

## STUDIES ON THE EVOLUTION OF TAX REVENUES AND GROSS DOMESTIC PRODUCT IN THE CZECH REPUBLIC, SLOVAKIA AND SLOVENIA

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**Abstract:** *The paper presents the dynamics of fiscal revenues and gross domestic product in some European Union countries: the Czech Republic, Slovakia and Slovenia, between 2007 and 2016. The economic and financial analysis is based on the time comparison of earnings and gross domestic product over the period using the following indicators: fiscal pressure, relative revenue deviation, tax pressure dynamics, absolute revenue deviation, absolute GDP deviation, the relative change in income index and the relative change in gross domestic product index. Determination of causal links was made using the regression equation and the correlation coefficient. The case study is based on data published by Eurostat, which are being processed and analyzed.*

**Key words:** tax revenue, Gross domestic product, economic growth.

**JEL codes:** G2, G3

### Introduction

The study looked at the analysis of tax revenues and gross domestic product in some countries within the European Union; Czech Republic, Slovakia and Slovenia. The economic and financial analysis includes the presentation of some indicators of state and effect of taxation: income, gross domestic product, fiscal pressure, income dynamics, fiscal pressure dynamics, absolute income deviation, absolute GDP deviation, gross relative index of gross domestic product. The causal links between the phenomenon studied and the factors of influence were studied through the regression equation and the intensity of the relationship between an analyzed indicator and the influence factors, using the correlation coefficient  $r$ . The linear model established the link between the revenue and the product gross domestic product and the extent to which revenue affects gross domestic product. The data was retrieved from Eurostat, which was then analyzed and interpreted.

### Literature review

A series of studies on the impact of income on economic growth highlight their role on the state budget, fiscal consolidation, resource allocation and economic stabilization (Desislava Stoilova, Nikolay Patonov, 2012).

The relationship between fiscal policy and economic growth is addressed in various specialized papers, thus establishing an empirical relationship between taxes and economic growth. There are a number of mechanisms by which taxes can influence economic growth (Engen and Skineer, 1999): fiscal policy may affect productivity growth by discouraging spending on research and development, taxes can lead to a flow of resources to other sectors of activity with lower productivity, high value of taxes have a negative influence on the use of labor force by discouraging workers with large tax burdens. A series of studies on the impact of income on economic growth highlight their role on the state budget, fiscal consolidation, resource allocation and economic stabilization (Desislava Stoilova, Nikolay Patonov, 2012).

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Agel J., Ohlson P., Thoursie P., 2006; Barro, R., 1990, 1991; Folster S. & Henrekson M., 2001; Levine R. & Renelt D., 1992; Paparas D. & Richter C., 2015, quoted by Desislava Stoilova, 2017, presented the relationship between the general level of taxation and growth through the use of regression models of growth between countries of different periods.

Baro R., 1989, 1991 analyzed the variables between the real expenditures of the public consumption and the gross domestic product as a regression factor, resulting in a negative correlation with the economic growth. Colander C.D., 2006 specified the main sources of economic growth: capital accumulation and investment, available resources, technological development and entrepreneurship. One way of economic growth is to invest the income earned by the population than its consumption.

Lee and Gordon, 2005 quoted by Arnold Jens, 2008 have established a negative correlation between taxes on profit and growth.

The study of 23 countries that are part of the Organization for Economic Co-operation and Economic Growth (1965-1990) highlights that the proportion of tax revenue has increased due to personal income taxation, with a negative correlation with economic growth (Widmalm, 2001) , quoted by Arnold Jens, 2008.

Various studies have addressed the issue of fiscal policy's effect on economic growth by analyzing the influence of government revenue or expenditure as a percentage of gross domestic product with an impact on economic growth.

### **Methodology of study**

The study methodology is based on the comparison of incomes and Gross Domestic Product in the case of three countries in the European Union, namely the Czech Republic, Slovakia and Slovenia, during the period 2007-2016. In this respect the following indicators were used: absolute deviation, relative variation index, relative deviation and correlation.

a) Absolute deviation was determined with the following relationship (Buglea A, 2011):

$$\Delta F = F_1 - F_0, \text{ where:} \quad (1)$$

$\Delta F$  - absolute deviation;

$F_1$  - the actual level of the phenomenon;

$F_0$  - the level of comparison of the phenomenon.

b) The relative variation index was calculated as follows (Buglea A.):

$$I_F = \frac{F_1}{F_0} \cdot 100, [\%] \quad (2)$$

c) The relative deviation was calculated with the following formula (Buglea A.):

$$\Delta I_F = \frac{F_1 - F_0}{F_0} \cdot 100, [\%] \quad (3)$$

e) The correlation allowed the relationship between the phenomenon analyzed and the influence factors to be determined. The regression equation used is the following (Buglea A.):

$$y = ax + b \quad (4)$$

The linear correlation coefficient was determined by the relationship (Buglea A.):

$$r_{yx} = \frac{n \sum xy - \sum x \cdot \sum y}{\sqrt{[n \sum x^2 - (\sum x)^2] \cdot \sqrt{n \sum y^2 - (\sum y)^2}}} \quad (5)$$

f) In the analysis was used the diagram with simple bar and lines (Buglea A., 2011).

