The Education of Inhabitants in Czech Regions as a Factor Signifying Their Competitiveness

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Abstract

The education of inhabitants is currently considered a factor signifying the level of competitiveness at both the national and regional levels. This paper is aimed at analyzing education levels and development in different regions of the Czech Republic from 1993-2007. The author compares statistical education data with selected basic economic data at the regional level in the Czech Republic and researches various interconnections to verify whether education is a factor of regional competitiveness in the Czech Republic.

Key words: education, region, regional competitiveness.

JEL Classification: I21

Introduction

Today, perhaps nobody doubts that education and qualified inhabitants, able and willing to learn and develop their knowledge and skills, affect the economic development of the area in which they live and work. [1] The achieved level of education in general, and especially tertiary education, affects a region's competitiveness. The question is the degree of this factor's impact because the competitiveness and development of regions is also affected by other factors that might play even more important roles in a given territory, a particular situation or at a given time.

The aim of this paper[2] is either to confirm or to disprove the hypothesis that the achieved level of education in inhabitants is a factor affecting the development and competitiveness of regions in today's Czech Republic. The hypothesis will be verified by selected statistical indicators available at the regional level.

Theoretical grounds

The importance of human resources is usually declaratory in regional development theories. Nevertheless, we can identify certain theoretical approaches dealing with the role of human resources and education and training within regional development concepts.

[1] In addition to infrastructure, the ability to innovate and an effective institutional and administrative framework, human resources and their capital are considered important factors of competitiveness (as specifically noted in the European Commission's third report on social and economic cohesion).

[2] This paper was made within the research project GA ČR 402/09/0179

Theories dealing with human resources as a basic factor of a region's development are usually based on empirical research carried out in different regions and strive to generalize collected knowledge and verify it through case studies, as mentioned by Lundvall (2002), Neave (1979) and the OECD publication (2005). According to Blažek (2008), the most recent regional development theory is the theory of learning regions that connect the knowledge of evolutionary and institutional economies with regional development. Blažek says that "the sources of competitiveness in the current world are knowledge, the ability to learn and the formation of a cultural climate that helps create innovation" (Blažek, 2008:167).

In the relationship between regional development and a region's environment, the role of tertiary education is often emphasized, especially the importance of colleges and universities as educational centres that help to create and disseminate innovation and the region's socio-economic development, as stated by Lundvall (2002). Empirical research shows that the situation is rather more complicated where the links between tertiary educational institutions and a region's socio-economic life, the orientation of colleges and universities and their possibilities to participate in development activities play a major role.[3]

Contrary to Neave (1979), an advanced educational system is an accompanying phenomenon of modern regional economies. Nevertheless, the studies that have been conducted show that higher education (i.e. higher secondary and tertiary[4]) serves as a stimulus and a local economic catalyst; in other words, a competitiveness factor under certain economic, social, organizational and other conditions, especially in growth regions. The idea that the actual existence of a university or tertiary educated labour without further continuity might become a catalyst for regional development is rather illusory. From the perspective of a region's development and competitiveness, the necessity of continual adaptation of the formal educational system to ever changing conditions of a region's socio-economic status has to be emphasized. This process has to be implemented while maintaining awareness of the system's inertia and in compliance with long-term socio-economic trends. The development of the educational system should be directly related to consensually adopted development priorities so that it generates, at least to a certain degree, labour employable in the region whose knowledge and skills will contribute to the region's competitiveness.

The importance of employees' qualifications for regional development and competitiveness is also emphasized in OECD publications. The publication entitled *Building Competitive Regions, Strategies and Governance* (OECD, 2005), dealing mainly with competitiveness at the regional level, uses the term "competitive region". The role of employee education and qualifications is confirmed by examples of successful regions of OECD member states as one of the important factors conditioning the development of innovation. This is one of the fundamental indicators of a regions' competitiveness. These examples also stress relationships and links between tertiary education institutions and the business sector that stimulate the further development and dissemination of innovation and therefore can significantly impact a region's competitiveness.

Links between education, research and entrepreneurship play an important role since many tertiary education institutions try to reflect the needs of their regions and accommodate the business sector (OECD, 2005: 40-45), as seen from the examples of universities both in the

[3] The issue of the relationship between tertiary educational institutions and a region's development has also been covered by other authors, e.g. Robson B., Drake K., Deus I.: Higher Education and Regions or Saaravirta T., Consoli D.: Regional Development, Education and Innovation: A Case Study on University Graduates in Finland

[4] Higher education in the Czech Republic includes secondary, higher technical and follow-up schools and college and universities.

USA and in Europe. Educational institutions can work as providers of technological services and, in conjunction with local authorities, they can engage in the implementation of developmental activities, work in branch boards and committees, and organize seminars and informational meetings and help, among other things, the development of local networks. (OECD, 2005: 50)

Regional competitiveness is also dealt with by the ESPON[5] project, which was launched in order to support the development of policies and in order to create a European scientific community for territorial development. Its aim is to increase the general level of knowledge of territorial structures, trends and impacts of policies in the expanding European Union. Here also the achieved level of education, especially in young people, is an indicator and possible source of regional competitiveness where the percentage of tertiary educated is monitored. (ESPON, 2006)

Wokoun (2009), who deals with the situation in the Czech Republic, also places human resources, characterized mainly by the achieved level of education, among the basic factors of regional development and regional competitiveness. Wokoun (2009) defines the factors representing the development potential of the Czech Republic's regions as follows:

- Natural resources and natural environment as long-term determinants of regional development;
- Tangible factors describing production potential and infrastructure;
- Intangible factors, namely innovation and the ability to create and spread it, the availability and effective use of information and communication technologies (ICT), environmental sustainability, the institutional environment;
- Human resources with a relevant level of skills and professional education.

We can say that the issue of theoretical and methodological questions directly focused on the relationship between the level of education and the educational structure of inhabitants and a region's socio-economic development is not currently verified. Scientific and specialized literature usually emphasize the achieved level of education and qualification as the strongest human resources in a territory; emphasis is placed on the further development of knowledge and skills according to labour market's needs and a territory's socio-economic activities and on the ability and willingness to engage in further educational and professional formation. At the same time, the role of tertiary educational institutions that may (but may not) play an important role in the development and competitiveness of the region is stressed. It is also important to note whether such institutions are able to establish relevant functional relationships with both the business, public and non-profit sectors in the given territory.

The level of education of inhabitants in the Czech Republic

The educational structure of the Czech Republic's population has significantly changed since 1989. The expansion of options to receive and complete one's secondary education in both public and private schools has played a major role in increasing the achieved level of education.

As far as tertiary education is concerned, universities have become more "open" and have expanded the number of fields of studies. As a result, the number of students substantially

[5] ESPON = European Spatial Planning Observation Network

increased in the 1990s. New universities emerged, both public and private. New higher technical schools also added to the number of opportunities to obtain tertiary education.

It is important to recognize that the demand for education in the 1990s was as high as the statistically strong 1970s. In addition, some people again picked up their education to complete the studies they were deprived of for various reasons before 1989. The increase in students has continued in the new millennium. While in 2001, there were 238,578 university students of all levels in the Czech Republic according to the Czech Statistical Office (CSO), in 2008 it was as many as 319,615[6]. According to data provided by the Ministry of Education, Youth and Sports (MEYS), there are 26 public, 46 private and 2 state universities in the Czech Republic[7]. Even though tertiary education institutions continue to be concentrated in traditional centres, we have seen a significant development of regional universities and tertiary education institutions available in all Czech regions. The question that has not been discussed too much is the quality of provided education.

Changes in the population's educational structure were also caused by the switch of generations. As in other countries, older generations in the Czech Republic tend to have a lower achieved level of education.

The following chart shows the development of the educational structure of the Czech Republic's population over 15 from 1993-2007.

