

Tertiary Education and the Crisis of Public Finance

Milos Maryska, Petr Doucek
Faculty of Informatics and Statistics
University of Economic, Prague
Czech Republic
milos.maryska@vse.cz, doucek@vse.cz

Abstract: *Turbulent economic environment after overwhelming the last crisis period is typical for present days as well as permanent increasing dependability of all our activities on information and communication technology (ICT). Although the global economic crisis was the reason for disinvestment into ICT in 2009 there is expected that ICT will generate almost 5.8 million new jobs in Europe till year 2013 and they have to be saturated also by adequately qualified ICT specialists.*

This contribution presents the research in the progress focused on the tertiary education system in the Czech Republic. We are predicting trends in education and especially in ICT education in Europe and in the Czech Republic as well for next ten years. We can expect that future ten years period will be critical not only for the Czech tertiary education system, but also for the Czech Republic because number of ICT students will be decreasing and number of ICT specialist demanded by labor market will be increasing. From macroeconomic point of view we can expect that also state subventions into state governed tertiary education system will decrease in the whole Europe.

Some recommendations, proposals and forecasts for further development of education system are presented at the end of this contribution.

Key words: tertiary education, information technology, number of students, expenditures

1. INTRODUCTION

Schooling system of post-communist countries went through dynamical evolution in last ten years. This evolution process has been started by crashing the iron wall in 90's of the last century and these changes were accelerated on the tertiary level by acceptance and implementation of Bologna declaration rules into European education system. A lot of people and experts as well talk about economics situation in tertiary education system, about number of students in it, but any more detail and deep analysis of visible facts is missing. Except history and confirmation of these statements is really important to predict future situation in tertiary education system at our state level and at European level too. Preparing prediction is not easy, because there are a lot of variables, but some of them can be influenced by statements of government officials, some of them by historical trends and some could be changed by expectations and visions provided by universities. We tried to identify the most important trends through survey that we have realized in the first quarter 2011. There were investigated and analyzed following main factors in our survey. Title of the Chapter

2. Problem Formulation

A lot of statements have been published presented by the Czech officials in last months. Some of these statements are about last trends and the future financial support of the tertiary education system and research and development that are closely connected to the future economic situation in Europe and in the Czech Republic too and their economic development characterized by GDP. In the context of these facts, we have defined three important hypotheses that are answered in the following text. The hypotheses validate these statements and try to compare the Czech officials' declaration with real situation in the tertiary education system and reveal real numbers in the Czech tertiary education system and research and development.

- H1: Investment, noninvestment and total expenditures per student are increasing or are at least constant in every year contained in analysis in the tertiary education system.
- H2: Expenditures in tertiary education system per student are increasing or are at least constant in every year contained in analysis.

3. Schooling system

According to (Doucek, Novotny, Pecakova & Vorisek, 2007), the future of tertiary education system is based on a few main factors:

1. Total number of children.
2. Number of students graduates at secondary schools.
3. Policy of government in the area of education.
4. Quality and number of HEIs (Higher Education Institutions) and Universities and quality of research and development work on it.

We abstract away from the influence of migration rate and immigration rate.

The first point "Total number of children" and its impact into the economy and school system is analyzed for example in (Maryska, Novotny & Doucek, 2010). The second point is one of key factors influencing tertiary education system. Number of graduates at secondary schools could be described as a limited pool providing resources (students) that can be enrolled by universities for study at the university. Limits are not only in number of them, but also in their abilities and skills. The third point cannot be directly influenced citizens but is essential for future of tertiary education and also for future situation in the whole economy in Europe and in our state as well. The influence rests in the setting up sum of money universities receive for their students etc. The fourth factor – Number of universities and HEIs – can be influence directly by policy of Ministry of Education. Situation in the Czech Republic is typical for system, where education became business activity and the majority of universities are private. Government regulates strong directly only state HEIs by financial means and it does not apply strictly the same financial principals on private ones.

We present numbers of children and numbers of students in the whole education system in last six year in the Tab. 1. In the Tab. 1 is providing each of rows to us information that describes future (shorter or longer) in tertiary education system in the Czech Republic.

As we see, the number of students in nursery school is increasing from 284,000 in year 2003 to 314,000 in year 2009. This is relative good news for longer period of analysis. Nursery schools are usually visited by children younger than six years in Czech. With due to regard that the average age for entrance to tertiary education system is 19.5 years (European Commission, 2009) in the Czech Republic. It is visible in the Tab. 1 that the size of graduate's pool will be increasing in future of next 13 years. But this increase has to take into account also situation at other levels of education. In opposite to the previous fact, we see that number of students is decreasing at elementary and secondary level of education in last seven years – especially at secondary level (secondary level = study finished with and also without leaving examination). This trend is comparable with trends presented at (Czech Statistical Office, 2009), (Eurostat, 2010) and (Fiala & Langhamrova, 2010).

Tab. 1: Number of Children, Pupils and Students According to the Level of Study in the Czech Republic *source: authors, (Institute for Information in Education, 2011)*

School	2003/04	2006/07	2009/10
Nursery	284,166	285,419	314,008
Primary school	992,770	876,513	794,459
High school	576,615	576,585	556,260
Higher Education Institution	30,681	27,650	28,749
Universities	243,801	316,367	389,231
Total	2,131,576	2,086,068	2,086,142

Other very important numbers are presented in following Tab. 2. For university education is interesting number of high school students with leaving examination that is potential source for the tertiary education system. These graduates create the potential pool for enrolment to the tertiary education system. As we see, the number of students with leaving examination is decreasing but this trend is caused by the decreasing number of new born in corresponding years (see Fig. 6).

Tab. 2: Numbers of Students at High School Level of Study in the czech republic
source: authors, (institute for information in education, 2011)

School	2003/04	2006/07	2009/10
High school - leaving exam	147,891	130,847	113,609
High school - indenture	382,274	400,510	396,214
Others (institute etc.)	46,450	45,228	46,437
High school - total	576,615	576,585	556,260

The Fig. 1 is prepared in the context of the previous two tables that describes number of student's at secondary level of study that means high school finished by leaving examination and their portion on the population 15-19 year old. These numbers are important for tertiary education in short run. Part of students at this level will be trying to entry universities in next few years. The portion of high school students at the selected population is increasing between years 2003 and 2009 for 5% points from 57 % to 62 %.