## Results

Table 1 and Figure 1, 2 and 3 show the situation of tax revenues and gross domestic product in the case of the Czech Republic, Slovakia and Slovenia at central government level in 2007-2016. In the Czech Republic, there is an increase in tax revenues in the study period compared to 2007. Thus in 2007 it is 54935 millions euro, and in 2016 the value of 70861,3 millions euro, resulting in an increase of 15926.3 million euros. Analyzing the evolution of the Gross Domestic Product over the same period, the tendency to increase the value of the Gross Domestic Product is recorded on the basis of comparison in 2007, with a difference of 38261,4 million euro between 2016 and 2007. It is noted that in 2009 the value is lower than in 2008, is 148682 millions euro compared to 161313,1 millions euro, with a negative difference of – 12631,1 million euros.

In the case of Slovakia, there is an increase in the value of tax revenues recorded in 2016 as compared to 2007, with a difference of EUR 12568,5 millions. The gross domestic product value shows both positive and negative variations, but the trend is increasing in the range analyzed. If the year 2016 compares to 2007, considered as the reference year, there is an increase of 24912,4 million euro in this case. There is a decrease in values in 2009 compared to 2008, when there is a difference of – 1979,7 millions.

Analyzing the situation in the case of Slovenia, there is a tendency of increasing the value of tax revenues by an increase of 2682,3 millions euro in 2016 compared to 2007. However, during this interval there are negative variations in 2009 when there is a higher value respectively, EUR 15325.8 millions compared to EUR 16112.7 millions in 2008. In the case of Gross Domestic Product, there are a number of positive and negative variations, but the overall trend is increasing, thus comparing the values in 2016 and those of 2007, an increase of EUR 5265,5 millions. There are also variations from one year to the next, namely EUR 36166,2 millions in 2009 and EUR 37951,2 millions in 2008.

Table 1.

### Statement of tax revenue and gross domestic product over the period 2007-2016 in the case of the general government (EUR millions)

Country	Czech Republic		Slovakia		Slovenia	
Year	Tax revenue	GDP	Tax revenue	GDP	Tax revenue	GDP
2007	54935	138302,9	19341,7	56241,6	14801,9	35152,6
2008	62359,3	161313,1	22777,6	66002,8	16112,7	37951,2
2009	57613,8	148682	23227,7	64023,1	15325,8	36166,2
2010	61628,9	156718,2	23422,3	67577,3	15814,7	36252,4
2011	66125,3	164040,5	25807,1	70627,2	15986,7	36896,3
2012	65461,2	161434,3	26380,6	72703,5	16044,1	36076,1
2013	65234	157741,6	28719,1	74169,9	16248,9	36239,2
2014	63150,8	156660	29927,4	76087,8	16664,1	37614,9
2015	69189,8	168473,3	33532,3	78896,4	17418,8	38836,6
2016	70861,3	176564,3	31910,2	81154	17484,2	40418,1

(Eurostat source)



Figure no. 1 Dynamics of incomes and gross domestic product in the Czech Republic