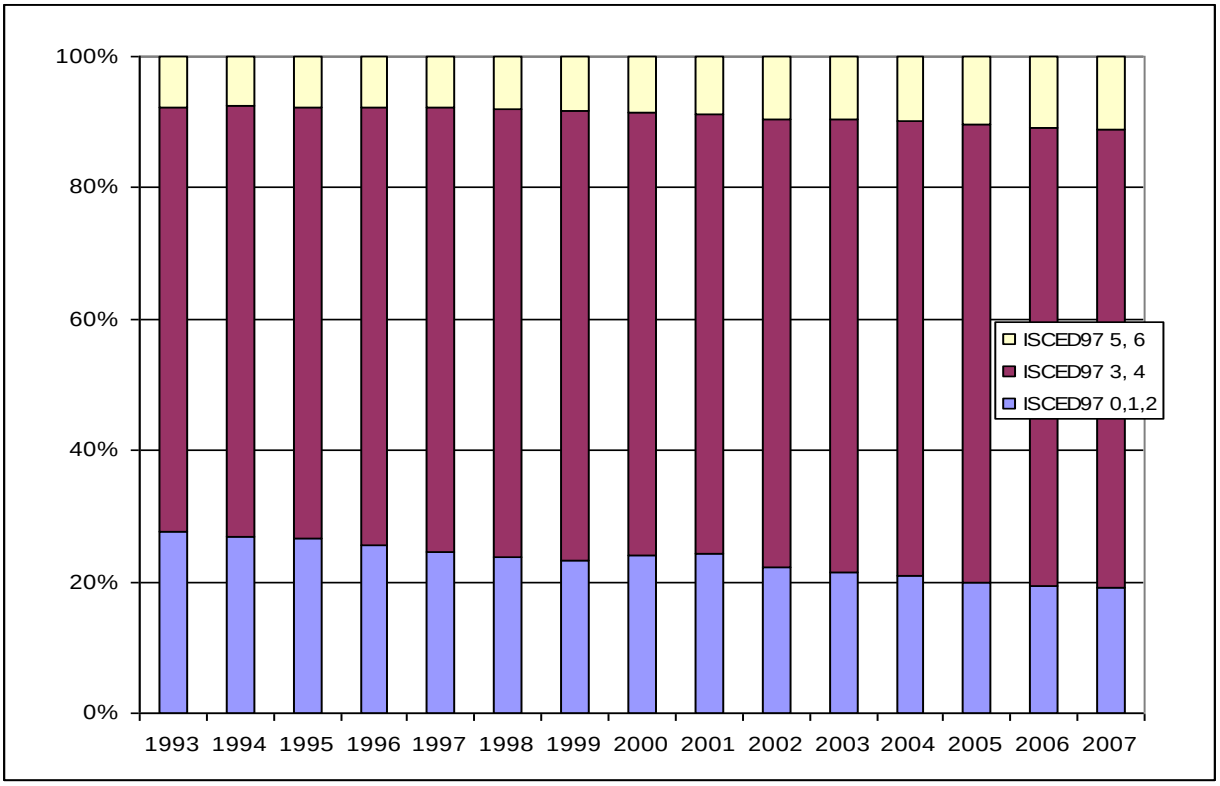

Chart 1: The educational structure of the Czech Republic´s population aged over 15, 1993-2007

Source: The author's chart is based on CSO data (http://www.czso.cz/csu/2009edicniplan.nsf/p/3103-09, 13 September 2009)

[6] CSO, on-line: http://www.czso.cz/csu/2009edicniplan.nsf/p/3301-09, 17 August 2009
[7] MEYS, on-line http://www.msmt.cz/vzdelavani/prehled-vysokych-skol, 17 September 2009

As seen in the chart, the number of people with the lowest achieved level of education in the Czech population has been decreasing (ISCED 0,1,2) and slowly but surely, the percentage of people who have achieved tertiary education (i.e. ISCED 5,6) has been increasing.

If we look at the situation in the Czech Republic in 2007, we find that the situation here is similar to other countries. The population with the highest achieved level of education is mainly concentrated in Prague. The South Moravia region also has a significant share of tertiary educated people because of its regional city of Brno, the second most important socio-economic centre in the Czech Republic with a wide range of educational institutions. The Moravia-Silesia region comes in third with the third largest socio-economic centre in the Czech Republic, the regional city of Ostrava. The position of the Central Bohemian region is strongly affected by Prague. It is necessary to point out that the above-mentioned regions are also the heaviest populated. The Olomouc region has a relatively high percentage of tertiary educated population with respect to its number of inhabitants. Its centre, Olomouc, is one of the most traditional university cities in the Czech Republic.

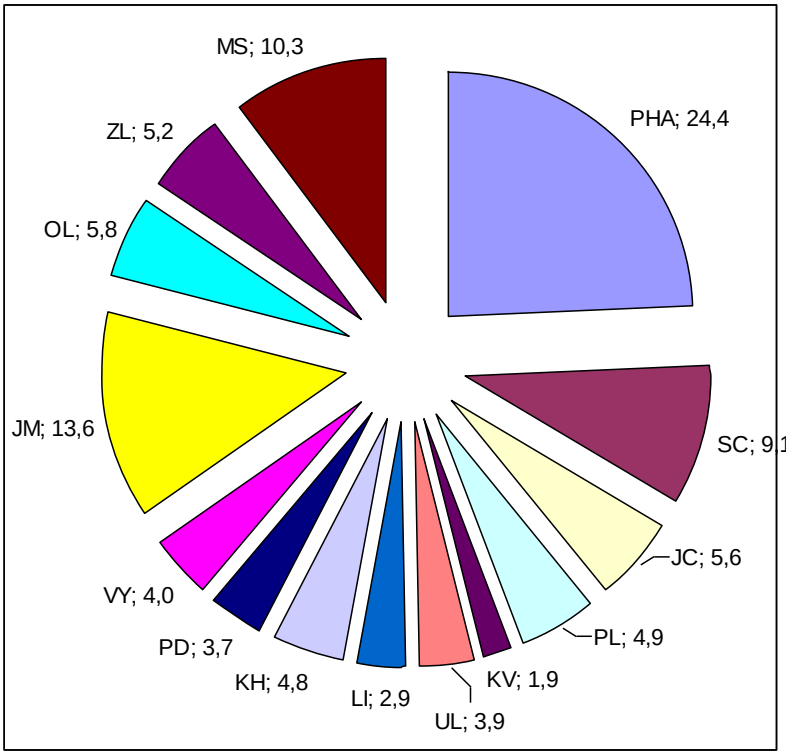

Chart 2: The regional structure of tertiary educated inhabitants in the Czech Republic (ISCED 5,6,), 2007, CR =100

Source: The author's chart is based on CSO data (http://www.czso.cz/csu/2009edicniplan.nsf/p/3103-09, 13 September 2009)

Note.: Regions: PHA – Prague, SC – Central Bohemia, JC – South Bohemia, PL – Plzeň, KV – Karlovy Vary, UL – Ústí nad Labem, LI – Liberec, KH – Hradec Králové, PD – Pardubice, VY – Vysočina, JM – South Moravia, OL – Olomouc, ZL – Zlín, MS – Moravia Silesia

The following chart shows changes in the educational structure between 1993 and 2007, using the example of tertiary educated inhabitants in the Czech Republic (ISCED 5,6):

