

# Tertiary education and the crisis of public finance

*Milos Maryska, Petr Doucek, University of Economic, Prague, Czech Republic*

Copyright © 2012 Milos Maryska, Petr Doucek.  
Article first published in "Journal of Systems Integration", V. 3, n. 2 (2012), pp. 74 – 87.  
Reprinted with permission.  
<http://www.si-journal.org/index.php/JSI/article/view/125>

**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.

**KEYWORDS:** *Global economic crisis, ITC students number decreasing, Labor market, State subvention, Tertiary education system*

## 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.

### **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.

### **Schooling system**

According to Doucek, Novotny, Pecakova and Vorisek (Doucek et al., 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 ICT Knowledge Analysis of University Graduates (Maryska et al., 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 influenced directly by policy of Ministry of Education. The 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 Table 1. In the Table 1 each rows provides information about the tertiary education system in the Czech Republic in years 2003/4, 2006/7 and 2009/10.

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

Table 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)

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. 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 Table 1 that the size of graduate's pool will be increasing in the next 13 years. But this increase has to take into account also situation at other levels of education. In opposition to the previous fact, we see that number of students decreases 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 in Czech Statistical Office (2009), Eurostat (2010) and Fiala, Langhamrova (2010).

Other very important numbers are presented in following Table 2. For university education is interesting the number of high school students with leaving examination that is the potential source for the tertiary education system. These graduates create the potential pool for enrollment 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 Figure 6).

Table 2. Numbers of students at high school level of study in the Czech Republic.

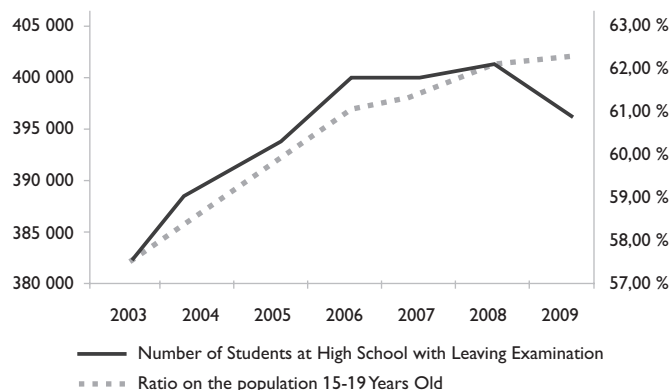
Source: authors (Institute for Information in Education, 2011)

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 Figure 1 is prepared in the context of the previous two tables and describes the number of student's at secondary level of study that means high school finished by leaving examination, and their percentage 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 few years. The portion of high school students in the selected population is increasing between years 2003 and 2009 5% points from 57% to 62%.

Figure 1. Numbers of students at High school with leaving examination and their portion on the population 15-19 years old.

Source: authors (Eurostat, 2010)



The situation in universities can be characterized 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 Figure 2 and Figure 4. Trend in ratio of all university students on population in Europe and in the Czech Republic is in Figure 2.

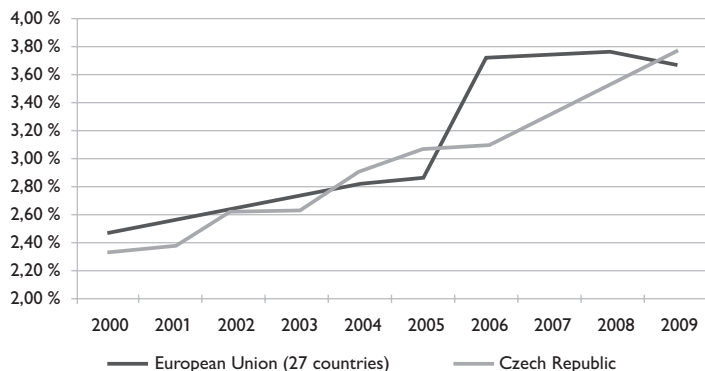


Figure 2. Ratio of all university students on population in the Czech Republic. Source: authors (Institute for Information in Education, 2011)

Structures of the students participation in the tertiary education system presented in Figure 3. It was already apparent in 1998 that more 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 graduated was very stable representing approximately three women graduated for every two men (European Commission, 2009).