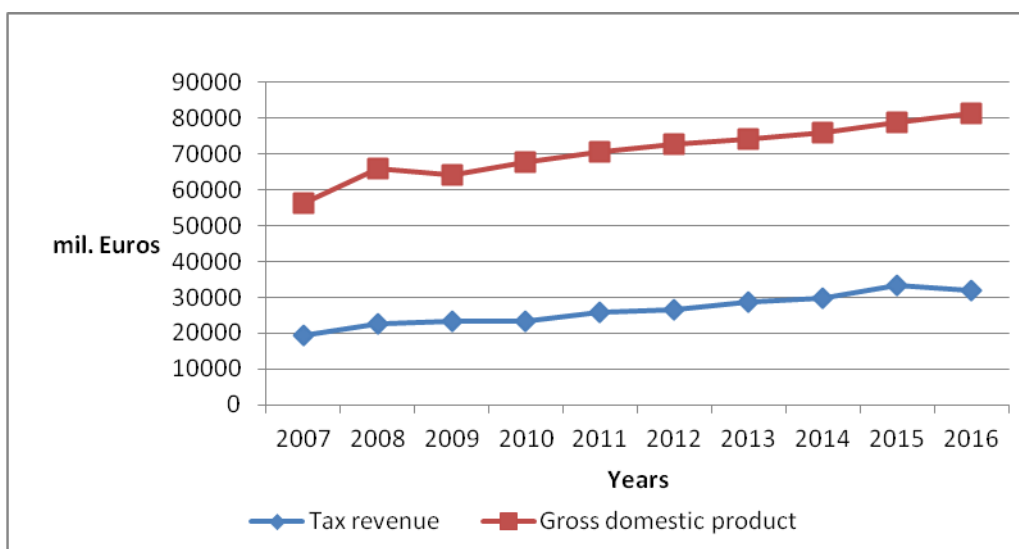
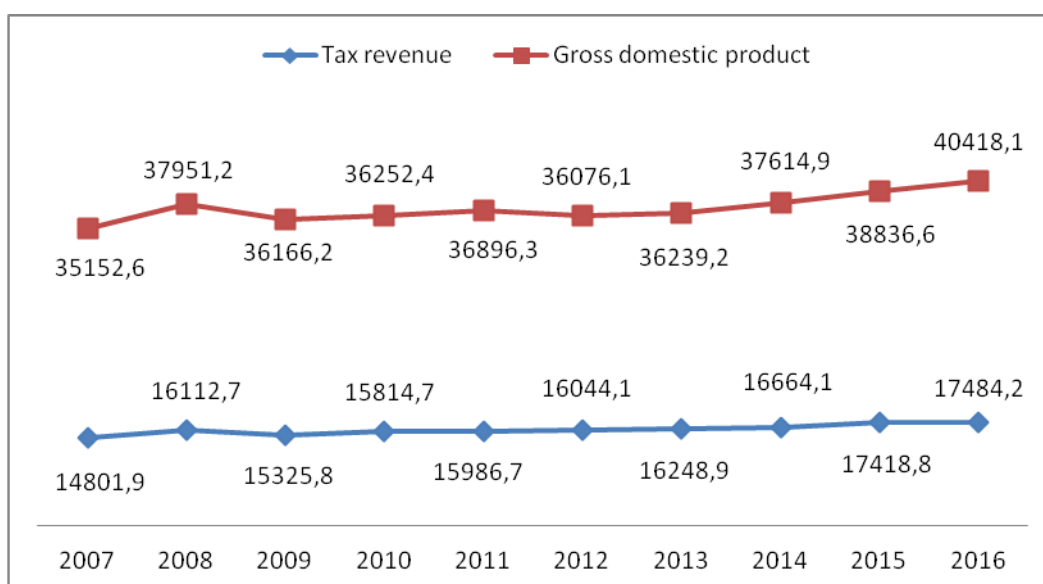
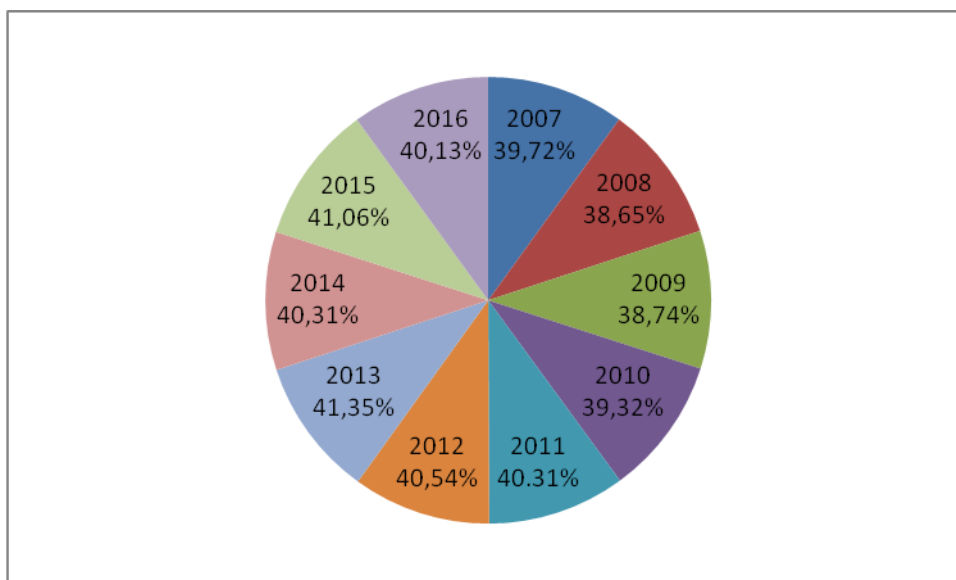


