

# THE CORRELATION OF CHANGES OF THE TOTAL PUBLIC EXPENSES ON THE EDUCATION IN THE CZECH REPUBLIC ON THE CHANGES OF GDP OF THE CZECH REPUBLIC IN THE YEARS 2001 – 2010

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## Abstract

*In the paper I will investigate whether there is a correlation between changes of the total public expenses on the education in the Czech Republic and the changes of GDP of the Czech Republic in 10 years period (in the years 2001 – 2010). I present a comparison and a comment to the development of changes of the total public expenses on education in the Czech Republic and a development of the GDP of the Czech Republic in the years 2001 – 2010.*

**Keywords:** *budget, public expense, GDP, Ministry of education, youth and sports, financing, school system, education.*

**JEL:** *I25 - Education and Economic Development*

## 1 INTRODUCTION

Education and learning is the only possible mean of achieving European economic, cultural, moral and political maturity. The level of education is considered to be socially beneficial. State policy [9] in education according to the Ministry of Education, Youth and Sports documents, presents an influence of state by state institutions and other instruments of state, providing conditions for the development and personality development of children and youth and among other things also creating conditions measures. If the company will consist mostly of educated and intelligent people, it can reduce crime, poverty, state expenditure on social and other support, which clearly has a positive impact on the country's economy. Only high-quality human capital in which is invested in education, information, culture and health is able to achieve knowledge and innovation potential. Governments should be aware of it and investment in human capital should be encouraged. [22]

Rich sources and resources are devoted to the issue of funding education: the outputs of the Institute for Social and Economic Analysis (ISEA); National Programme

of the Development of Education in the Czech Republic ; White Paper issued by the Ministry of Education [19]; The budget of the Ministry of Education Chapter 333 of the year and the distribution of binding parameters among school sections, issued by the Ministry of Education; annual reports and analysis of the Czech Statistics Office about GDP.

Aim of this paper is to determine if there is a correlation between changes in total public expenditure on education in the CR and CR GDP changes in the selected period of 10 years (2001-2010). In this paper I present a comparison of development of the total public expenditure on education in the CR and the development of GDP of the Czech Republic in the years 2001-2010. The work is based on a theoretical basis and generally accepted conclusions in this area. Methods of description, correlation analysis, synthesis and subsequent deduction and evaluation are used in processing of this paper.

Czech Republic, unfortunately, has not advanced much towards the knowledge society. Contrary to statements from the political representation, our society makes only small steps to a knowledge society. Czech Republic still ranks among countries with medium high investments in human resources. There is not a tuition officially existing on state and public universities in the Czech Republic and responsibility for funding students studying at public universities is taken by the state. The right to education without tuition fees can be, simply speaking, applied only within the quotas set for each year. This quota determines the maximum number of students that can be admitted to university within the existing financial limits (ie state grants to public universities). The question remains, what will be the budget policy of the government to the education sector. By the notorious lack of funds in the Treasury, it is expected that the introduction of tuition fees will not alleviate the financial problems of schools by a single crown. [5]

## **2 PUBLIC EXPENSES ON EDUCATION**

One of the indicators in the educational system of the country is the share of total expenditure from public sources on the GDP, which the particular country invests in education (see Figure 1). The state budget is an essential element of public finances, because it concentrates the biggest part of income to the budget system and is mostly involved in irretrievable redistribution of a significant part of GDP through the budget system. Thus we can find out, how important position has the area of education in the particular country, by measuring the share of expenditure from public resources into education on GDP. The amount of public expenditure on education is influenced by many factors. One of the most important is the overall economic development of the state and above all the total amount of the state budget. Education is financed from the budget of the Ministry of Education, Youth and Sports (Chapter 333), from the budget of other ministries that are founders of these schools, the budget of municipalities, voluntary citizens' groups and regional offices. Public budgets are still the main source of funding education, but the share of private funding is growing. Private sources can

be divided into self-financing, sponsorship, or growing of their own qualified human resources by the private companies. 93 % of primary, secondary and post-secondary (non-tertiary) education in OECD countries is on average covered by public funds. Between the years 1995-2003 [20] an increase of financial flows to education (all its stages) is shown in exactly as many countries as many other countries their financial flows reduced (investments are measured from the ratio of total public resources, thus investment may not be reduced in fact, but by the growth of the economy the investment in education are only not increased).