The Czech situation is visible on Figure 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 comes from IT related study programs in our university – we have approximately 12% of women at the start of ICT study programs at our university (bachelor study the first semester).

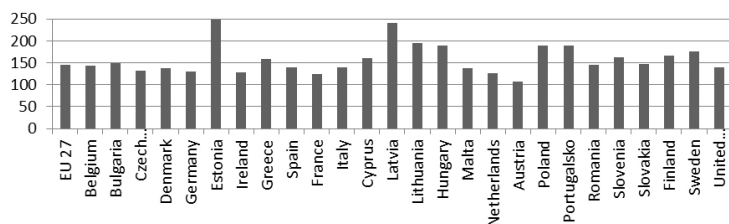


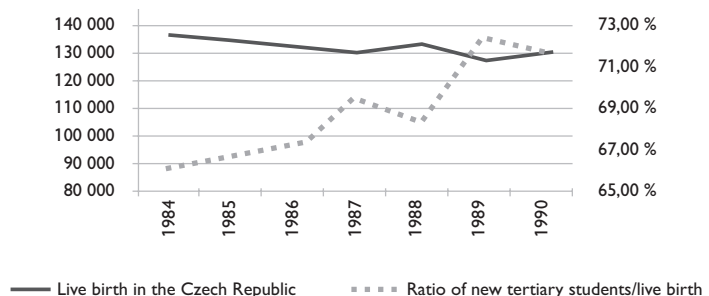
Figure 3. Number of women per 100 man graduating from tertiary education 2006. Source: European Commission, 2009

As presented above, the average age of students entering universities is 19.5 years in the Czech Republic. On this fact is based the comparison in Figure 4. We have compared number of new enrolments to the tertiary education (19 years old) to the number of children born in the same year. We see (Figure 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 Table 3.

Table 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

Figure 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 Figure 2 and Figure 4, the portion of all university students in population 15-19 years old is increasing, meaning that for tertiary study are enrolled students with worse results from high school.

These statements are supported by the following Figure 5 that presents the number 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).

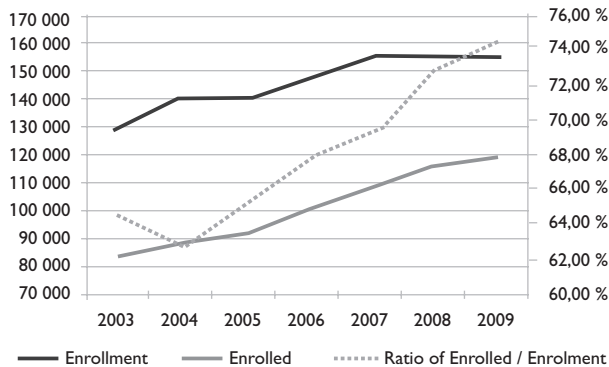


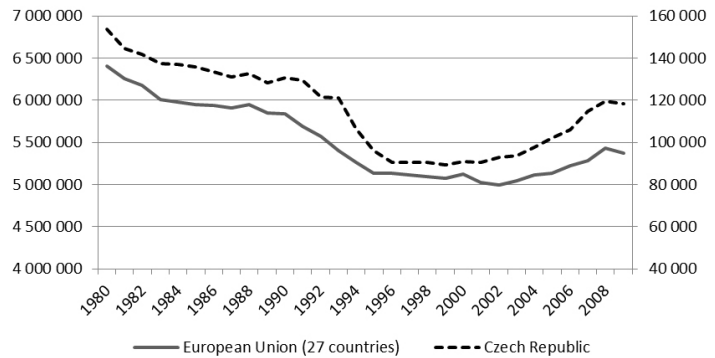
Figure 5. Number of enrolment, enrolled and ratio of student in the Czech Republic. Source: authors (Institute for Information in Education, 2011)

Detailed information about analysis of graduates is presented in *ICT knowledge Analysis of University Graduates* (Maryska et al., 2010).

The graph presented in the Figure 6 presents the 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.