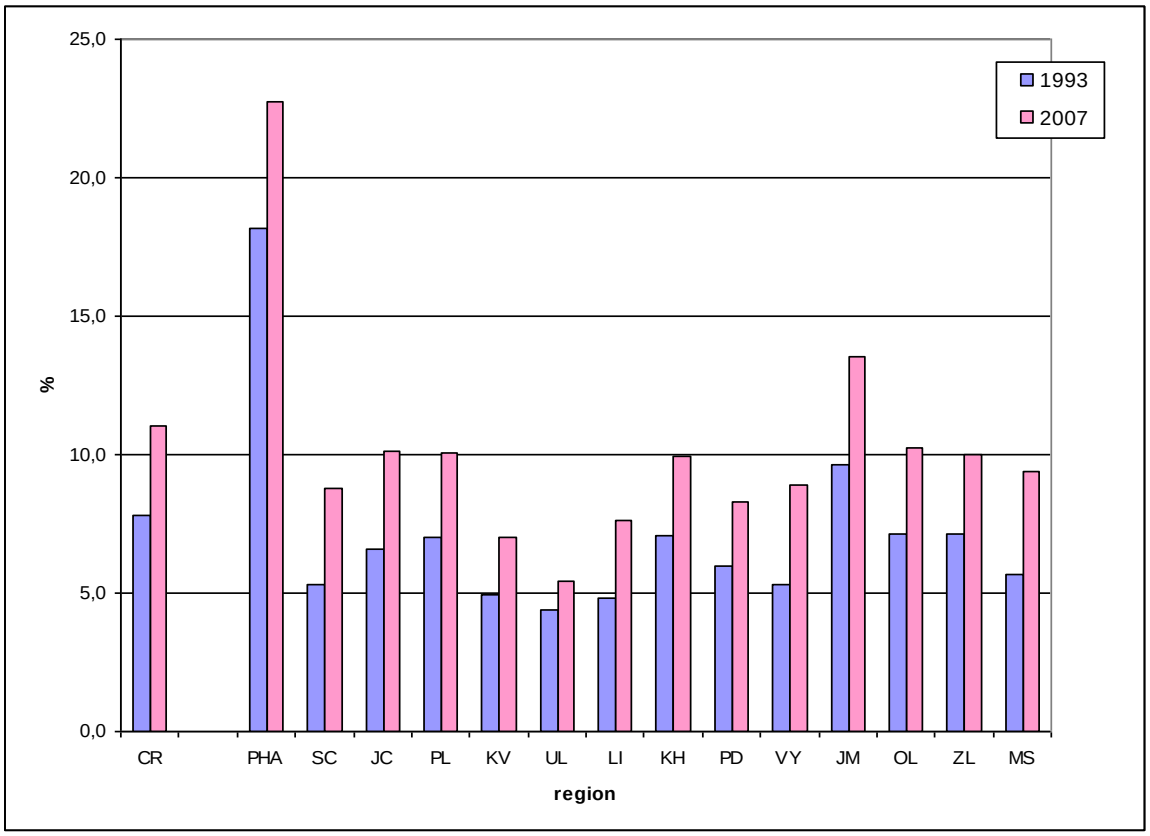

Chart 3: The percentage of tertiary educated (ISCED97 5,6) inhabitants in regions of the Czech Republic, 1993 and 2007
Source: The author's chart is based on CSO data (http://www.czso.cz/csu/2009edicniplan.nsf/p/3103-09, 13 September 2009)

Throughout the monitored period, the educational structure of the Czech Republic's population has changed; the share of tertiary educated inhabitants has increased. Nevertheless, the increase is regionally differentiated. Traditionally, the highest share of tertiary educated people has by far been in Prague, followed by the South Moravian region, whose educational structure is significantly affected by the inhabitants of Brno, the second largest socio-economic centre in the Czech Republic. All other regions are below the nationwide share of tertiary educated. In 2007, the author performed the following categorization of regions based on the educational structure of inhabitants (Kouřilová, 2007: 132) that can still be applied today. The regions are divided into 5 groups:

1) Regions with the highest achieved level of education – Prague. This category includes the capital since its position has been dominant in terms of university and tertiary educated people.

2) Regions with a high achieved level of education – South Moravia. This category also includes only one region and is strongly affected by the fact that the regional city is the second most important educational centre in the Czech Republic.

3) Regions with an average or slightly below average achieved level of education – South Bohemia, Plzeň, Hradec Králové, Olomouc, Zlín and Moravia Silesia. Cities in these regions have traditionally been educational centres, seats of universities and higher technical educational institutions.

4) Regions with a below average achieved level of education – Central Bohemia, Liberec, Pardubice, Vysočina.

5) Regions with a low achieved level of education – Karlovy Vary and Ústí nad Labem. In spite of the existence of tertiary educational institutions, the educational structure of both regions, especially the Ústí nad Labem Region, has remained the worst.

If we compare the above classifications with the typology of the Czech Republic's regions pursuant to Wokoun (2008), we discover both links and contradictions between the degree of economic development and the educational structure of the population. Wokoun ((2008: 384-385) based his typology on an evaluation of economic performance, long-term socio-economic development, the degree of concentration of activities and the geographic location and identifies:

1. Fast developing regions: Prague;
2. Developing regions: Central Bohemia, Plzeň and South Moravia;
3. Regions with slow growth dynamics: South Bohemia, Hradec Králové, Pardubice, Zlín and Liberec;
4. Regions lagging behind: Vysočina, Karlovy Vary;
5. Declining regions: Olomouc, Moravia Silesia and Ústí nad Labem.

In this relationship, it is necessary to point out significant internal disparities in different regions where the concentration of activities in cities (especially regional cities) as growth and development centres results in a widening of the differences that impact the development and competitiveness of the region as a whole (Wokoun, 2008).

Both regional classifications agree on Prague and South Moravia on the one hand and Ústí nad Labem on the other. The classification of other regions is different, which can mean that other factors such as geographical locations or infrastructure play a more significant development role. In some regions, such as the Olomouc and Moravia Silesia Regions, the potential of educated labour is probably insufficiently used.

A comparison of the achieved levels of education with selected statistical data

If we want to look at the relationship between the achieved level of education of Czech inhabitants and the level of their socio-economic development, then we can use indicators available at the regional level. These mainly include GDP, commonly used in evaluating the socio-economic level of regions in the European Union. For assessment of investment the author used the gross fixed capital formation and cumulated level of direct foreign investment indicators. The innovative capability of businesses and the granting of patents are important for regional competitiveness. Both these indicators should be related to the achieved level of education since the capability of innovation is often related to the ability to learn, be open to new ideas and new solutions. Similarly to other European Union countries, the higher the achieved level of education, the more likely it is that an employee in the Czech Republic will engage in further education and people usually follow up in the same field of study as was their original education (ÚIV, 2006). Regardless, relevant time line data on further education of Czech inhabitants are not available and therefore, the author is using data about the tertiary educated population.

The educational structure of the Czech Republic is also affected by migration. Generally, young, active and educated people tend to migrate more often.

Table 1: Migration balance of the Czech Republic, 5-year average, 2003-2007

Region	Migration balance - 2003-2007 average
Prague	10 959
Central Bohemia	14 974
South Bohemia	1 767
Plzeň	2 799
Karlovy Vary	556
Ústí nad Labem	2 349
Liberec	1 193
Hradec Králové	1 044
Pardubice	1 112
Vysočina	682
South Moravia	3 035
Olomouc	333
Zlín	66
Moravia Silesia	-1 005

Source: The author's table based on CSO data available at: http://www.czso.cz/csu/2008edicniplan.nsf /t/24003E060C/$File/4032080904.pdf (5 September 2009)

As confirmed by the data in Table 1 (the five-year average is provided in order to eliminate annual variations in the regional migration balance), people within the Czech Republic migrate mainly to Prague and Central Bohemia, followed by South Moravia, which substantially lags behind and whose migration balance is significantly influenced by Brno and its surroundings, the second most important socio-economic centre in the Czech Republic. The Moravia Silesia region has been losing population due to migration. The region is one of the structurally affected regions of the Czech Republic, as is the Ústí nad Labem region, which gains population through migration. (As seen in the data for 2002-2004[8], with the exception of Prague and Central Bohemia, all other regions in the group have decreased the number of tertiary educated people. The migration increase in the Ústí nad Labem region was strongest among people with primary education and people without education during the concerned period). Because the Czech Statistical Office (CZSO) does not publish data on the education levels of those migrating, the importance of migration with respect to its impact on the educational structure of regional inhabitants cannot be assessed.

Regional unemployment can also be an important factor for migration. According to the CZSO, the unemployment rate and the share of tertiary educated people in the Czech Republic is provided in the table below. In order to eliminate annual deviations, the five-year average for 2003-2007 is provided.

Table 2: The unemployment rate and the share of tertiary educated inhabitants in regions of the Czech Republic, 2003-2007 average

	2003-2007 average	
Region	Unemployment rate	Share of tertiary educated people
Prague	3.4	22.4
Central Bohemia	4.7	8.1
South Bohemia	4.9	9.2
Plzeň	4.9	8.9
Karlovy Vary	9.0	6.7

[8] Data were published in regions´ statistical yearbooks for 2002-2004.

Ústí nad Labem	13.1	5.6
Liberec	6.5	7.4
Hradec Králové	5.4	9.1
Pardubice	6.0	8.5
Vysočina	5.8	8.1
South Moravia	7.6	12.6
Olomouc	9.2	9.3
Zlín	7.4	9.0
Moravia Silesia	12.7	8.6
Czech Republic	7.3	10.4

Source: The author's table based on CSO data available at http://www.czso.cz/csu/2009edicniplan.nsf/p/3103-09, 20 September 2009

The table confirms the indirect proportion among these indicators in Czech regions – the unemployment rate falls with a higher level of education In Moravian regions (South Moravia, Olomouc, Zlín and Moravia Silesia) the situation is different because there is a above-average unemployment rate in spite of there is a higher level of tertiary educated population in comparison with Czech regions. Generally, for all regions, correlation is not confirmed[9].