Gross domestic product is the sum of values added by all sectors of activity considered in the system of national accounts as productive (ie, including market and non-market services). This calculation uses purchase prices at which market outputs are implemented (ie, including taxes on products and excluding subsidies on products). For non-market services the added value is expressed as the sum of compensation of employees and consumption of fixed capital. The initial calculation is made at current prices (these values are used in this paper). To follow the development of GDP, excluding the impact of price changes, the transfer of the average prices of the previous year would be made, of which by the so-called chaining we would obtain data in constant prices of 2000. Data are not adjusted for unequal working day effects.

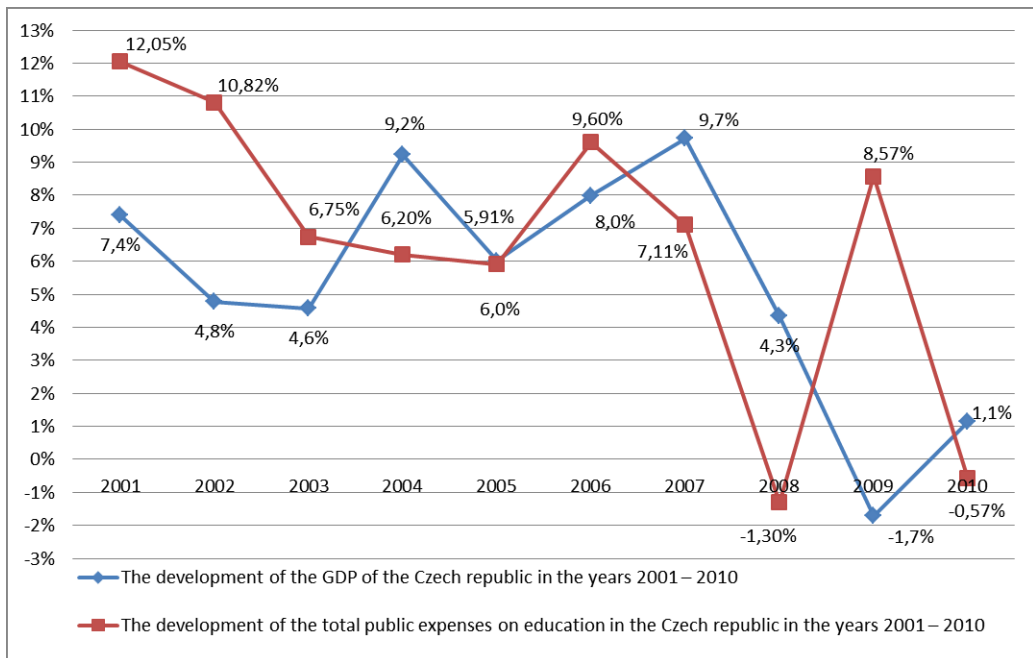
Public expenditure on education as a proportion of all public expenditure characterize the priority of education relative to other public expenditure such as health, social care, national defense and Home Office of the Czech Republic . This is the share of direct public expenditure on educational institutions, including public subsidies and grants to households and other private entities by levels of education, in total public expenditure. Total expenditure on education includes data from chapters 333-Ministry of Education, Youth and Sports; 700-Municipalities and voluntary associations of persons, regional offices, 380-District Offices (budgetary measures from Ministry of Education, Youth and Sports) and other sections. Since 2007, transfer of funds from Chapter 307 of the regions was subtracted from the total expenditure on education. The annual reduction in expenditures in 2008 is because the government departments unused funds were not moved into reserve funds, and they were not included in the use (application of Act No. 26/2008 of the Code). [13, 14, 15, 16, 17, 18]

### **3 COMPARISON OF GDP DEVELOPMENT OF THE CZECH REPUBLIC AND DEVELOPMENT OF TOTAL PUBLIC EXPENDITURE ON EDUCATION IN THE CZECH REPUBLIC**