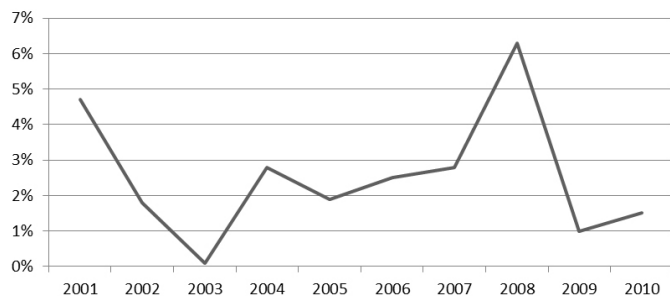
Figure 6. Time series of live births in the Czech Republic.  
Source: authors (Eurostat, 2010)



### Economic indicators in tertiary education system

Above presented facts give us information about numbers of students. These facts are important, but for a detailed evaluation of the situation in the tertiary education they are not sufficient. It is also important to realize the analysis of economic indicators in the education system. 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 in the following Figure 8. The dotted line in 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 these expenditures increased 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 the evolution of inflation in this period for bettering up the value of this information (Figure 7).

Figure 7. Annual inflation rate in the Czech Republic in analyzed period.  
Source: authors (Czech Statistical Office, 2009)



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 findings are 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 in the way of paying for accommodation during the study period. Until the year 2006 directly to the campuses but from the year 2006 it have been governmental financial was provided directly to the student that satisfy all condition defined by law.

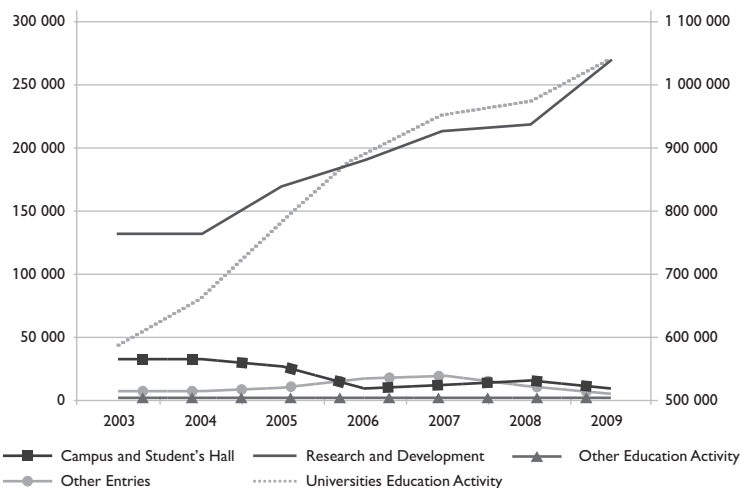


Figure 8. Expenditures on tertiary education system in detail (in thousand EUR).  
Source: authors (Institute for Information in Education, 2011)

Trends presented in Figure 8 are completed by the Table 4. It provides detail information about each of analyzed entries in the Table 5. New information resulting from the Table 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.

Table 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 Table 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.

Table 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 Figure 8 and Table 4 was divided into investment and noninvestment part in the Figure 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 Figure 9 (the dotted line on right axis) is slightly increasing from 0.73% to 0.91% in the period 2003 and 2009.

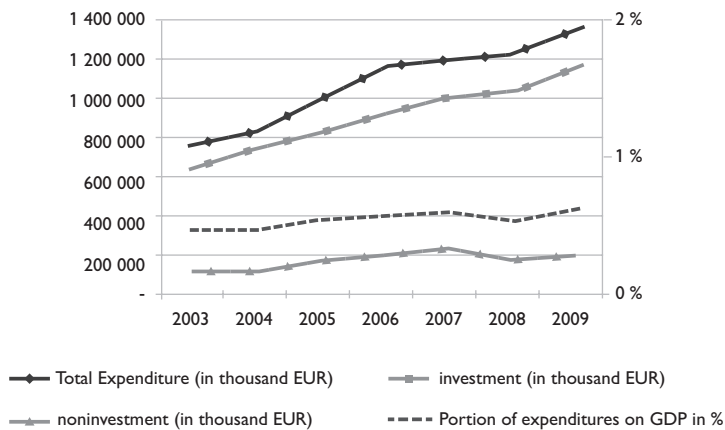
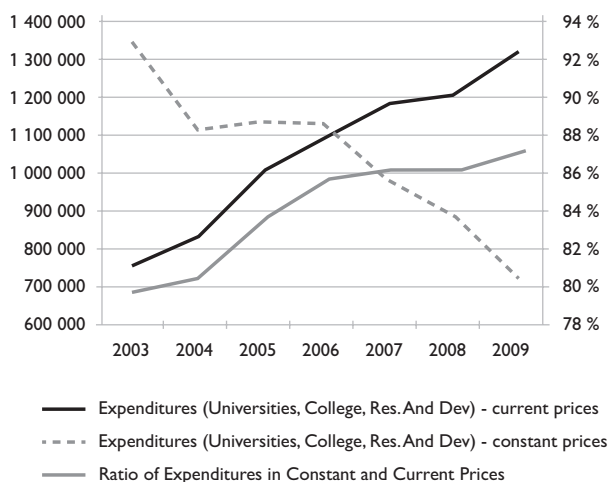