GDP and the achieved level of education

Provided that the theory that education and qualification of human resources are a pre-requisite for competitiveness and development of regions is valid, then we should also be able to deduce that if the achieved level of education grows, it should be, at least partially, reflected in GDP growth.

The following chart shows five-year average values of regional GPD per capita (in %, CR=100) and the share of tertiary educated population in 2003-2007.

[9] Under Wilcoxon test: by p=0,05, T=30,05 > $T_{0,05}$=11, but Spearman coefficient: by p=0,05 R=0,1913 < $r_{0,05}$=0,5324

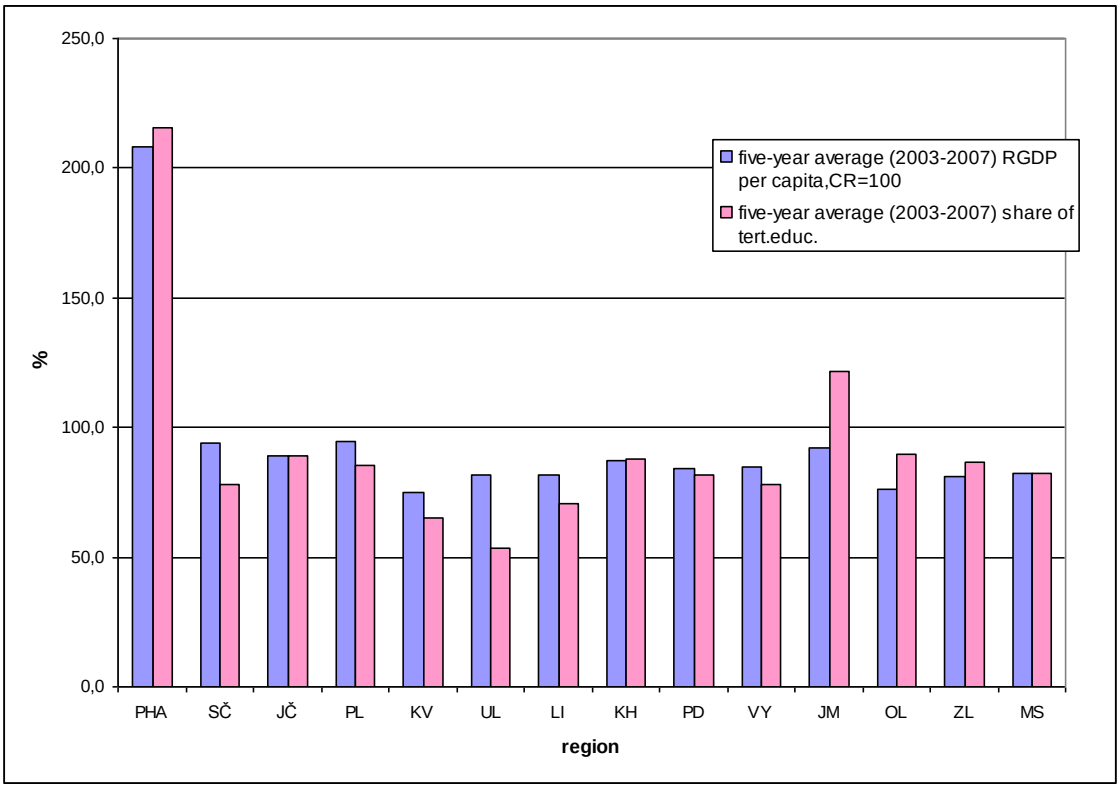

Chart 4: Regional GDP per capita and the share of tertiary educated people in regions of the Czech Republic, 2003-2007 five-year average
Source: The author's chart based on CSO data available at http://www.czso.cz/csu/2009edicniplan.nsf/p/3103-09 a http://www.czso.cz/csu/2008edicniplan.nsf/publ/1371-08-2007, 14 September 2009

The chart shows that regional GDP lags somewhat behind the share of tertiary educated people, especially in Moravian regions, i.e. South Moravia, Olomouc and Zlín, but also in Prague. To simplify, this might mean, among other things that the potential of tertiary educated people is not fully used in those regions and that there are certain competitive advantages, especially for more sophisticated activities. Three regions show an identical value of the indicators (South Bohemia, Moravia Silesia and Hradec Králové); all other regions show a higher GDP value which, if viewed through the same logic, might mean a deficit in tertiary educated and an obstacle for further development of activities with an added value in the future. There is not a direct correlation between the indicators[10].

Another view of the relationship between the achieved level of education and GDP can be seen in a comparison of growth rates of both indicators between 1993 and 2007, as show in the below chart.

[10] Under Wilcoxon test: by p=0,05, T=42,5 > $T_{0,05}$=17, but Spearman coefficient: by p=0,05 R=0,36723 < $r_{0,05}$=0,5324

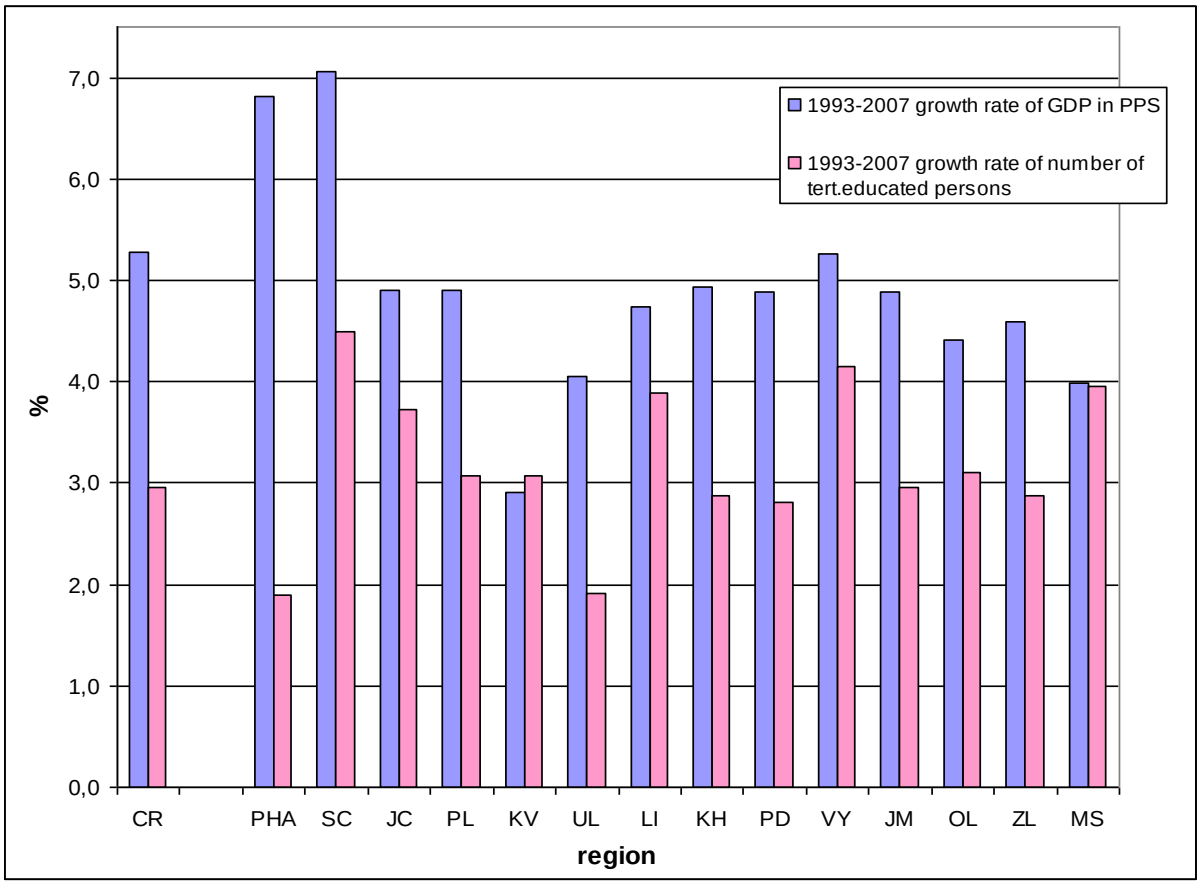

Chart 5: The GDP growth rate in PPS and the growth rate of the number of tertiary educated people (over 15) in regions of the Czech Republic in 1993-2007
Source: The author's chart based on CSO data (http://www.czso.cz/csu/2009edicniplan.nsf/p/3103-09, 13 September 2009, http://www.czso.cz/csu/2002edicniplan.nsf/publ/1371-02-za_rok_2001, 14 September 2009, http://www.czso.cz/csu/2008edicniplan.nsf/publ/1371-08-2007, 14 September 2009)

The chart shows that if we compare the GDP growth rate and the growth rate of the number of tertiary educated inhabitants in different regions with the national average, the regions can be divided into four groups:

1) Regions with both indicators above the national average: Central Bohemia and Vysočina, the GDP growth rate of the latter is at the national value;
2) Regions with an above average GDP growth rate and a below average growth rate of the number of tertiary educated: Praha;
3) Regions with a below average GDP growth rate and an above average growth rate of the number of tertiary educated: South Bohemia, Plzeň, Karlovy Vary, Liberec, Olomouc and Moravia Silesia. This group also includes South Moravia, where the growth rate of the number of tertiary educated people is equal to the national average;
4) Regions with both indicators below the national average: Ústí nad Labem, Hradec Králové and Zlín.