Figure no.2 Dynamics of incomes and gross domestic product in the Slovacia



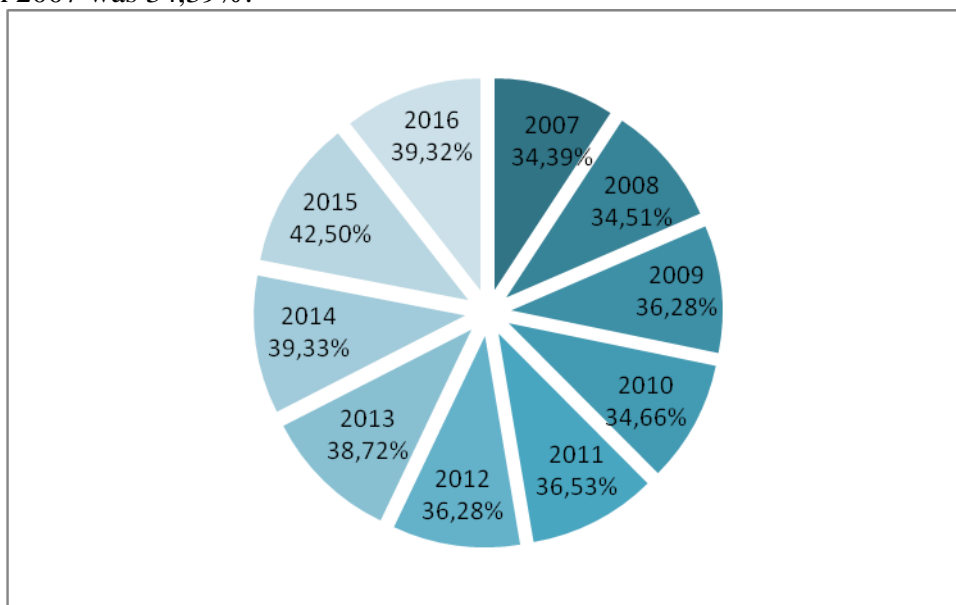
**Figure no. 3 Dynamics of incomes and gross domestic product in the Slovenia**

Figures 4, 5 and 6 show the percentages of tax revenue in gross domestic product for the Czech Republic, Slovakia and Slovenia. It is noted that in the Czech Republic the values are between 38.65% and 41,35%. The highest values are 41,35% in 2013, and the lowest in 2008 is 38,65%. Throughout the analysis period, there is a trend of progressive increase of these values starting with 2008 (38,65%) until 2013 (41,35%).



**Figure no. 4 Percentage of tax revenues in the Gross Domestic Product in the Czech Republic**

In the case of Slovakia (Figure 5), there is a tendency to increase the percentage of the fiscal revenues from the gross domestic product, so in 2007 the value of 34,39% is registered, and in the year 2016 the value of 39,32%. In this case, the highest value is registered in 2015 (42,50%), and the lowest in 2007 was 34,39%.



**Figure no. 5 Percentage of tax revenues in the Gross Domestic Product in the Slovenia**

The data presented in the case of Slovenia (Figure 6) highlight different values of the percentage of tax revenue in gross domestic product, so the lowest value is registered in 2007 (42,10%), and the highest in 2015 is 44,85%.

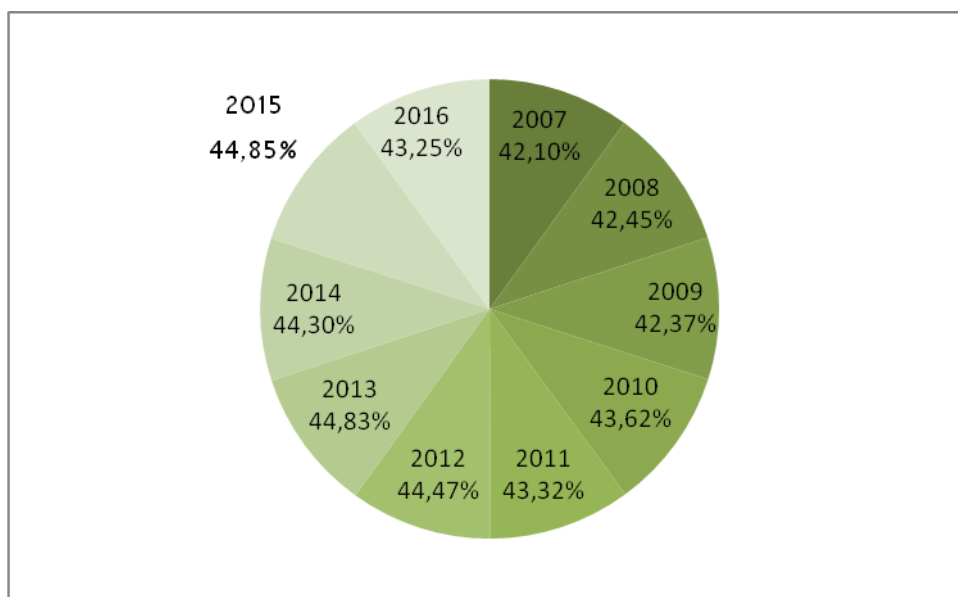


Figure no. 6 **Percentage of tax revenues in the Gross Domestic Product in the Slovenia**