Figure 9. Expenditure on tertiary education and their portion on GDP. Source: authors (Institute for Information in Education, 2011)

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

Figure 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 visible, the space is enlarging that means that the real expenditures on tertiary education system without influence of price changes are significantly lower.

Figure 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.

### 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 expenditure 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, we have used for recalculation of current prices on constant prices the price level of the year 2000. As we see in the Figure 11 the total expenditure is increased between years 2003 and 2006. Between years 2006 and 2008 the total expenditure decreases almost to the level of the year 2004. In the next period since year 2008 this indicator increased. The indicator

of 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 while between years 2004 and 2006 presents on increasing trend (above mentioned indicators also increased in this period). Since the year 2006 this indicator constantly decreases. This analysis shows investment and noninvestment expenditure. Except noninvestment expenditure are other analyzed indicators increasing from year 2009.

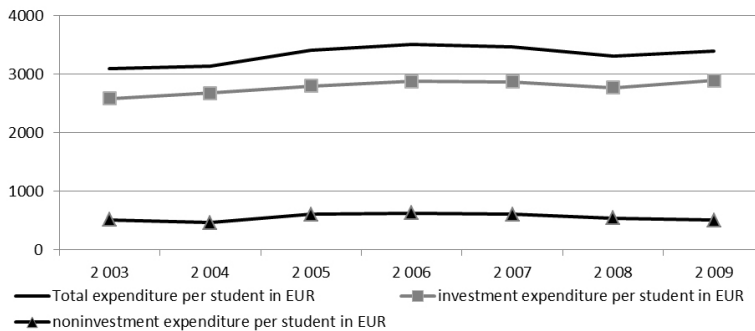
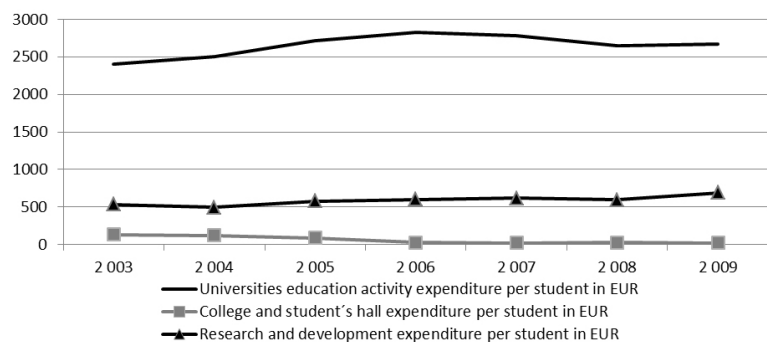


Figure 11. Investment, noninvestment and total expenditure per student in the tertiary education system. Source: authors (*Institute for Information in Education, 2011*)

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 visible in 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 the majority of all expenditure in tertiary education system.

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

Figure 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 Figure 13. The Figure 13 provides comparison of governmental expenditure 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 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), the comparison of total expenditures in constant prices show that the situation is absolutely different. There is visible in the Fig. 13 that the increase of expenditure into the tertiary education in constant prices is smaller than in current prices.

In period 2006-2008 expenditure per one student in constant prices decreased from 3 000 EUR to 2 720 EUR. This fact has a strong impact on further situation in tertiary education system. Expenditure 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 expenditure in current prices per one student are decreasing. In the context analysis realized in the Figure 11 and in the Figure 12 we know that the total expenditure is 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.