For the purpose of the paper, to determine if there is a correlation between changes in GDP and changes in the CR total public expenditure on education in each year, it is necessary to show a development of both variables in the selected ten-year period, ie in the years 2001-2010. In Figure 1 (source data from Table 1) is shown the development of CR GDP (at current prices, that is not counted for the effects of inflation; last year is 100 %) in the years 2001-2010 and

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the development of total public expenses on education in the Czech Republic in the years 2001-2010 (in current (nominal) prices, previous year is 100 %). Public expenses on education are understood as expenses on education and training in school, preschool and school facilities spent from public funds (ie from the state budget and local budgets).



**Figure 1: Comparison of the development of changes in GDP of the Czech Republic and changes in total public expenditure on education in the Czech Republic in 2001-2010<sup>1</sup>**

**3.1 Comments on the comparison of the Czech Republic GDP development and development of total public expenses on education in the Czech Republic in 2001-2010**

In the Figure 1 is monitored the development of total public expenditure on education in the CR in observed ten-year period (years 2001-2010), (previous year is 100 %). Development of CR GDP (at current prices, previous year is 100 %) is monitored in the same graph in the same period. Source data are listed in Table 1.

Development of total public expenditure on education in the CR in 2001-2003, has similar shape as scores of GDP development of the Czech Republic in this period (both observed variables show reduction in the rate of growth). Reduction in the rate of growth of total public expenditure on education in the Czech Republic continues until

<sup>1</sup> Figure 1 structured by author, data from Table 1.

2005. CR GDP recorded an increase in the rate of growth in 2004, with its consequent reduction in the following year (2005). The estimate of the GDP development in CR for 2006, manifested by the increased pace of growth, was real. Equally total public expenditure on education in the Czech Republic were planned and budgeted. The trend of reduction in GDP of CZ rate of growth was forecasted in 2007, but the CZ GDP shows growth. In the world, the influence of emerging global economic crisis was noticeable, starting in 2008. Development of total public expenditure on education in the Czech Republic in 2007 already shows a loss in the rate of growth from 9.6 % to 7.1 % and continues by decrease of the growth rate and ultimate decline of GDP in 2008 (-1.3 %, see Figure 1).

Budgeting of the total public expenses on education in the Czech Republic for the year 2009, based on the GDP development in 2008 is surprisingly optimistic and budgeted change in development is almost 9% (8.57 %). This increase in the rate of growth of total public expenditure on education in the Republic was due to the influence of increase in salaries for the staff in education system and increasing expenditures in the area of operational programs. These include the Structural Funds, aimed at promoting national dimension of education support. In the programming period 2007 - 2013 is in the Czech Republic focused on tertiary education Priority Axis 2 of the Operational Programme "Education for Competitiveness". This operational program draws from the European Social Fund and for the Priority Axis 2 is allocated € 626.6 million, ie 35 % allocation of the entire operational program. Its governing body is the Ministry of Education, Youth and Sports.

The International Monetary Fund (unites 185 countries of the world) in its forecast in January 2009 said that global economic growth will fall in 2009 to 0.5 %, while in 2008 it reached 3.4 %. In November 2008 the estimate of growth for 2009 was still 2.2 %. [1] Reduction in the rate of growth of GDP of the CR occurs in 2009 (-1.7 % at current prices), but total public expenditure on education in the CR this year, as already commented above, increased their growth rate. This positive blip in the development of the growth rate of total public expenditure on education in the CR in 2009 was replaced by a reduction in growth rate (-0.57 %) in 2010. Subsequent positive CZ GDP development in 2010 offers an optimistic outlook for the budgeting of total public expenditure on education in the Czech Republic for the year 2011. A positive influence have the news about the unwinding of the global economic crisis.