Comparing the values recorded for the three analyzed countries, it is observed that the highest values of the percentage of the fiscal revenues of the gross domestic product are registered in the case of Slovenia 44,85% in 2015 and the lowest for Slovakia of 34,39% in 2007.

The values of the status and effect indicators of taxation in the Czech Republic are presented in Table 2 and Figure 7. There is an increase in the value of fiscal pressure in 2007 (39,72%) to 40,54% in 2012. Also, the dynamics of revenues tax increases in the analyzed period, thus in 2008 compared to 2007 the value of 13,51% and in 2016 as compared to 2007 the value of 28,99%. The dynamics of the fiscal pressure shows increasing values in the period 2007-2016, so in 2013 is presents the maximum value of 4,10% compared to – 2,69% in 2008.

Table 2

**State and effect indicators of taxation in the Czech Republic**

No.	Year	Tax pressure (%)	Dynamics of tax revenues (%)	Dynamics of fiscal pressure (%)	Absolute revenue deviation (EUR million)	Absolute deviation of GDP (million euro)	Revenue Variation Index (%)	Index of relative GDP change (%)
1	2007	39,72	-	-	-	-	-	-
2	2008	38,65	13,51	-2,69	7424,3	23010,2	113,51	116,63
3	2009	38,74	4,87	-2,46	2678,8	10379,1	104,87	107,50
4	2010	39,32	12,18	-1	6693,9	18415,3	112,18	113,31
5	2011	40,31	20,37	1,48	11190,3	25737,6	120,37	118,60
6	2012	40,54	19,16	2,06	10526,2	23131,4	119,16	116,72
7	2013	41,35	18,74	4,10	10299	19438,7	118,74	114,05
8	2014	40,31	14,95	1,48	8215,8	18357,1	114,95	113,27
9	2015	41,06	25,94	3,37	14254,8	30170,4	125,94	121,81
10	2016	40,13	28,99	1,03	15926,3	38261,4	128,99	127,66

The absolute revenue gap shows different values in the study period, so the highest value was EUR 15926,3 millions in 2016 and the lowest value in 2009 was 2678,8 millions.

Analyzing the absolute deviation of gross domestic product, there is a variation in values between 2007 and 2016, so that the highest figure was recorded in 2016 (38261,4 millions euro) and the lowest in 2009 was 10379,1 millions.

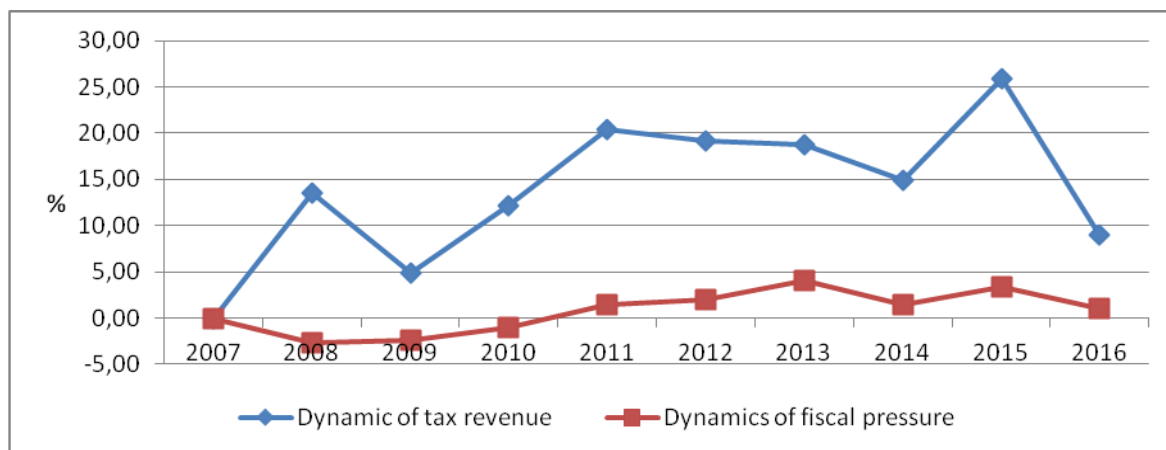


Figure no. 7 **Dynamics of tax revenues and pressure in the Czech Republic in the period 2007-2016**

Table 3 and Figure 8 show the status and effect indicators of taxation in the case of Slovakia.