None of the above groups can be definitely or uniformly characterized. Regions represented in the above groups find themselves in different current and initial situations that are reflected

both in the rate of GDP growth and in the number of tertiary educated inhabitants. It is obvious that those regions that show relatively high initial values of tertiary educated within the Czech Republic in 1993 experienced a slower growth in tertiary educated people (Prague, South Moravia). A special case is the Ústí nad Labem region, whose growth rate of the number of tertiary educated people, in spite of a low initial 1993 level, has been the lowest throughout the entire concerned period and over the long run. This region has the lowest share of tertiary educated people. No relationship can be found between the indicators[11].

Education and investment

Regional competitiveness is affected by investors who decide on which investments to make based on different factors. One factor is, or might be, how qualified the people in a given territory are. The role of education in the Czech Republic can be tracked via the relationship between the achieved level of education in the population and either the gross fixed capital formation (GFCF) or foreign direct investment (FDI).

Education and gross fixed capital formation

If we compare the growth rate of gross fixed capital in 1996-2007[12] and the growth rate of the number of tertiary educated people, we find that both indicators grew, but there are significant regional differences as seen the following chart:

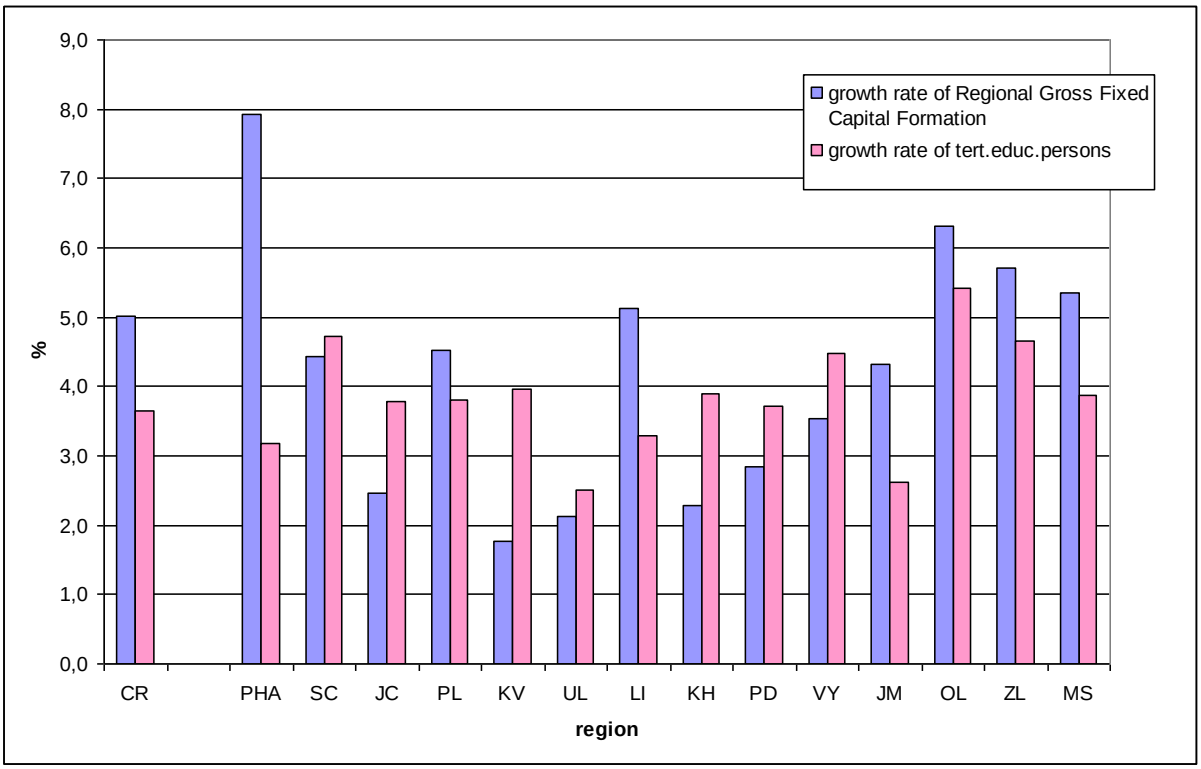

Chart 6: The growth rate of the gross fixed capital formation and the number of tertiary educated people in regions of the Czech Republic between 1996 and 2007
Source: The author's chart based on CSO data (http://www.czso.cz/csu/2009edicniplan.nsf/p/3103-09, 13 September 2009,

[11] Under Wilcoxon test: by p=0,05, T=29 > $T_{0,05}$=14, but Spearman coefficient: by p=0,05 R=-0,05102 < $r_{0,05}$=0,5324
[12] This period has been chosen because of the availability of relevant data.

http://www.czso.cz/csu/2002edicniplan.nsf/publ/1371-02-za_rok_2001, 14 September 2009, http://www.czso.cz/csu/2008edicniplan.nsf/publ/1371-08-2007, 14 September 2009)

Prague had the highest growth rate of gross fixed capital from 1996-2007, with Olomouc, Zlín, Moravia Silesia and Liberec lagging behind. The lowest values were identified in Karlovy Vary, Ústí nad Labem and Hradec Králové. The growth rate of the number of tertiary educated people was the highest in Olomouc, Zlín and Central Bohemia, and the lowest in Ústí nad Labem and South Moravia.

Based on the two above indictors, the Czech Republic can be divided into 4 groups:

1. Regions with an above-average growth rate in both indicators during the given period, i.e. Olomouc, Zlín and Moravia Silesia;

2. Regions with an above-average growth rate of the gross fixed capital and a below-average growth rate in tertiary educated people: Prague and Liberec;

3. Regions with a below-average growth rate of gross fixed capital and an above-average growth in tertiary education: Central Bohemia, South Bohemia, Plzeň, Karlovy Vary, Pardubice and Vysočina;

4. There are only two regions with a below-average growth rate of gross fixed capital and a below-average growth rate in tertiary education: Ústí nad Labem and South Moravia.

The relationship between the number of tertiary educated people in the Czech Republic and the gross fixed capital formation cannot be proven[13].

Education and foreign direct investment

Another indicator that expresses a region's attractiveness from the foreign investor perspective is the inflow of foreign investment. The following chart compares the regional structure of foreign direct investment (cumulated expenses as of 31 December 2007) and the regional structure of tertiary educated inhabitants aged over 15 in 2007.