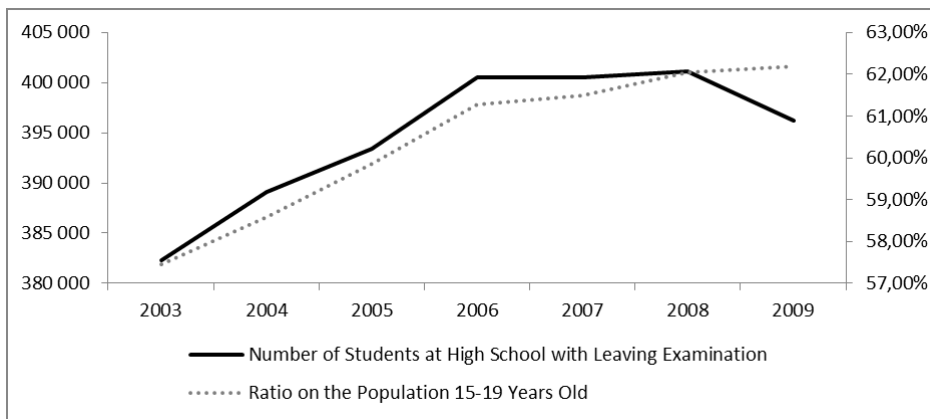


Fig. 1. Number of Students at High School with Leaving Examination and their Portion on the population 15-19 years old *source: authors, (Eurostat, 2010)*

The situation at universities can be characterized as speed overheated progress. Between years 2000 and 2009 increased the number of students in tertiary education system from 238,473 to 392,667 (approximately 60 %). This is not caused only by number of graduates at lower level of education system but also by increasing number of enrolled students and increasing ratio of tertiary education students on the number of the whole population. Similar trend is also in the EU where the ratio of net tertiary students on population increases from 11,841,653 to 18,337,845 students. These facts are proved by Fig. 2 and Fig. 4. Trend in ratio of all university students on population in Europe and in the Czech Republic is on the Fig. 2.

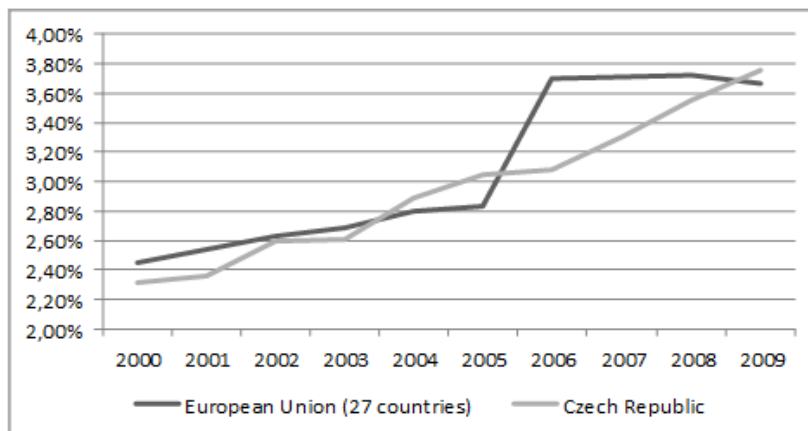


Fig. 2. Ratio of All University Students on Population in the Czech Republic
source: authors, (Institute for Information in Education, 2011)

Structures of the students participate in the tertiary education system presents Fig. 3. It was already apparent in 1998 that a great number of women than men were qualifying from tertiary education in almost all European countries (except Germany and Austria). This trend continued through to 2002. From 2002 until 2006, the proportion of women graduates was very stable representing approximately three women graduates for every two men. (European Commission, 2009)

The Czech situation is visible on Fig. 3 and it is very similar to the situation in the whole Europe. For 100 men is graduating approximately 130 women. Only one short remark or experience from IT related study programs on our university – we have approximately 12 % of women at the start of ICT study programs at our university (bachelor study the first semester).

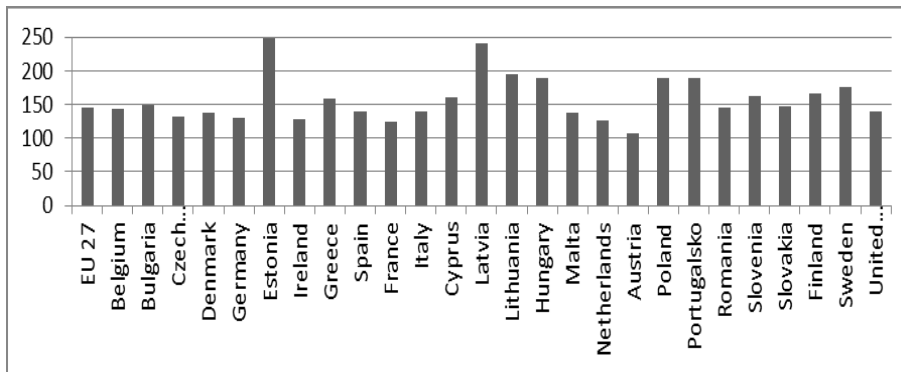


Fig. 3 Number of Women Per 100 Man Graduating From Tertiary Education 2006
source: (European Commission, 2009)

As is presented above, average age of students entering on universities is 19.5 years in the Czech Republic. On this fact is based this comparison in the Fig. 4. We have compared number of new enrolments to the tertiary education (19 years old) to the number of live birth that were born in the same year as these new enrolments. We see (Fig. 4) that the ratio is increasing from 66 % to 72 % (dotted line) between years 1984 and 1989. We have to compare this period because younger people aren't entering tertiary education system yet. The numbers of all new students entering universities divided according to the study level are shown in the Tab. 3.