The fiscal pressure presents different values in the study interval, so the highest value was recorded in 2015, this being 42,50%, and the lowest in 2007, 34,39%.

The dynamics of the tax revenues presents different values in the analyzed period, so the highest value was recorded in 2015, this being 42,50% and the lowest of 17,76% in 2008, compared to 2007, considered as year of reference.

The absolute deviation of tax revenues shows different values, so the highest value was in the year 14190,6 millions euro in 2015 and the lowest amount of 3886 million euro in 2009 compared to 2007.

The absolute deviation of the gross domestic product shows increasing values, except for 2009, when the lowest value was of 7781,5 millions euro compared to 2007.

Table 3

**Status and effect indicators of taxation in Slovakia**

No.	Year	Tax pressure (%)	Dynamics of tax revenues (%)	Dynamics of fiscal pressure (%)	Absolute revenue deviation (EUR million)	Absolute deviation of GDP (million euro)	Revenue Variation Index (%)	Index of relative GDP change (%)
1	2007	34,39	-	-	-	-	-	-
2	2008	34,51	17,76	0,34	3435,9	9761,2	117,76	117,35
3	2009	36,28	20,09	5,49	3886	7781,5	120,09	113,83
4	2010	34,66	21,09	0,78	4080,6	11335,7	121,09	120,15
5	2011	36,53	33,42	6,22	6465,4	14385,6	133,42	125,57
6	2012	36,28	36,39	5,49	7038,9	16461,9	136,39	129,26
7	2013	38,72	48,48	12,59	9377,4	17928,3	148,48	131,87
8	2014	39,33	54,72	14,36	10585,7	19846,2	154,72	135,28
9	2015	42,50	73,36	23,58	14190,6	22654,8	173,36	140,28

10	2016	39,32	64,98	14,33	12568,5	24912,4	164,98	144,29
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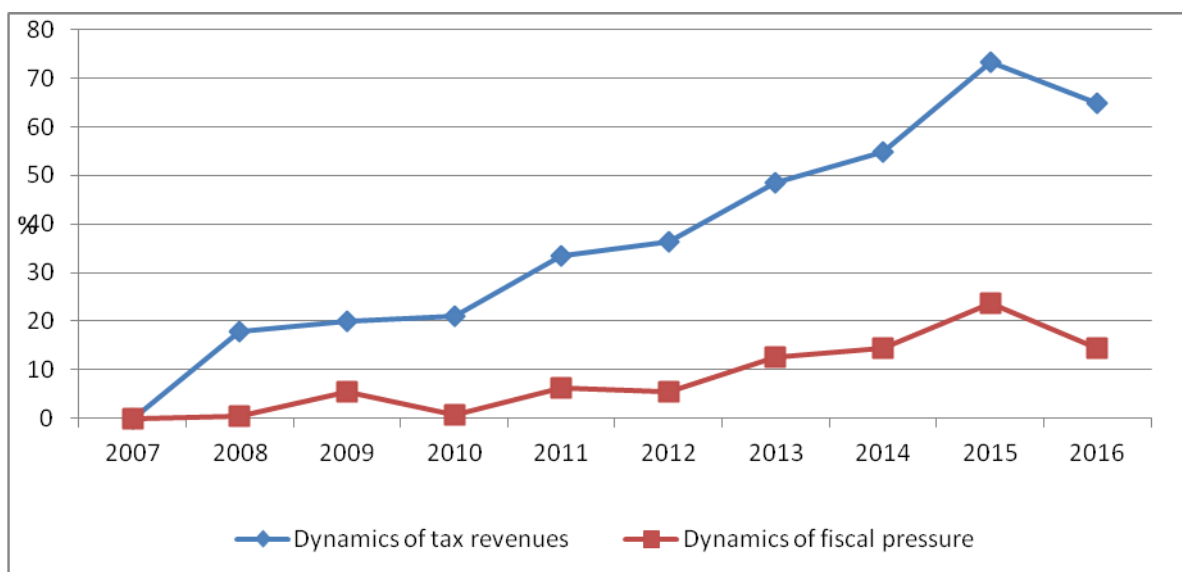


Figure no. 8 **Dynamics of tax revenues and fiscal pressure in Slovakia in 2007 – 2016**

Analyzing the results of the status and effect indicators of taxation in the case of Slovenia (Table 4 and Figure 9), different values arise between 2007 and 2016.

The fiscal pressure ranges between 42,10% in 2007 and 44,85% in 2015, the highest value. Dynamics of tax revenues show variable values in the analyzed range, so the highest value of 18,12% was recorded in 2016, and the lowest in 2009 of 3,53% compared to 2007.