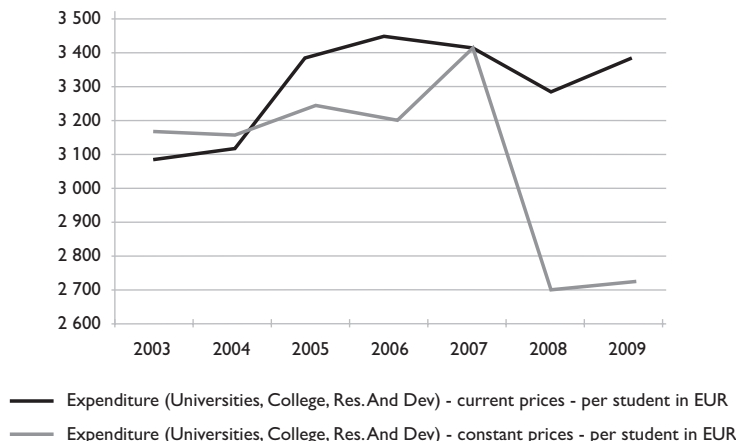


Figure 13. Expenditure in tertiary education system per student in constant and current prices. Source: authors (Institute for Information in Education, 2011)

The Figure 13 contains answers to the hypothesis H2: Expenditure 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 the analyzed periods. Especially indicators of expenditure in constant prices based on the price level of the year 2000 was strongly decreasing between years 2007-2008.

### Situation in ICT related tertiary education

This part of the contribution describes the current situation in ICT related tertiary education. 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 of the ICT tertiary education. The number of ICT companies (delivery and development centers like IBM, DHL, Microsystems etc.) is still increasing. These and other companies

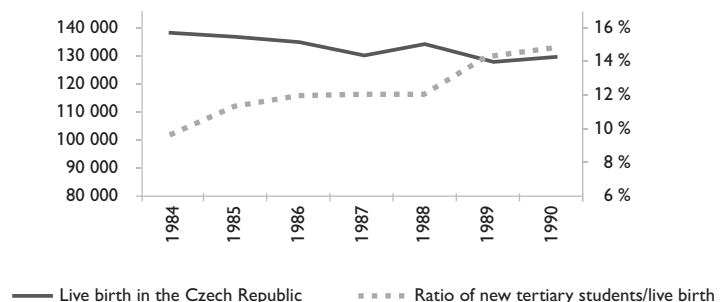


require a lot of ICT specialists and these ones are obviously expected to graduate in a master study program (Doucek et al. 2007). The situation in the last few years is not too positive in this area in the Czech Republic, although number of new students (Figure 15) and their share on total number of all tertiary students and also their portion on number of live births (Figure 14) is increasing and slowly is also increasing the number of graduates (Figure 16), there are some problems that cause current scarcity of ICT specialists:

- knowledge level of graduates at bachelor level
- knowledge level of graduates at master level
- number of ICT specialist graduate 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 *Lidské zdroje v ICT (2007)* and *ICT Knowledge Analysis of University Graduates (2010)*.

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



The first graph in this part (Figure 14) presents the percentage 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 increases in the analyzed years and is increasing from 10% to 15% during 6 years. Detailed information about the number of new students and graduates are presented in the Figure 15 and Figure 16. In the Figure 15 is visible that the number of new students is increasing at bachelor and master (2-years) level and relatively

stable at 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 Figure 15. It is visible (Figure 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 are only between 3 500 and 4 000 students (Figure 15) in years 2008 and 2009 but their number is quickly increasing. These numbers are important to compare with numbers of graduates (see Figure 16).

The term “new students” represent the 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 students were enrolled for more than one study program.