[13] Under Wilcoxon test: by p=0,05, T=36,5 > $T_{0,05}$=14, but Spearman coefficient: by p=0,05, R=0,0612 < $r_{0,05}$=0,5324

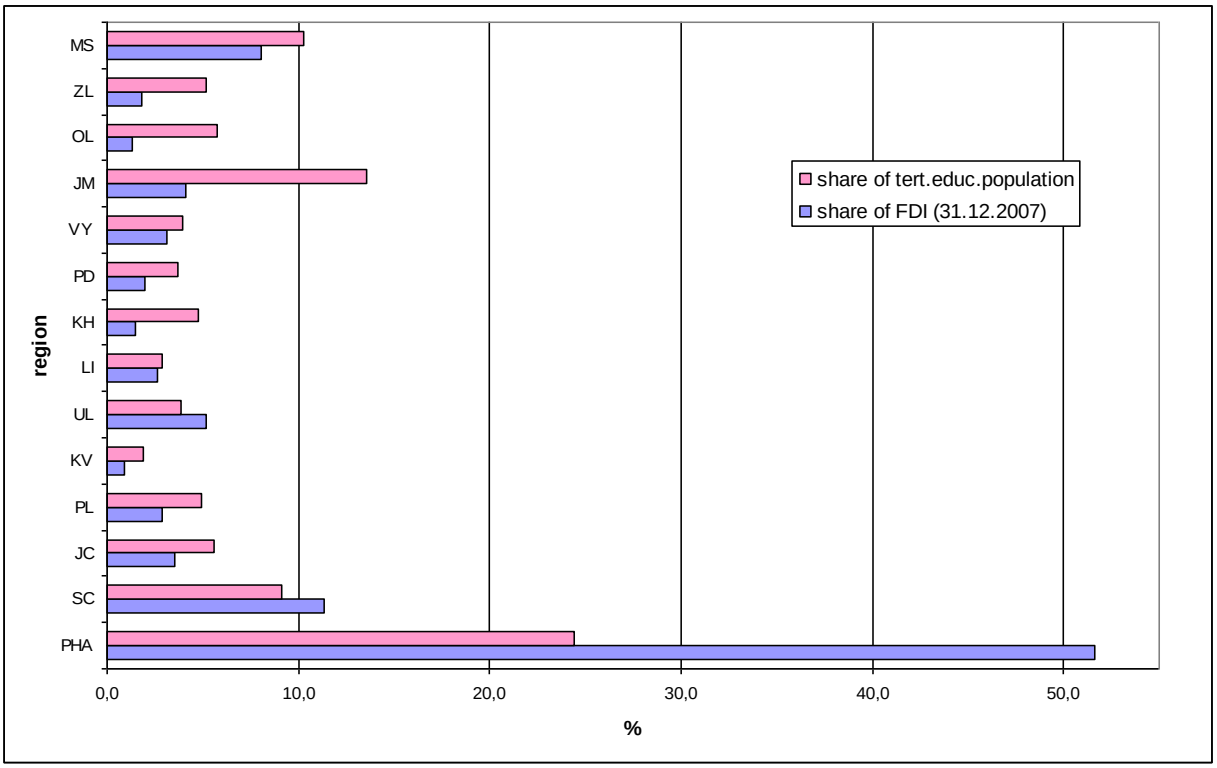

Chart 7: The regional structure of direct foreign investment (as of 31 December 2007) and tertiary educated population aged over 15
Source: The author's chart based on CSO data (http://www.czso.cz/csu/2009edicniplan.nsf/p/3103-09, 13 September 2009) and CNB (http://www.cnb.cz/cs/statistika/platebni_bilance_stat/publikace_pb/pzi/, 8 June 2009)

The largest recipient of FDI as of 31 December 2007 was Prague, whose share is almost 52 %, with Central Bohemia lagging behind – the region is interesting for investors because it is integral to Prague, with all the problems and benefits that come with it. Major investments in Central Bohemia mainly occurred in the automotive and industrial sectors.

The FDI share in Prague, Central Bohemia and the Ústí nad Labem regions is higher than the share of tertiary educated population in these regions; in all other regions it is the other way round. FDI in Prague is mostly directed towards services; in the other regions it is mostly industry. Investors' requirements concerning the qualification and education of the population can be very different; lower qualifications are sufficient for assembly shops where employees can receive on the job training. State policy also plays a major role in the localization of direct foreign investment. The state usually wants to resolve unemployment issues and allows for labour retraining, which mostly concerns people with lower qualifications. Nevertheless, a correlation between the regional structure of FDI and tertiary educated can be identified.[14]

The achieved level of education and innovation, patents

Regional competitiveness is significantly influenced by its ability to quickly respond to changing market requirements. This ability can be documented by the number or share of

[14] Under Wilcoxon test: by p=0,05, T=21,5 > $T_{0,05}$=8. Spearman coefficient: by p=0,05, R=0,5408 > $r_{0,05}$=0,5324

businesses that engage in innovation. Information about these businesses assumed that innovation is related to the population's level of education and qualifications.

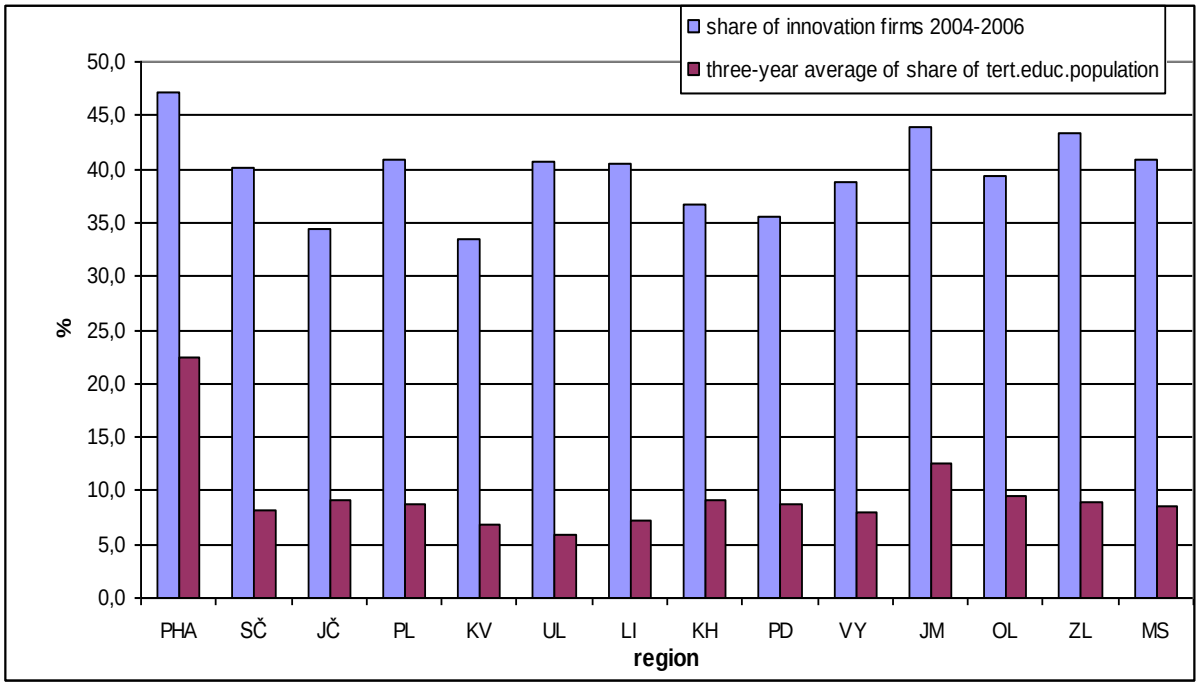

Chart 8: The share of innovative businesses in regions of the Czech Republic compared to the three-year average of tertiary educated population, 2004-2006
Source: The author's chart based on CSO data (http://www.czso.cz/csu/2009edicniplan.nsf/p/3103-09, 13 September 2009 and http://www.czso.cz/csu/2008edicniplan.nsf/kapitola/9605-08-v_letech_2004_2006-03, 16 September 2009)

The chart does not show a direct correlation between the achieved level of the population's education and the innovative activities of businesses that strive to become or remain competitive on the market.

Prague dominates both the share of innovative businesses and the share of tertiary educated inhabitants, followed by South Moravia (in terms of the share of tertiary educated it is the only other region above the national level) and the Zlín Region. Other regions that exceeded the 40% level of innovative businesses include Moravia Silesia, Plzeň, Liberec, Ústí nad Labem and Central Bohemia; the Ústí nad Labem region has the lowest share of tertiary educated inhabitants by far. On the other hand, the lowest share of innovative businesses in the Czech Republic between 2004 and 2006 was in the Karlovy Vary (33.5%) and South Bohemia regions (34.4%). Both regions show rather low shares of tertiary educated population. But generally, correlation is not confirmed[15].

If we divide innovations into technology[16] and non-technology[17] innovations, then the highest share of businesses with technology innovations are registered in South Moravia, Zlín and Prague; on the other hand, regions with the lowest share (below 25 %) include Karlovy Vary,

[15] Under Wilcoxon test: by p=0,05, T=25 > $T_{0,05}$=8, but Spearman coefficient: by p=0,05, R=0,0408 < $r_{0,05}$=0,5324
[16] Technology innovations cover product and process innovations.
[17] Non-technology innovations cover organisational and marketing innovations.