Tab. 3: Numbers of Students According to the Study Level
source: authors, (Institute for Information in Education, 2011)

	2003	2006	2009
Bachelor	45,596	69,658	81,300
Master - 2 years	6,277	20,663	38,500
Master - 5 years	21,427	10,906	6,872
Doctorate	5,313	5,098	5,733
Total	78,613	106,325	132,405

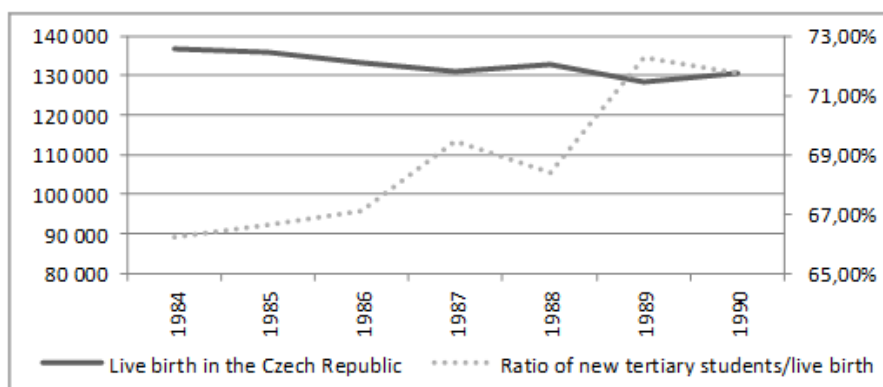


Fig. 4. Live Birth and Ratio Indicators in the Czech Republic
source: authors, (Eurostat, 2010)

We can mark increasing trend in this indicators as positive. Comparing this ratio with ratio in other European countries (EU) we find out that this ratio is still higher in EU than in the Czech Republic. But this trend can be marked also as negative because as we see in the Fig. 2 and Fig. 4 the portion of all university students on population 15-19 years old is increasing that means that for tertiary study are enrolled students with worse results from high school.

These statements are supported by the following Fig. 5 that present numbers of enrolled student for tertiary education and number of enrolment for tertiary education. We see that the ratio of enrolled students was more than 74 % in year 2009 (dotted line)

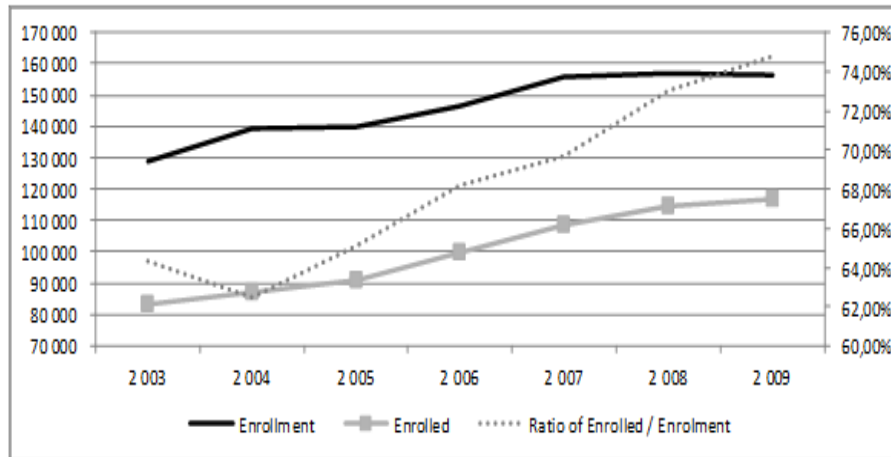


Fig. 5. Number of Enrolment, Enrolled and Ratio of Student in the Czech Republic
source: authors, (Institute for Information in Education, 2011)

Detailed information about analysis of graduates is presented in (Maryska, Novotny & Doucek, 2010).

Graph presented in the Fig. 6 presents number of live births in time series from year 1980 to year 2009. These numbers are important for future situation in the tertiary education system. We see that future years will be difficult for universities and also for quality of tertiary education system as a whole because numbers of potential students (based on number of live birth) was decreasing until year 2001 in the Czech Republic (dotted line) and in the EU(27) countries till year 2003. When we take into account average entering age to the tertiary education system, the difficult times will be for tertiary education system till year 2020.

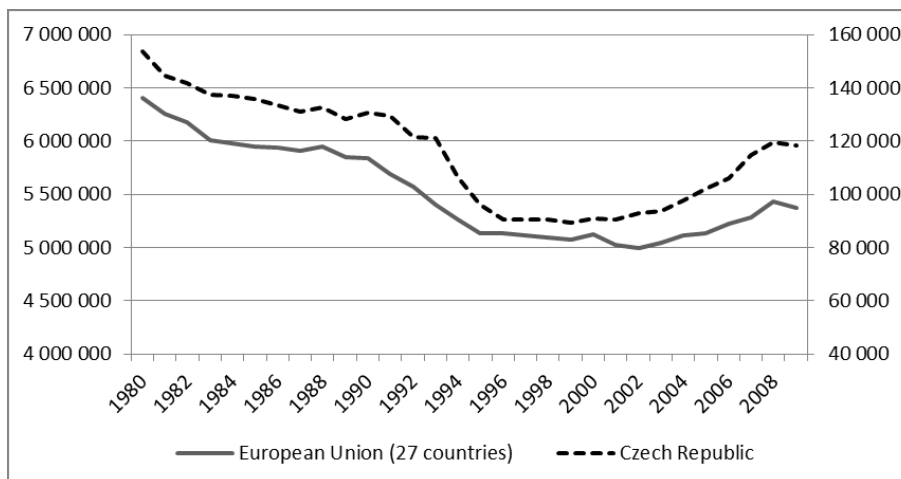


Fig. 6. Time Series of Live Births in the Czech Republic
source: authors, (Eurostat, 2010)

4. Economic Indicators in Tertiary Education System

Above presented facts give us information about numbers of students. These facts are important, but for detail evaluation of situation in the tertiary education are not sufficient enough. It is important to

realize also analysis of economic indicators in education system from this reason. Subsequently we can identify and predict future trends and situation in the education system in the Czech Republic.

Expenditures on tertiary education system are presented on the following Fig. 8. The dotted line on right axis presents the most important expenditures on basic activities related to education that means teacher's salaries, operational costs etc. Between years 2003 and 2009 increased these expenditures from 0.59 billion EUR to 1.04 billion EUR (in current prices). Increase in this indicator was 77 % in seven years. We have to specify evolution of inflation in this period for bettering up the value of this information (Fig. 7).