The global economic crisis was in 2008 indicated by several important indicators. The primary cause was the American mortgage crisis in 2007, which gradually grew into the global financial crisis in 2008. High oil prices in the first half of 2008 also played an important role, which led to a decline of the real GDP and a rise in consumer prices. [4] It can be assumed, according to commented connectors of traces of the development total public expenditure on education in the Czech Republic and the connectors of CZ GDP development, that the prediction of GDP of the CR was more difficult by the onset of the global economic crisis thus the quality of the basis for budgeting has decreased for next year. In this paper, there is not monitored the

development of budgeting of the total expenditure of chapter 333 of the Ministry of Education, Youth and Sports, but if there is any budgeting, it may be assumed that this budget will usually be exceeded. The negative impact of the global economic crisis still join other negatively acting factors such as the ongoing reform of the public finance of the Czech Republic, the demographic development in the country and also the ongoing discussion on tuition.

### 3.2 Correlation coefficient of CR GDP development and development of total public expenditure on education in the Czech Republic in 2001-2010

To determine the dependence (construction of graph 2 (Figure 2) and calculation of correlation) between changes in GDP of CR and changes in development of total public expenditure on education in the Czech Republic in the years 2001-2010 the source data in Table 1 are used.

The simplest relationship between two metric variables is a linear relationship, whose rate can be determined by correlation coefficient. The term correlation is used in statistics, which is a mutual linear relationship between characteristics or variables  $x$  and  $y$ . If one of them changes, correlatively changes also the second and vice versa. If the two processes show a correlation, it is likely that they depend on each other, but it can not be concluded yet, that one of them is the cause and the second result. The correlation itself does not allow to decide this. The degree of correlation is expressed by the correlation coefficient, which is always a number from the interval  $<-1.1>$ . The value  $+1$  of the correlation coefficient indicates an entirely direct dependence. If the correlation coefficient equals to  $0$  (non-correlation), then there is no statistically detectable linear dependence between the characters. Is worth noting that even with zero correlation coefficient the quantities can depend on each other, only this relationship can not be expressed by a linear function, even not approximately.

The relationship between characters and variables  $x$  and  $y$  can be positive if (approximately) it is true  $y = kx$ , or negative ( $y = -kx$ ). The value  $-1$  of the correlation coefficient indicates an entirely indirect dependency (anticorellation), so the more you increase the value in the first group of characters, the more it diminishes the value in the second group characters.

The equation calculating the correlation coefficient is:

$$\rho_{x,y} = \frac{\text{cov}(X,Y)}{\sigma_x \sigma_y} = \frac{E((X - \mu_x)(Y - \mu_y))}{\sigma_x \sigma_y}, \quad (1)$$

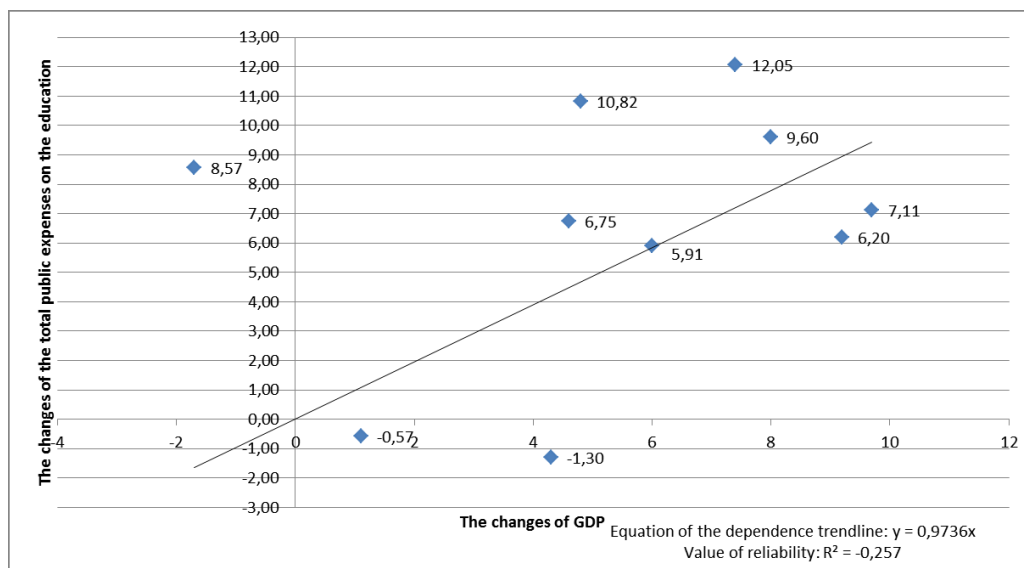
where  $x$  and  $y$  are the mean of the selection  $\text{AVERAGE}(\text{matrix1})$  and  $\text{AVERAGE}(\text{matrix2})$ . [6]