Moravia Silesia and Vysočina. Prague has the highest values in non-technology innovations, followed by the South Moravia and Zlín regions; the lowest values were measured in the Pardubice, South Bohemia and Olomouc regions (below 27 %).

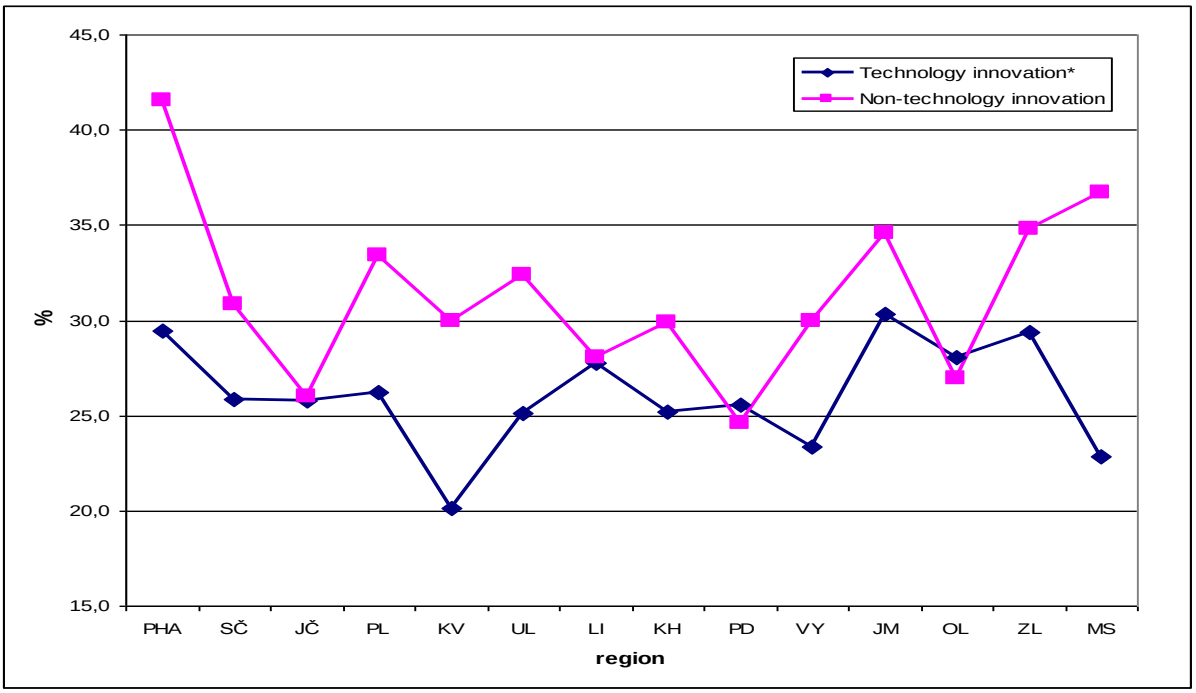

Chart 8: The share of businesses implementing technology and non-technology innovations in the Czech Republic, 2004-2006
Source: The author's chart based on CSO data (http://www.czso.cz/csu/2008edicniplan.nsf/kapitola/9605-08-v_letech_2004_2006-03, 16 September 2009)

A relatively significant share of businesses implementing technology innovations in Prague, South Moravia and Zlín can be affected by the present of traditional technical schools in the regions. On the other hand, the low share of technology innovations in the Karlovy Vary region can be caused by the non-existence of technically or technologically oriented tertiary education institutions.

The number of granted patents can also be used as indicator describing the competitiveness of regional economy. The Czech Statistical Office published data about patents at the regional level for 2001-2005. For the sake of comparison, the author used the growth rate of patents and the growth rate of tertiary educated people in this period. The chart does not include the Karlovy Vary region as no patents were granted in the region in 2001, which distorts the growth rate of the entire period.

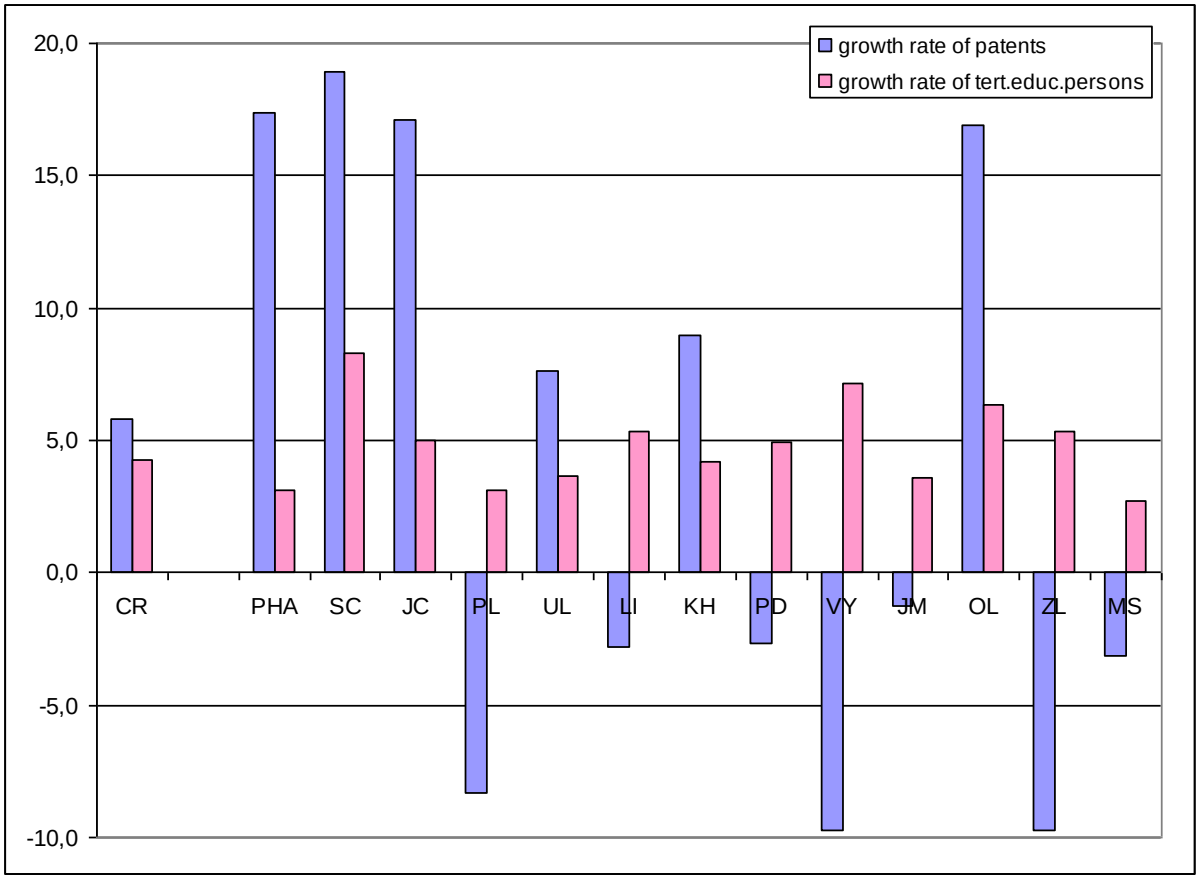

Chart 9: The growth rate of patents and the number of tertiary educated people from 2000-2005

Source: The author's chart based on CSO data (http://www.czso.cz/csu/2009edicniplan.nsf/p/3103-09, 13 September 2 and http://www.czso.cz/csu/2006edicniplan.nsf/p/9612-06, 17 September 2009)

The chart shows that even though the share of tertiary educated people in all regions grew, the number of granted patents grew in six regions between 2000 and 2005, while it dropped in seven other regions; this is most significantly noticed in the Zlín and Vysočina regions. The decrease in the number of patents is also visible in regions that show the highest share of businesses with technological innovation between 2004 and 2006 (South Moravia and Zlín). In this respect, we have to realize that the growth rate is significantly affected by the 2000 initial value and this indicator does not fully reflect the actual situation in the regions.

As the Czech Republic's various regions substantially differ in the size of population, granted patents have been recalculated to 100,000 inhabitants.