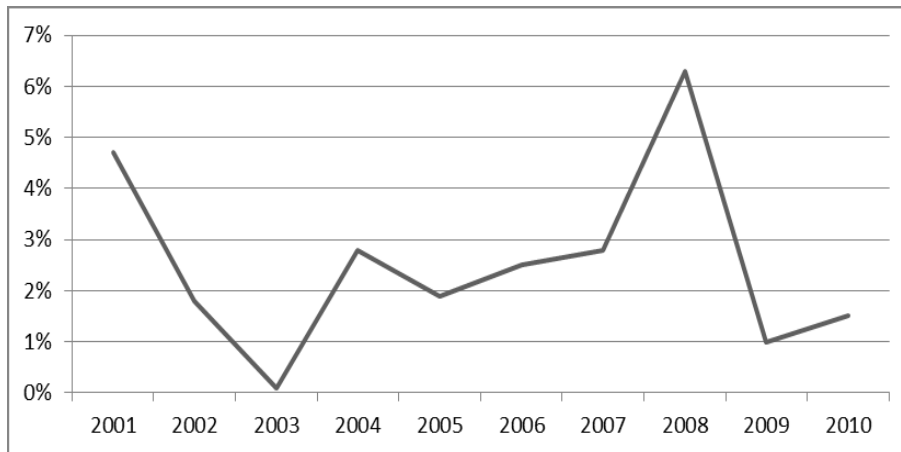


Fig. 7. Annual Inflation Rate in the Czech Republic in Analyzed Period
source: (Czech Statistical Office, 209), authors

The second important indicator is expenditures on Research and Development that are presented in the Fig. 8. The expenditures are presented by thick black line without any marks. Trend of this line is also increasing. This indicator increased between years 2003 and 2009 from 130 million EUR to 267 million EUR and is presented in the Fig. 8 (black line without marks on left axis). These finding is very positive for the Czech science. Interesting findings are in expenditures on the first sight on campus and student's hall that are sharply decreasing in period 2004 and 2006 for more than 73.4%. This is caused by the change the way of paying for accommodation during study. Until the year 2006 time were provided all governmental financial support directly to the campuses but from the year 2006 have been governmental financial support providing directly to the student that satisfy all condition defined by law.

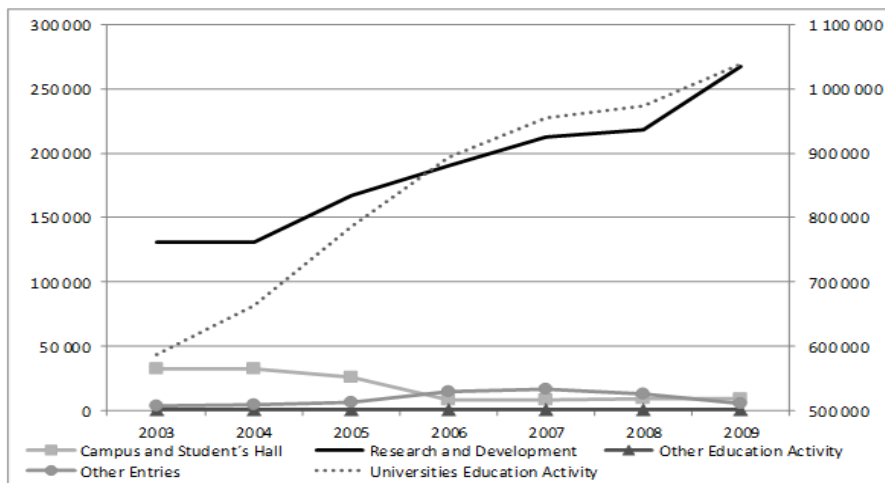


Fig. 8. Expenditures on Tertiary Education system – in detail (in thousand EUR)
source: authors, (Institute for Information in Education, 2011)

Trends presented in Fig. 8 are completed by the Tab. 4. It provides detail information about each of analyzed entries in the Tab. 5. New information resulting from the Tab. 4 is that total expenditures on tertiary education system in current prices were increasing from 0.75 billion to 1.32 billion EUR between years 2003 and 2009. The increase ratio was 75.01 % that is lower than increase in research

and development (104.45 %) and universities education activity (77.00 %). We can state that these findings are positive for the Czech tertiary education system, but these findings have to be also compared with the development of numbers of students (see part 5).

Tab. 4: Expenditures on Tertiary Education system – in detail (in thousand EUR)
source: authors, (Institute for Information in Education, 2011)

	2003	2006	2009
Universities education activity	586,788	893,485	1,038,588
College and student's hall	32,636	8,217	8,669
Research and development	120,807	190,445	267,436
Other education activity	212,145	272	158
Other entries	3,572	14,522	4,777
Total expenditures	754,015	1,106,942	1,319,629

There are presented GDP in current and constant prices in Tab. 5. Constant prices are based on year 2000. (Czech Statistical Office, 2011) This data are valuable for another comparison of expenditures on tertiary education system in the Czech Republic.

Tab. 5: GDP in Current and Constant Prices in Selected Years
source: authors, (Institute for Information in Education, 2011)

in million EUR	2003	2006	2009
GDP - current prices	103,084	128,895	145,035
GDP - constant prices	94,713	112,374	117,131

Expenditures presented in Fig. 8 and Tab. 4 was divided into investment and noninvestment part in the Fig. 9. This structuring is supplemented by the portion of total expenditures on tertiary education system on GDP in the Czech Republic. Ratio is presented in the Fig. 9 (the dotted line on right axis) is slightly increasing from 0.73 % to 0.91 % in the period 2003 and 2009.

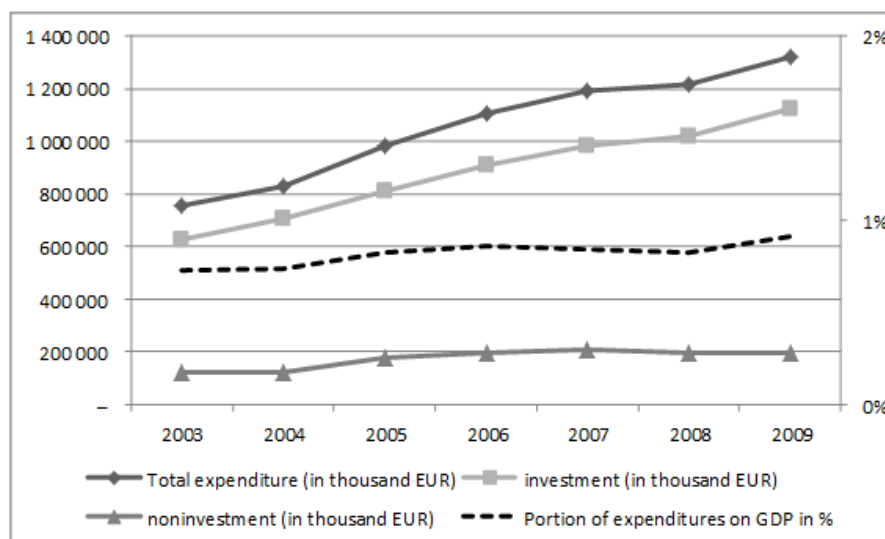


Fig. 9. Expenditure on Tertiary Education and their Portion on GDP
source: authors, (Institute for Information in Education, 2011)

All of above analyzed indicators were recalculated in current prices. The Fig. 10 presents total expenditures in current prices (dark black line) and constant prices (light line) and their ratio (the dotted line).