**Table 1: The values for calculating the correlation between the Czech Republic GDP development and the development of the total public expenditure on education in the Czech Republic in the years 2001-2010**

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
The development of the GDP of the Czech Republic in the years 2001 – 2010 (n. p.)	7,4	4,8	4,6	9,2	6,0	8,0	9,7	4,3	-1,7	1,1
The development of the total public expenses on education in the Czech Republic in the years 2001 – 2010 (n. p.)	12,05	10,82	6,75	6,20	5,91	9,60	7,11	-1,30	8,57	-0,57

From the values of the Table 1 above was calculated the correlation coefficient between changes of GDP of the Czech Republic and changes of the total public expenses on education in the Czech Republic in the years 2001-2010.

The calculated value of the correlation coefficient is: 0.2946.



**Figure 2: The correlation between the Czech Republic GDP development and the development of the total public expenditure on education in the Czech Republic in the years 2001-2010<sup>2</sup>**

<sup>2</sup> Figure 2 structured by author, data from Table 1.

### **3.3 Correlation coefficient of Czech Republic GDP development and the development of total public expenditure on education in the Czech Republic in the years 2001-2010**

To calculate and visualize the correlation between the development of changes in CR GDP and the development of changes in total public expenses on education in the Czech Republic in the years 2001-2010 a source Table 1 was compiled and a graph 2 (Figure 2) constructed. The correlation coefficient was calculated in Microsoft Excel 2010 using CORREL function. The value of the correlation coefficient +1 indicates an entirely direct dependence and the values of both variables simultaneously increase. Linear dependence of two statistical variables was not proven. It is also suggested by Figure 2 - The correlation between the Czech Republic GDP development and the development of the total public expenditure on education in the Czech Republic in the years 2001-2010. From Figure 2 the presence of outliers in the observed period is apparent.

Due to the calculated and rounded value of the correlation coefficient  $r = 0.3$ , it can be stated that the relationship between changes in GDP of CR and the development of total public expenses on education in the Czech Republic in the selected period of 10 years (2001-2010) has a positive value, hence exists. Its significance is not too strong, due to the aforementioned outliers. Tightness of the dependence can be in detail assessed as mild tightness, located in the range of  $0.3 \leq r < 0.5$ . It is obvious from Figure 2 that these outlying values in the selected period are the values of 2008, 2009 and 2010, they are the most distant from the trendline, or a cluster of values. It can be assumed, according to the state of dependence between changes in GDP of the CR and development of total public expenditure on education in the Czech Republic in the period 2001-2010, that by the influence of the global economic crisis and crisis in public finance resources between 2008 and 2010 the predictions of the Czech Republic GDP development in these years were erroneous, thereby the quality of the basis for budgeting of the total public expenditure on education in the Czech Republic has decreased in the coming years.

## **4 CONCLUSION**

The objective of this paper was to determine if there is dependence between the changes of total public expenditure on education in the Czech Republic and changes of GDP of the Czech Republic in the selected period. I dealt with a comparison of the development of changes in total public expenditure on education in the Czech Republic and the development of changes of GDP of the Czech Republic in 10 years (2001-2010). In the paper I mentioned comparison of development of total public expenditure on education in the CR and CR GDP in the years 2001-2010. The work is based on a theoretical basis and generally accepted conclusions in this area. Methods of



description, correlation analysis, synthesis and subsequent deduction and evaluation were used when processing this paper.

In the introductory part of this work there are developments of changes of the monitored values in the selected period listed. Development of changes in GDP of the CR (at current prices, previous year is 100 %) is illustrated in Figure 1, which is designed based on data from Table 1. Development of changes in total public expenditure on education in the CR in 2001-2010 (previous year is 100 %) is visualized in Figure 1 and the source data are contained in Table 1. The decline in the development of changes in GDP in 2008-2010 is due to the manifestation of the global economic crisis and the necessity of a reform of public finances. This fluctuation in the development of changes in GDP corresponds to the fluctuations of total public expenditure on education in the country.

