2011): Területi különbségek alakulása a visegrádi országok régióiban 1995-től 2007-ig. Budapesti Gazdasági Főiskola, Magyar Tudomány Ünnepe 2011. évi tudományos konferencia: „Útkeresés és növekedés”
2. Lampertné Akócsi I.(2011): Regionális egyenlőtlenségek a Visegrádi országcsoportban. A Dunaújvárosi Főiskola 2011. november 7-11. között „Összhang. Tudomány a gazdaságban és a társadalomban” c. konferenciáján

3. Lampertné Akócsi I.(2010): Az Emberi Erőforrás menedzsment feladata válság idején (A humán erőforrás szerepe a vállalati versenyképesség megőrzésében) „Fenntartható versenyképesség válság idején” XII. Nemzetközi Tudományos Napok, Gyöngyös, ISBN 978-963-87831-2-7
4. Lampertné Akócsi I.(2009): A humántőke szerepe a visegrádi régiók versenyképességében. Mór, IV. KHEOPS Tudományos Konferencia, ISBN 978-963-87831-2-7
http://www.kheops-konferencia.hu/upload/file/tanulmanykotet_2009.pdf
5. Lampertné Akócsi I.(2009): Humántőke versenyképessége a visegrádi országokban, Dunaújvárosi Főiskola a Magyar Tudomány Napja és a Kreativitás és Innováció Európai Év, ISSN 1586-8567
6. Lampertné Akócsi I. (2008): Versenyképes oktatás, oktatás a versenyképességért. Károly Róbert Főiskola, Gyöngyös, XI. Nemzetközi Tudományos Napok, ISBN 978-963-87831-2-7
7. Lampertné Akócsi I.(2008): Humántőke versenyképességének mérési problémái. BGF, Kultúraközi párbeszéd az üzleti világban, Közgazdaság és módszertan szekció, Budapest
8. Lampertné Akócsi I. (2008): Mit ér a humántőke, ha magyar? Dunaújvárosi Főiskola Magyar Tudomány Napja, Interdiszciplináris Nemzetközi Tudományos Konferencia, Területfejlesztési Szekció, ISSN 1586-8567
9. Horváthné Fábrián M.-Lampertné Akócsi I. (2005): A „fakanál és az esti mese” hozzájárulása a társadalmi-gazdasági fejlődéshez /avagy a háztartási munka és a gyermeknevelés értékének meghatározása a GPI mutatóban./ Magyar Tudomány napja, Dunaújvárosi Főiskola, ISSN 1586-8567
10. Lampertné Akócsi I.- Petres T.- Kovács P.(2004): A multikollinearitás mérése lineáris regressziós modellekben, Dunaújvárosi Főiskola, Magyar Tudomány Napja, ISSN 1586-8567

Books and parts of books

Published in foreign language

1. Lampertné Akócsi I.(2012): Knowledge Based Economy in the Regions of Visegrad Countries., III. Danube-region Cohesion, International Scientific Conference, Szabadka, Megjelenés alatt.
2. Lampertné Akócsi I.(2009): Competitiveness of Human Capital in the countries of Visegrád, Challenges for Analysis of the Economy, the Businesses. International Scientific Conference, Szeged, ISBN 978-963-069-558-9, 1069-1083 p.
<http://www.e-doc.hu/index.php?eb=26> (2/d.melléklet)

Published in Hungarian

1. Tóth T. - Lampertné Akócsi I. (2009): A humán tőke és az infrastruktúra vizsgálata különös tekintettel szlovák és magyar határ menti területekre Cégek célkeresztben. Vállalkozások a Szlovák-Magyar határ mentén, Komárom, 203-216 p. <http://mek.oszk.hu/09800/09863/09863.pdf> (2/b.melléklet)
2. Lampertné Akócsi I.(2010): Szlovák régiók versenyképessége, Danube Area Cohesion essays based on II. Interregional International Scientific Conference, Szabadka, ISBN 978-86-85409-57-8, 263-272 p.
3. Lampertné Akócsi I., Raffay Z., Veres L. (2012): Légi közlekedés. In: Veres L. (et al): Turizmus és közlekedés., Pécsi Tudományegyetem, ISBN: 978-963-642-434-3 (0,5ív)<http://www.eturizmus.pte.hu/szakmai-anyagok/Turizmus%20%C3%A9s%20k%C3%B6zleked%C3%A9s/book.html>

Lecture Notes and parts of Lecture Notes

Published in Hungarian

1. Lampertné Akócsi I.(2005): Gazdaságstatisztika tankönyv, DF. Kiadói Hivatal, Dunaújváros, 124 p.
2. Lampertné Akócsi I.(2005): Feladatgyűjtemény gazdaságstatisztikából, DF. Kiadói Hivatal, Dunaújváros, 73 p.
3. Lampertné Akócsi I.-Budaházy Gy.(2004): Statisztika szigorlati példák, DF. Kiadói Hivatal, Dunaújváros, 30 p.
4. Lampertné Akócsi I. (2003): Gazdaságstatisztika példatár, DF. Kiadói Hivatal, Dunaújváros, 20 p.

Report of Research

1. Lampertné Akócsi I.(2006): Út a monokultúrás gazdaságtól a logisztikai központtá válásig (Dunaújváros gazdasági szerkezetének elemzése), Területfejlesztési kutatócsoport, Dunaújváros

Other Publications

Citations:

1. Havellant Orsolya (2007): Dunaújváros gazdasági és társadalmi folyamatai 1990 után, Doktori (PhD) értekezés 27. p.
2. Urbánné Malomsoki Mónika - Széles Ivett - Péli László (2010): Budapest közeli megye, vagy periféria? Nógrád megye területi, közlekedési és társadalmi adottságainak elemzése, “Szellemi tőke mint versenyelőny” Tudományos konferencia, Komárom, 791. p.