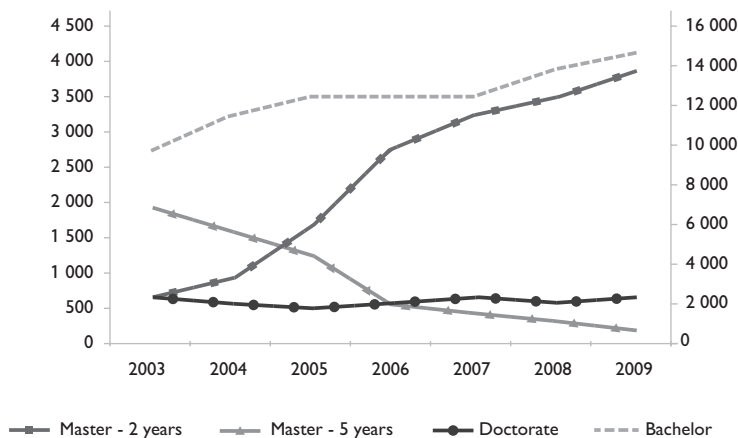
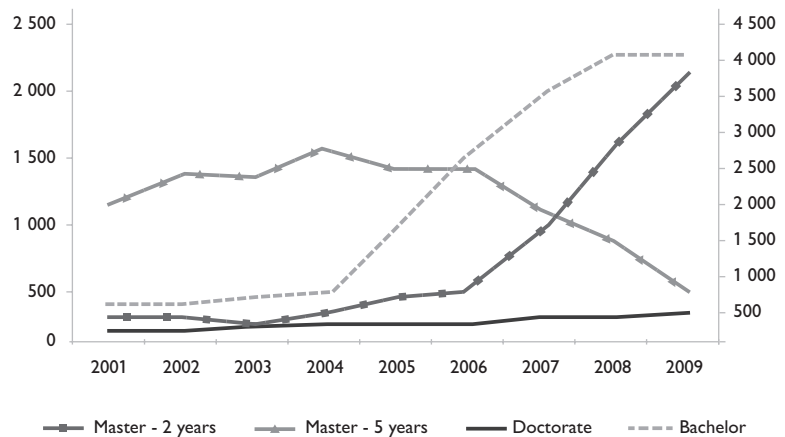


Figure 15. Number of new students in ICT related study programs in tertiary education. Source: authors (Institute for Information in Education, 2011)

In the Figure 16 the number of graduates in ICT related study programs is presented. The dotted line (right axis) represents the number of graduated at bachelor level. This line had a really dynamic increasing trend between year 2004 and 2007. The cause of this trend was the acceptance of the Bologna declaration and establishment of new bachelor study programs. The situation is the same at master level but with delay in length of approximately 2 years. This delay is caused by the length of the master study. A different situation is visible in the 5 years master study which is

Figure 16. Numbers of ICT graduates in tertiary education. Source: authors (Institute for Information in Education, 2011)



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

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

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

## Conclusion

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

Although old EU members has different values of basic economic indicators like GDP per Capita, on the other side a lot of various important indicators 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 for 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 number of potential students entering tertiary education system. In the Czech republic it 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 of 25% during this period. This number will be almost constant for next five years up to 2021. This number of students will increase 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 (Maryska et al., 2010).

One of the cautionary examples that can be mentioned is the Czech Republic. In the Czech Republic is currently in preparation a 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 hand of this situation is the trend in tertiary education in ICT. Findings mentioned above have the fundamental influence on the situation in the ICT. According to (Doucek, 2010), the share of Czech work force in ICT sector on the whole European ICT sector

work force is approximately 2.8%. Doucek writes that the number of ICT professionals in the Czech Republic is from the “European” point of view constant. On the 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 Figure 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 impact, could start the way to oncoming poverty of nation.

This fact is an 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 defining limits for target numbers of students and expected graduated. 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. These study programs should be significantly boosted and motivated to provide quality education and enroll for study not all students but only the best students according to our view.

Not everything can be solved 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 graduated. The second problem with employers is that they do not want to employ graduated at bachelor level and the number of graduates at master level does not cover their requirements.

On the 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) the 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 current value is only 1.47% GDP and expenditure will be furthermore reduced. In the second target the value from year 2010 in the Czech Republic is only 20.04%, that means only one half of defined target (European Commission, 2011)

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

## Acknowledgement

Paper was processed with contribution of GAČR by handling task P403/10/0092 projects titled "Advanced Principles and Models of Managing Business Informatics" and GAČR 402/09/0385 "Human Capital in IS/ICT Operations and Development: Competitiveness of Czech Tertiary Education Graduates".