The dynamics of the fiscal pressure shows a maximum of 6,55% in 2013 and the lowest of 0,64% in 2009, the values in the interval 2007 - 2016 are variable.

The absolute deviation of tax revenues is different, so the maximum amount of EUR 2.682,3 millions is recorded in 2016 and the lowest of EUR 523,9 millions in 2009.

The absolute deviation of gross domestic product is variable in the analyzed period, with the highest value of EUR 5265,5 millions in 2016 and the lowest of EUR 923,5 millions in 2012.

Table 4

**Tax status and effect indicators in Slovenia**

No.	Year	Tax pressure (%)	Dynamics of tax revenues (%)	Dynamics of fiscal pressure (%)	Absolute revenue deviation (EUR million)	Absolute deviation of GDP (million euro)	Revenue Variation Index (%)	Index of relative GDP change (%)
1	2007	42,10	-	-	-	-	-	-
2	2008	42,45	8,85	0,83	1310,8	2798,6	108,85	107,96
3	2009	42,37	3,53	0,64	523,9	1013,6	103,53	102,88
4	2010	43,62	6,84	3,61	1012,8	1099,8	106,84	103,12
5	2011	43,32	8	2,89	1184,8	1743,7	108	104,96
6	2012	44,47	8,39	5,62	1242,2	923,5	108,39	102,62
7	2013	44,83	9,77	6,55	1447	1086,6	109,77	103,09
8	2014	44,30	12,58	5,22	1862,2	2462,3	112,58	107
9	2015	44,85	17,67	6,53	2616,9	3684	117,67	110,48
10	2016	43,25	18,12	2,73	2682,3	5265,5	118,12	114,97



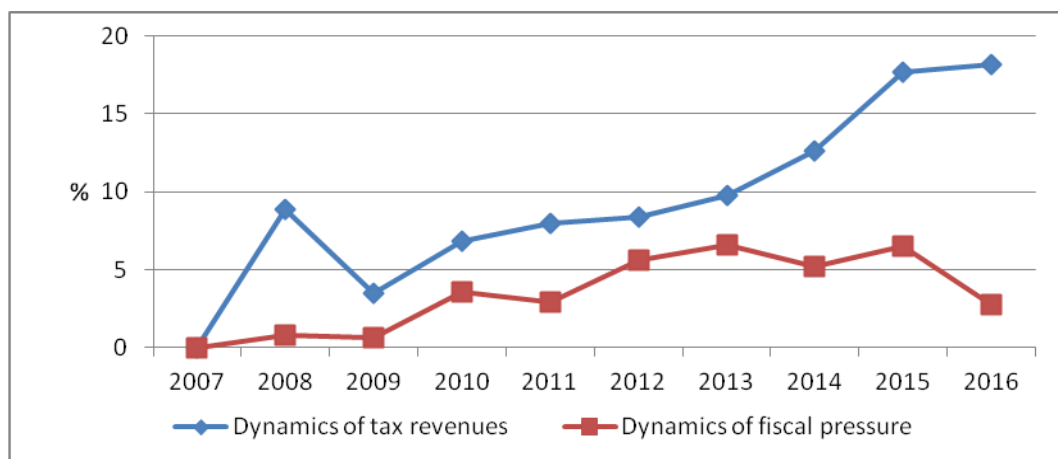


Figure no. 9 Dynamics of tax revenue and pressure in the case of Slovenia over 2007-2016

There is a direct link between the increase of the value of the tax revenues and the gross domestic product, in the case of the Czech Republic, the regression equation being of the following form:  $y = 2,0634 x + 27648$ ;  $R^2 = 0,9234$ ,  $R = 0,961$  (Fig.10).