Fig. 10 shows that although the increase in current prices was from 0.76 billion EUR to almost 1.32 billion EUR (that means 75.24 %). The increase in constant prices was substantially lower – only 0.68

billion EUR to 1.08 billion EUR (that means only 53.84 %). The dotted line on right axis presents the decline in the ratio of expenditures in current prices and constant prices from 92.00 % to 81.80 %. As is visible, the space is enlarging that means that the real expenditures on tertiary education system without influence of price changes are significantly lower

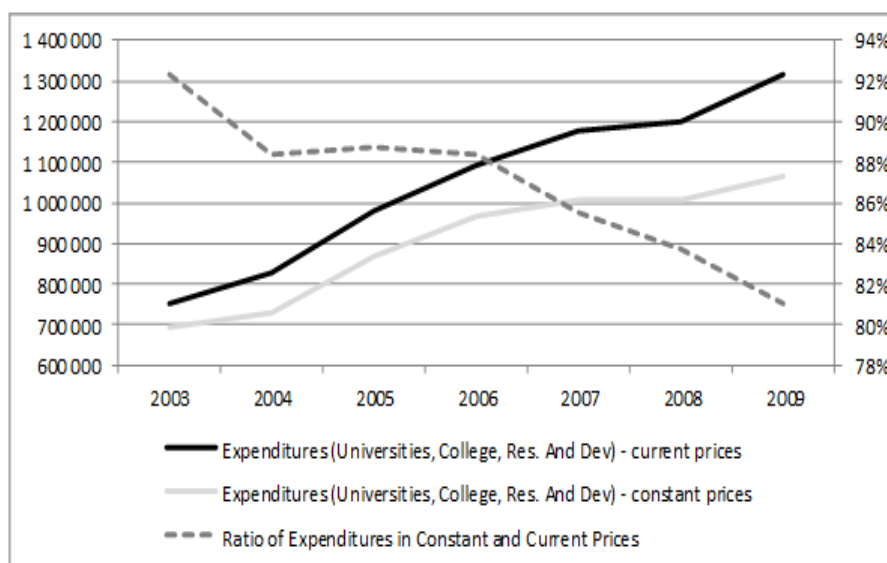


Fig.10. Comparison of Expenditures in Constant and Current Prices on Selected Entries
source: authors, (Institute for Information in Education, 2011)

Partial conclusions

Although expenditures on tertiary education system in the Czech Republic are increasing in current prices, the situation is absolutely different in the case of constant prices, where the increase is subsequently lower.

5. Comparison of trends in numbers of students and economic indicators

This part is devoted to the comparison of development in numbers of students and economy indicators. Fundamental comparison is based on the number of students and expenditures on tertiary education system in total and also in detail exactly on education activities. The impact of ICT students into the economy is solved for example in (Vltavska & Fischer, 2010).

As we have mentioned above yet, we have used for recalculation of current prices on constant prices the price level of the year 2000.

As we see in the Fig. 11 the total expenditure are increasing between years 2003 and 2006. Between years 2006 and 2008 decreases the total expenditures almost to the level of the year 2004. In the next period since year 2008 is this indicator increasing. The indicator investment expenditure per student reports the same trend as the first indicator. The indicator of noninvestment expenditures shows another trend. This indicator decreased between years 2003 and 2004 and between years 2004 and 2006 presents on contrary increasing trend (above mentioned indicators also increased in this period). Since the year 2006 has been this indicator constantly decreasing. This analysis shows investment and noninvestment expenditure. Except noninvestment expenditure are other analyzed indicators increasing from year 2009.

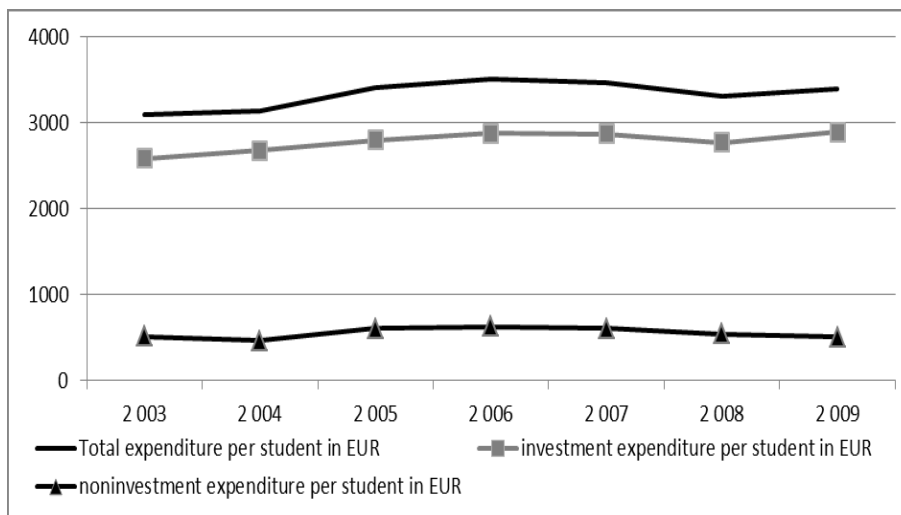


Fig. 11. Investment, Noninvestment and Total Expenditure per Student in the Tertiary Education System source: authors, (Institute for Information in Education, 2011)

The same results (except expenditures on college and student’s hall – reasons were mentioned in previous text) as in the Fig. 11 are in the Fig. 12. Interesting progress has the indicator expenditures on college and student’s hall. As is visible from Figure 12 this indicator is since year 2004 still decreasing. This is caused by the change of system housing allowance that is provided not to the colleges and student’s hall but directly to the students that meets requirements set up by the law. Comparing lines Total expenditure per student in the Fig. 11 and Universities education activity expenditure per students in the Fig. 12 we see strong correlation (0,9852) with positive gradient ratio. Education activity expenditure represents majority of all expenditure in tertiary education system.