## References

Czech Statistical Office (2009), *Demografická ročenka*,  
<http://www.czso.cz/csu/2010edicniplan.nsf/p/4019-10>

Czech Statistical Office (2011), *HDP – výrobní metoda*,  
[http://apl.czso.cz/pll/ročenka/ročenkavyber.makroek\\_prod](http://apl.czso.cz/pll/ročenka/ročenkavyber.makroek_prod)

Doucek Petr, Novotny Ota, Pecakova Iva, Vorisek Jiří (2007), *Lidské zdroje v ICT*, "Praha: Professional Publishing", pp. 179-202

Doucek Petr (2010), *Human Resources in ICT – ICT Effects on GDP*. Proceeding of the IDIMT-2010 Information Technology – Human Values, Innovation and Economy, 8 – 10 September 2010, Jindřichův Hradec, Czech Republic, Trauner, pp. 97–105

European Commission (2011), *Europa 2020*  
[http://ec.europa.eu/europe2020/targets/eu-targets/index\\_cs.htm#Eurostat](http://ec.europa.eu/europe2020/targets/eu-targets/index_cs.htm#Eurostat)

All URLs checked  
June 2013

European Commission (2009), *Key Data on Education in Europe 2009*  
[http://eacea.ec.europa.eu/education/eurydice/documents/key\\_data\\_series/105en.pdf](http://eacea.ec.europa.eu/education/eurydice/documents/key_data_series/105en.pdf)

Eurostat (2010), *Statistics*  
<http://epp.eurostat.ec.europa.eu/portal/page/portal/education/data/database>

Fiala Tomáš, Langhamrová Jitka (2010), *Population Projection of the Number and Age Structure of ICT Experts in the Czech Republic*. Proceeding of the IDIMT-2010 Information Technology – Human Values, Innovation and Economy, 8 – 10 September 2010, Jindřichův Hradec, Czech Republic, Trauner, pp. 115–123

Institute for Information in Education (2011), *databáze studentů*  
<http://www.uiv.cz>

Maryska Milos, Novotny Ota, Doucek Petr (2010), *ICT Knowledge Analysis of University Graduates*. Proceeding of the IDIMT-2010 Information Technology – Human Values, Innovation and Economy, 8 – 10 September 2010, Jindřichův Hradec, Czech Republic, Trauner, pp. 125–135

Vltavska Krystina, Fischer Jakub (2010), *Labour Productivity and Total Factor productivity in the Czech ICT*. Proceeding of the IDIMT-2010 Information Technology – Human Values, Innovation and Economy, 8 – 10 September 2010, Jindřichův Hradec, Czech Republic, Trauner, pp. 251–257

## Sintesi

*L'attuale società globalizzata risulta contraddistinta da due caratteristiche essenziali, la turbolenza economica e una crescente dipendenza di tutte le attività umane dall'ICT.*

*Benché la crisi economica abbia causato già nel 2009 un vistoso disinvestimento in ambito ICT, si è calcolato che fino alla fine del 2013 l'intero settore creerà in Europa*

quasi 5,8 milioni di nuovi posti di lavoro che ovviamente necessiteranno di altrettanti lavoratori specializzati, opportunamente qualificati.

È in questo complesso scenario internazionale che s'inserisce la ricerca tuttora in corso presso la Facoltà di Informatica e Statistica dell'Università di Economia (VŠE) di Praga, la quale analizza in particolare il sistema dell'istruzione universitaria nella Repubblica Ceca.

Essa identifica alcune tendenze chiave destinate, nel decennio venturo, a dominare l'istruzione e la formazione nell'ambito informatico e tecnologico non soltanto nella Repubblica Ceca ma in tutta Europa. In tal modo si prevede che nei prossimi dieci anni il numero di studenti nel campo ICT diminuirà in misura considerevole e, specularmente, aumenterà il numero di esperti ICT richiesto dal mercato del lavoro. Dal punto di vista macroeconomico, si prevede altresì che le sovvenzioni governative al sistema dell'Higher Education si ridurranno significativamente nell'intera Unione europea, impedendo di fatto il raggiungimento degli obiettivi proposti dalla Strategia Europa 2020. E all'orizzonte non si profilano – né a livello nazionale né a livello comunitario – interventi in grado di modificare radicalmente o quanto meno attenuare le tendenze in atto.

Verosimilmente, la carenza di professionisti ICT provocherà quindi, in tutto il Paese, una grave perdita di competitività economica e di potenziale di innovazione, con un impatto assai negativo sulla ricchezza nazionale.