From the course of connectors of changes development in public expenditure on education in the Czech Republic in the years 2001-2010 and connectors of the development of changes in GDP of the CR, see Figure 1, it can be assumed that with the onset of the global economic crisis the estimation of CR GDP has become more difficult. Development of changes in total public expenditure on education in the Czech Republic in 2001-2003, has similar outcomes as states of CR GDP in this period (both observed variables show reduction in the rate of their growth). Reduction of the rate of growth of total public expenditure on education in the Czech Republic continues until 2005. The trend of reduction in the CR GDP rate of growth was forecasted in 2007, but the Czech Republic GDP shows growth. In the world, the influence of emerging global economic crisis was noticeable, starting in 2008. Development of total public expenditure on education in the Czech Republic in 2007 already shows a loss in the rate of growth from 9.6 % to 7.1 % and continues by decrease of the growth rate and ultimate decline of GDP in 2008 (see Figure 1).

The increase of the growth rate of total public expenditure on education in the CR in 2009 was caused due to increase in salaries for education system workers and increasing expenditures in the area of operational programs. Reduction in the rate of growth of GDP of the CR and subsequent decline in GDP of the CR occurs in 2009. The negative impact of the global economic crisis still join other negatively acting factors such as the ongoing reform of the public finance of the Czech Republic , the demographic development in the country and also the ongoing discussion on tuition. This positive blip in the development of the growth rate of total public expenditure on education in the CR in 2009 was replaced by a reduction in growth rate (-0.57 %) in 2010. Subsequent positive CR GDP development in 2010 offers an optimistic outlook for the budgeting of total public expenditure on education in the Czech Republic for the year 2011. A positive influence has the news about the unwinding of the global economic crisis, see Figure 1.

To calculate and visualize the correlation between the development of changes in CR GDP and the development of changes in total public expenses on education in the Czech Republic in the years 2001-2010 a source Table 1 was compiled and a graph

(Figure 2) constructed. The value of the correlation coefficient did not prove the linear dependence of two statistical variables. From Figure 2 the presence of outliers in the observed period is apparent.

Due to the calculated value of the correlation coefficient  $r = 0.3$ , it can be stated that the relationship between changes in GDP of the CR and the development of total public expenses on education in the Czech Republic in the selected period of 10 years (2001-2010) has a positive value, hence exists (values of both variables at the same time increase). The significance of the correlation is not too strong because of the influence of outliers in 2008, 2009 and 2010 in the observed period 2001-2010, see Figure 2. Dependence tightness can be assessed as mild tightness.

After the recession of the economic crisis, most OECD countries are forced to decide whether to push for sustainability of its public finances, or create a foundation for long-term economic growth. Expenditure on education is an important part of public budgets in most countries. At the same time education is also a major investment in the development of long-term economic potential of the country. Public investments in education are offset by subsequent higher financial revenues from taxes, especially from people with higher education. The advantage of education is becoming a necessity given the demographic and structural changes in the labour market. High quality education is a major factor for individual, it increases his chance to gain a job and allows him to be able to remain on the labour market longer.

Although the increase in budgetary chapter of Ministry of Education, Youth and Sports itself will not solve anything (definitely it is necessary to develop a conceptual reform), it is essential so that legislators noted that the advanced countries in the EU and also in the world, give much higher percentage of GDP out on education than the Czech Republic. Higher spending on education does not mean high expenditure on all educational levels, which vary by both - the total number of pupils who attend and different financial demands of teaching. The current solutions of the crisis of public budgets at the expense of public education funding in the form of cut education funding with the concurrent introduction of tuition fees at state and public universities and increasing tuition at private universities, mean that for people among the employees will the access to higher education be basically disallowed. Cancellation of social grants for students will cause that people with low incomes will not have access to education. The introduction or increase of tuition fees will bring minimum state budget savings and in the long-term, a decline in education of the population can have an adverse impact on the creation of GDP.

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