This analysis replies to the first hypothesis H1: Investment, noninvestment and total expenditures per student are increasing or at least constant in every year contained in analysis in the tertiary education system.

Analysis and their result didn’t prove the hypothesis H1. There were at least one period in each of analyzed indicators when the values of the indicators were decreasing.

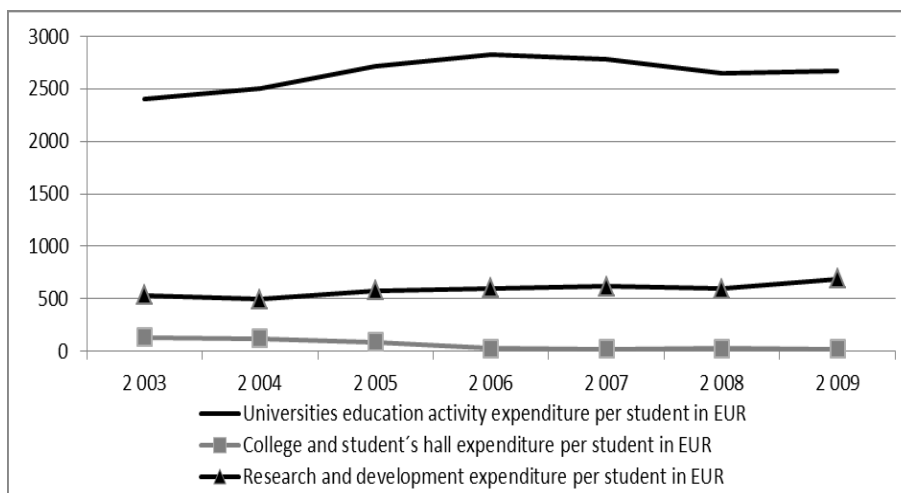


Fig. 12. Expenditures Per Student in the Tertiary Education System - According to the Selected Entries source: authors, (Institute for Information in Education, 2011)

The most important analysis is presented in the Fig. 13. The Fig. 13 provides comparison of governmental expenditures in tertiary education system per one student in constant and current prices. This comparison is really important because constant prices removing influence of inflation and changes in prices (think up that constant prices are based on price level of the year 2000). Although we have presented in previous graphs, that total governmental expenditures are increasing (except period 2005-2007). If it is realized comparison of total expenditures in constant prices the situation is

absolutely different. There is visible in the Fig. 13 that the increase of expenditures into the tertiary education in constant prices is smaller than in current prices.

In period 2006-2008 decreased expenditures per on student in constant prices from 3,000 EUR to 2,720 EUR. This fact has a strong impact on further situation in tertiary education system. Expenditures in this period decreased for 10% to the lowest level in analyzed period.

This finding gives alarming information about the situation in the Czech tertiary education system. Although number of students is increasing the governmental expenditures in current prices per one student are decreasing. In the context analysis realized in the Fig. 11 are in the Fig. 12 we know that the total expenditure are increasing since year 2008 but the rate of growth in economic indicator is smaller than the rate of growth in number of students in the tertiary education system.

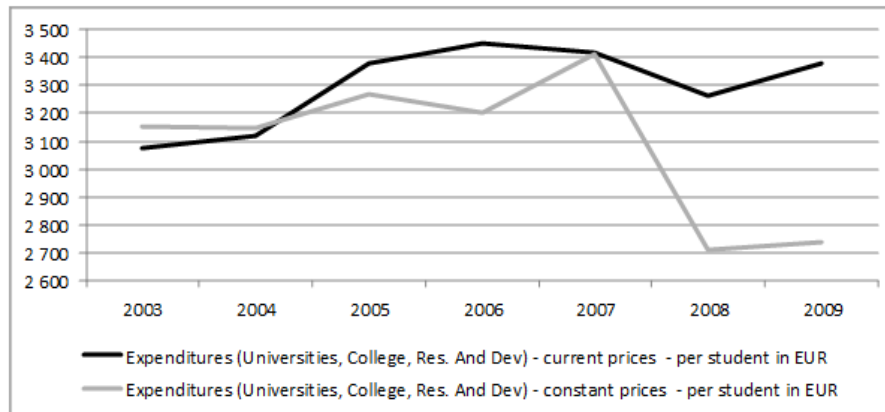


Fig. 13. Expenditures in Tertiary Education System Per Student in Constant and Current Prices
source: authors, (Institute for Information in Education, 2011)

The Fig. 13 contains answers to the hypothesis H2: Expenditures in tertiary education system per student are increasing in constant and in current prices or are at least constant in every year contained in analysis. Through above mentioned analysis we have rejected hypothesis H2. Both indicators were decreasing at least once during analyzed period. Especially indicator of expenditures in constant prices based on the price level of the year 2000 was strongly decreasing between years 2007-2008.

6. Situation in ICT Related Tertiary Education

There is described current situation in ICT related tertiary education in this part of the contribution. Economic indicators cannot be presented in detail on ICT related tertiary education, because these data are not investigated by statistical organizations in the Czech Republic. For future development of the Czech economy is important situation in ICT tertiary education. There is still increasing number of ICT companies (delivery and development centers like IBM, DHL, and Microsystems etc.). These and other companies required a lot of ICT specialist and these ones are obviously expected to graduate the master study programs (Doucek, Novotny, Pecakova & Vorisek, 2007). Situation in last few years is not too positive in this area in the Czech Republic. Although number of new students (Fig. 15) and their share on total number of all tertiary students and also their portion on number of live births (Fig. 14) is increasing and slowly is also increasing the number of graduates (Fig. 16). There are some problems that caused current scarcity of ICT specialists:

- Knowledge level of graduates at bachelor level.
- Knowledge level of graduates at master level.
- Numbers of ICT specialist graduates in ICT related study programs (not only at universities but also at high schools and HEIs).

Analysis of knowledge levels at bachelor and master level are presented for example in (Doucek, Novotny, Pecakova & Vorisek, 2007), (Maryska, Novotny & Doucek, 2010).