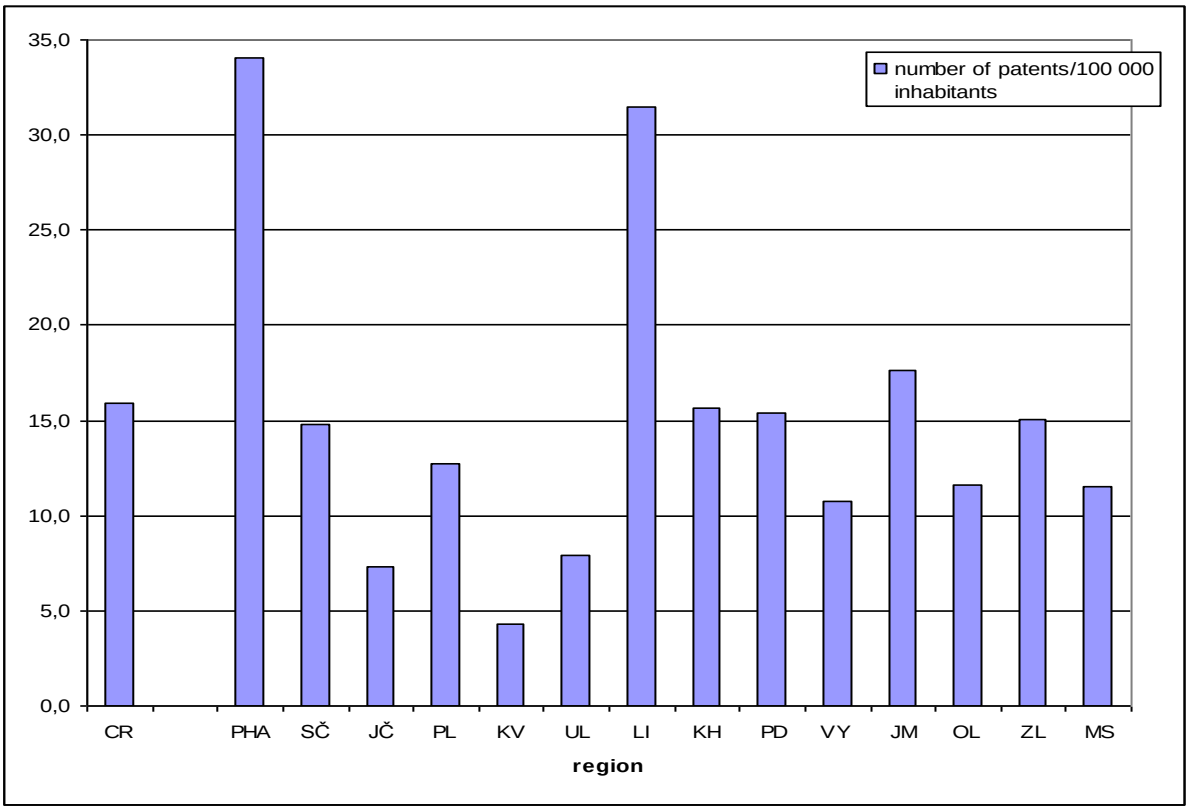

Chart 10: The number of granted patents (based on originators) from 2000-2005 per 100,000 regional inhabitants:
Source: The author's chart based on CSO data, http://www.czso.cz/csu/2006edicniplan.nsf/p/9612-06, 17.9.2009 and http://www.czso.cz/csu/2006edicniplan.nsf/publ/1304-06, 20 September 2009)

The application of the above indicator confirms Prague's dominant position, followed the Liberec Region, which is traditionally associated with textile machinery (a tradition of higher education in the region). The South Moravia region, in spite of lagging behind Prague and Liberec, also scored above the nationwide average; the number of patents in the region is clearly affected by the existence of tertiary education and research and development institutions, especially in the regional city of Brno. All other regions show below-average levels. The Karlovy Vary, South Bohemia and Ústí nad Labem regions are the worst. Karlovy Vary and Ústí nad Labem show a low share of tertiary educated people and are among the lowest group when classified by the population's level of education. Quite a different situation is in South Bohemia where the low number of patents is affected by the traditional orientation of tertiary education and research and development institutions on agriculture and biological sciences.

Summary and conclusion

This paper attempted to verify whether the achieved level of education among inhabitants in the Czech Republic is currently a factor affecting the development and competitiveness of regions. The author used statistical indicators available at the regional level. Unfortunately, not all data are available for the same period. Nevertheless, the author believes that certain conclusions can be drawn from the analysis.

The analysis showed that under current Czech conditions, the educational structure of inhabitants, represented in the analysis as the share of tertiary educated people, may contribute to a region's socio-economic level and its future development. But direct relationship is not proved on the present conditions of the Czech republic. In other words, it is a factor that can be held to determine the competitiveness of Czech region.

The analysis also shows a certain level of unused potential represented by educated people in different regions. Data on the innovative activities of businesses show that employees' level of education and qualifications can be considered as a pre-condition for creating and implementing product innovations and technological and organizational processes. Regions that do not have technically and technologically oriented tertiary educational and research and development institutions show lower business activities centred around technological innovations; these regions also produce a lower number of patents.

According to Wokoun (2008), if we compare the results of the analysis with the typology of the Czech Republic, we can again see the dominant position of Prague and the poor position of the Ústí nad Labem Region. Positions of other regions differ depending on the indicator. If we view the creation of patents and innovative business activities as the basic indicators of regional competitiveness, beside Prague the Liberec region places among the top and the South Moravia Region also fares well, even though its number of patents dropped between 2000 and 2005.

Overall, we can say that under the current Czech Republic's conditions, the achieved level of education of population in regions can contribute to the competitiveness and development of the regions. In this respect, tertiary education plays the most important role as it can affect the situation in the Czech Republic' s regions in the long term. Even though it is especially technical and scientific education that is important to product and technology innovation, the availability of tertiary education as such is essential. Tertiary educated people are usually aware of the necessity to continue their education and develop their skills, which brings the ability to seek new approaches and solutions and better respond and adjust to changes today's society and economy face.

References:

Blažek J. (2008): Teorie regionálního rozvoje. In: Wokoun, R., Malinovský, J., Damborský, M., Blažek, J. et al.: Regionální rozvoj (východiska regionálního rozvoje, regionální politika, teorie, strategie a programování, Linde, Praha, s. 220-281. ISBN 978-80-7201-699-0

Kouřilová, J.: Vzdělání obyvatel ČR: regionální disparity, faktor regionálního rozvoje. Disertační práce. Národohospodářská fakulta VŠE, 2007.

Lundvall, B. A. (2002): The University in the Learning Economy, DRUID Working Paper no 0206, ISBN 87-7873-122-4 (www.druid.dk/wp/pdf_files/02-06.pdf)

Neave G. (1979): Education and Regional Development: An Overview of a Growing Controversy. European Journal of Education, Vol. 14, No.3, 1979, ISSN 0141-8211

OECD (2005): Building Competitive Regions. Strategies and Governance. ISBN92-64-00946-9

OECD (2004): Global Knowledge Flows and Economic Development. ISBN 92-64-10766-5

Robson B., Drake K., Deus I. (1997): Higher Education and Regions. Report 9, Centre for Urban Policy Studies, University of Manchester (www.leeds.ac.uk/educol/ncihe/report9.htm (22.4.2007),

Saaravirta T., Consoli D. (2006): Regional Development, Education and Innovation: A Case Study on University Graduates in Finland (www.proact2006.fi/chapter_images/304_Ref_A28_Toni_Saaravirta.pdf (22.4.2007))

ESPON (2006): Territory matters for competitiveness and cohesion. Facets of regional diversity and potentials in Europe. ESPON Synthesis Report III, 2006, ISBN 2-9599669-4-5

ÚIV (2006): České školství v mezinárodním srovnání. Stručné seznámení s vybranými ukazateli publikace OECD Education at Glance, UIV 2006.

Wokoun, R.(2008): Regionální politika v Evropské unii a České republice. In: Wokoun, R., Malinovský, J., Damborský, M., Blažek, J. et al.: Regionální rozvoj (východiska regionálního rozvoje, regionální politika, teorie, strategie a programování, Linde, Praha, s. 329-428. ISBN 978-80-7201-699-0

Wokoun, R. (2009): Regional Competitiveness and Regional Development Factors in the Czech Republic. Paper for CERS, Košice 2009