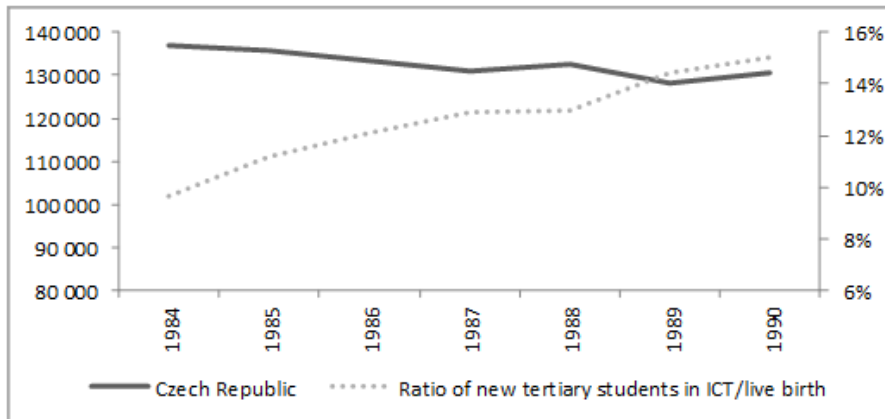


Fig. 14. Number of live births in the Czech Republic source: authors, (Eurostat, 2010)

The first graph in this part (Fig. 14) present portion of all ICT related students in tertiary education system in the Czech Republic compared with total live births in corresponding years when the new students were born. The ratio is still increasing in analyzed years and is increasing from 10 % to 15 % during 6 years. Detailed information about numbers of new students and graduates are presented in the Fig. 15 and Fig. 16.

In the Fig. 15 is visible that number of new students is increasing at bachelor and master (2-years) level and relatively stable is a doctorate level. Number of students is decreasing at master (5-years) level. This is caused by the Bologna declaration that stops 5-years study programs and supports study sectionalized into two levels.

Total number of new students in ICT related study programs at bachelor level is presented by the dotted line (right axis) in Fig. 15. It is visible (Fig. 15) that total number of students was higher than 13,000 (2008) and almost higher than 14,000 (2009). Situation at master (2-years) level is different. There is only between 3,500 and 4,000 students (Fig. 15) in years 2008 and 2009 but their number is quickly increasing. These numbers are important to compare with numbers of graduates (see Fig. 16).

The term “new students” represent number of all enrolled applications at all faculties in the Czech Republic. That means that the number of persons in the ICT related study programs in the Czech republic can be lower in the case some student were enrolled for more than one study program.

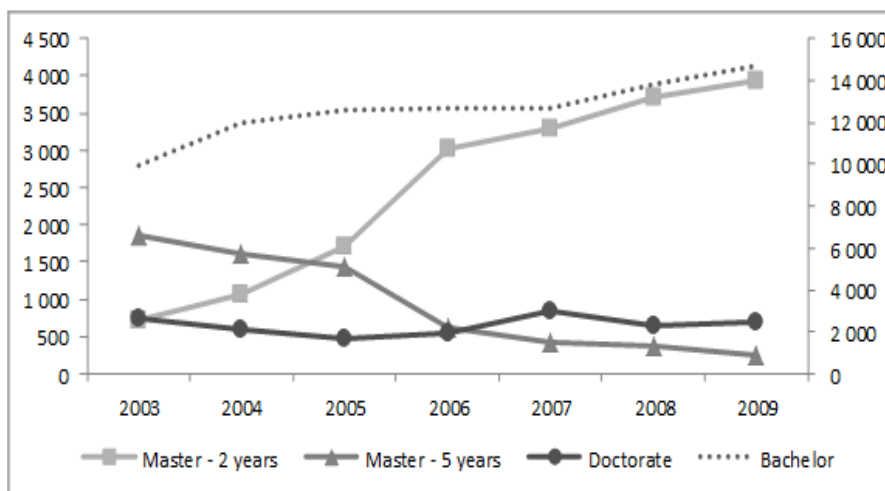


Fig. 15. Numbers of New Students in ICT Related Study Programs in Tertiary Education source: authors, (Institute for Information in Education, 2011)

In the Fig. 16 is presented number of graduates in ICT related study programs. The dotted line (right axis) represents number of graduates at bachelor level. This line has really dynamical increasing trend between year 2004 and 2007. The cause of this trend was acceptance of Bologna declaration and establishing new bachelor study programs. The same situation is also at master level but with delay in length approximately 2 years. This delay is caused by the length of the master study. Different

situation is visible by the 5 years master study which is decreasing since the year 2004. This situation is also caused by the Bologna declaration that stops this type of study.

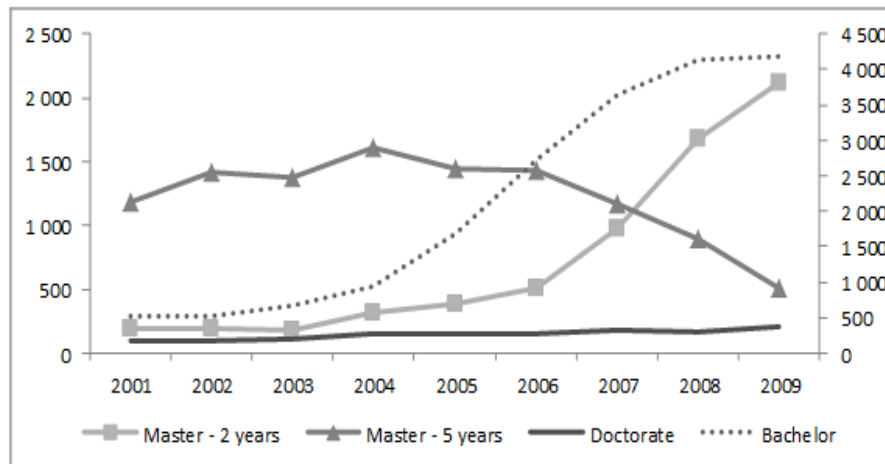


Fig. 16. Numbers of ICT Graduates in Tertiary Education
source: authors, (Institute for Information in Education, 2011)

Interesting results could be presented through comparing numbers in the Fig. 15 and Fig. 16. It should be taken into account fact that the number of graduates at bachelor level is connected with number of new students that were enrolled for study at bachelor level 3 years before and at master level is this time lag 2 years.

We compare number of graduates at bachelor level during years 2008 and 2009 in the Fig. 16 (the dotted with numbers on right axis) with number of new students during years 2005 and 2006 in the Fig. 15.

The situation is alarming. Although in years 2005 and 2006 were enrolled for study in ICT related study program between 13,000 students (not persons!) the corresponding numbers of graduates are only 4,200 students. On the other hand the numbers of new students at master level were approximately 3,500 students in years 2006 and 2007 and corresponding number of graduates were approximately 2,000 students. From these results that successfulness is approximately only one third of all new students at bachelor level and at master level is successfulness approximately 57%.

7. Conclusions

EU tertiary education system has been fundamentally changing from year 1999 (signature of Bologna declaration). The Bologna declaration split universities study into three levels – bachelor level (3 years), master level (2 years) and doctorate level (till year 1999 was only 2 levels – 5 years master and doctorate level). Aims of this dividing were improvement quality of education process, increase student's and lecturer's international mobility etc. In years 2000-2001 has started increase in number of students in tertiary education system especially in new EU member.

Although old EU members has different values of basic economic indicators like GDP per Capita, XXX on the other side a lot of various important indicator has similar trend in EU members and in the Czech Republic, for example live birth, trends in portion of tertiary students on population (not numbers!), number of students on one lecturer etc. This facts show us that the aim to reach the same level standard in the Czech Republic and new EU members as in old EU members is not possible in near future.

All countries in the EU can expect sharp decrease in absolute numbers of potential students entering tertiary education system. In the Czech republic will be decreasing in the period 2012-2016 in the context of the Fig. 6 (approximately 40,000 students). That means the decrease will be for 25% during this period. This number will be almost constant for next five years up to 2021. This number of students increases to the level of year 2012 between years 2021 and 2029. The decrease will fundamentally affect level of education and one of the possible results of this decrease will be decreasing GDP that is nearly connected with level of education (see - Maryska, Novotny & Doucek, 2010)).

One of the cautionary examples can be mentioned the Czech Republic. In the Czech Republic is currently prepared new legislative system for tertiary education system that will be "privatized". That means: universities will be managed by the non-academic board. One of important task, except management of the university will be also nomination of rector etc.

The other hands of this situation are trend in tertiary education in ICT. Findings mentioned above have the fundamental influence on the situation in the ICT. According to the (Doucek, 2010), is the share of Czech work force in ICT sector on the whole European ICT sector work force approximately 2.8 %. (Doucek, 2010) writes that the number of ICT professionals in the Czech Republic is from the "European" point of view constant. On contrary we can expect increase in demand for ICT specialists in years 2011, 2012 after finishing economic crisis. We can expect critical lack of ICT specialists in the context of the Fig. 6. The lack of ICT educated professionals could cause decreasing competitiveness of the whole economy, decreasing global innovation potential and these two facts with their impacts could start way to oncoming poverty of nation.

This fact is important warning for all major players on the ground of educations – universities, ministry of education, youth and sports (MEYS), applicants and employers. MEYS has to determine conception of tertiary education especially defines limits for target numbers of students and expected graduates. Hand in hand with these limits should be clearly defined qualitative characteristics that should be fulfilled by the students. Universities also have to pay attention to quality of education and not only to quantity. MEYS should change the access to the study programs oriented on education of future ICT specialist. It should be these study programs significantly boosted and motivated to providing quality education and enrolled for study not all students but only the best students according to our view.

Not all is possible solve only from position of MEYS. Also employers should be more interested in education of their potential applicants and for example to influence tertiary education at least through definition of knowledge that expect from graduates. The second problem with employers is that they do not want to employ graduates at bachelor level and the number of graduates at master level does not cover their requirements.

On contrary the EU support some of our above mentioned proposals through the strategy document "Europe 2020". Europe 2020 defines in the second target (R&D / innovation) and in the four targets (Education) following targets:

- 3% of the EU's GDP (public and private combined) to be invested in R&D/innovation,
- Reducing school drop-out rates below 10% and allow at least 40 % of 30-34-year-olds completing third level education

As we see, these targets are in contradiction to the plans of the MEYS. In the target R&D/innovation is current value only 1.47 % GDP and expenditures will be furthermore reduced. In the second target is the value from year 2010 in the Czech Republic only 20.04 %, that means only one half of defined target. (European Commission, 2011)

In the context of the previous paragraph we can say that proposed changes cannot lead to the targets defined in "Europe 2020".

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8. References

Czech Statistical Office, 2009. Demografická ročenka 2009. Retrieved 4.1.2011, [Online], Available: http://www.czso.cz/csu/2010edicniplan_nsf/p/4019-10.

Czech Statistical Office, 2011. HDP – výrobní metoda, Retrieved 13.05.2011, [Online], Available: http://apl.czso.cz/pll/ročenka/ročenkavyber.makroek_prod

Doucek, P., Novotny, O., Pecakova, I., Vorisek, J., 2007. *Lidské zdroje v ICT*. Praha : Professional Publishing, 2007, pp. 179 202. (In Czech)

Doucek, P., 2010. Human Resources in ICT – ICT Effects on GDP. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: *IDIMT-2010 Information Technology – Human Values, Innovation and Economy*. Linz : Trauner, pp. 97–105

European Commission, 2009. *Key Data on Education in Europe 2009*, European Commission, 2009, ISBN: 978-92-9201-033-1

European Commission, 2011. Europa 2020, European Commission 2010, Retrieved 11.9.2011, [Online], Available: http://ec.europa.eu/europe2020/targets/eu-targets/index_cs.htm#Eurostat

Eurostat. Statistics, 2010. Retrieved 18.1.2010, [Online], Available: <http://epp.eurostat.ec.europa.eu/portal/page/portal/education/data/database>.

Fiala, T., Langhamrová, J., 2010. Population Projection of the Number and Age Structure of ICT Experts in the Czech Republic. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: *IDIMT-2010 Information Technology – Human Values, Innovation and Economy*. Linz : Trauner, 2010, pp. 115–123.

Maryska, M., Novotny, O., Doucek, P., 2011. ICT Knowledge Analysis of University Graduates. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: *IDIMT-2010 Information Technology – Human Values, Innovation and Economy*. Linz : Trauner, 2010, pp. 125–135. ISBN 978-3-85499-760-3.

Institute for information in education, 2011. databáze studentů. Retrieved 7.1.2011 [Online], Available: <http://www.uiv.cz>. (In Czech)

Vltavska, K., Fischer, J., 2010. Labour Productivity and Total Factor productivity in the Czech ICT. Jindřichův Hradec 08.09.2010 – 10.09.2010. In: *IDIMT-2010 Information Technology – Human Values, Innovation and Economy*. Linz : Trauner, 2010, pp. 251–257.

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