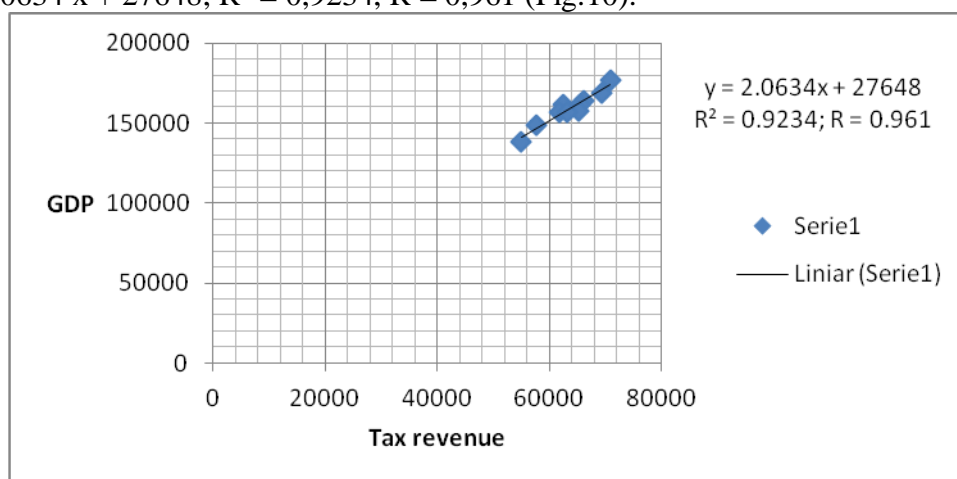


Figure no. 10 Regression function for the Czech Republic

A direct relationship between tax revenue and gross domestic product was established in the case of Slovakia on the basis of the regression equation of the form:  $y = 1,6152 x + 27939$ ;  $R^2 = 0,9322$ ,  $R = 0,965$  (Fig. 11).

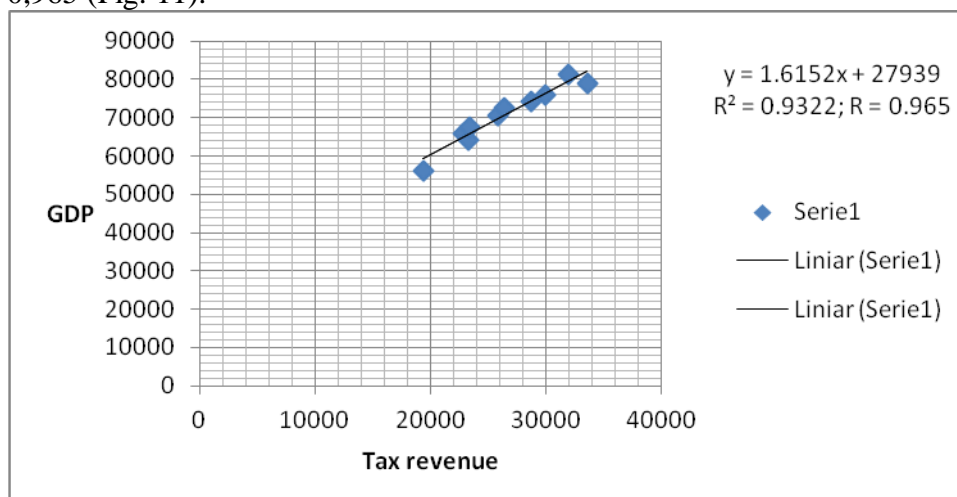


Figure no. 11 Regression function for Slovakia

There is a direct relationship between tax revenue and gross domestic product, in the case of Slovenia, the regression equation as follows:  $y = 1,6795 x + 9968,3$ ;  $R^2 = 0,8003$ ;  $R = 0,894$  ( fig. 12).

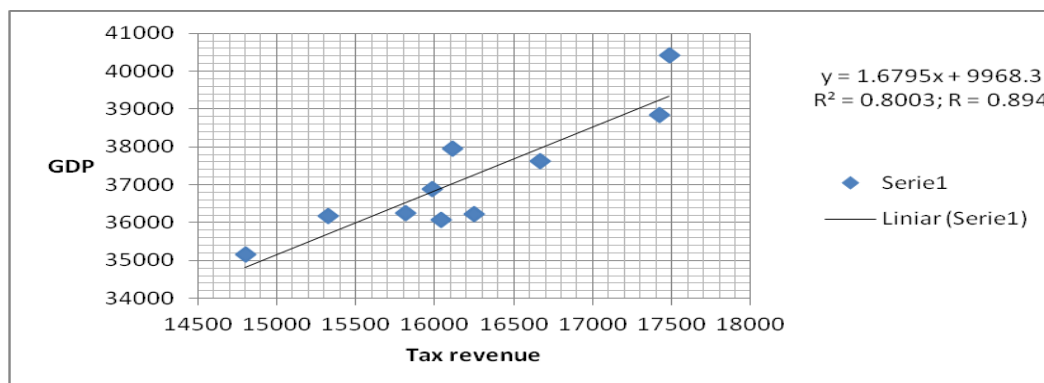


Figure no. 12 **Regression function for Slovenia**

### Conclusions

A series of analyzes of the relationship between tax and economic growth refers to the influence of tax levels and their structure in terms of economic growth.

The study covers the comparison of incomes and gross domestic product in the case of the Czech Republic, Slovakia and Slovenia over the period 2007-2016.

The analysis was performed on the basis of the following indicators: absolute deviation, relative variation index, relative deviation and correlation.

In the case of the Czech Republic, there is an increase in tax revenues in the studied period as compared to 2007. Thus, in 2007, the value of EUR 54935 million is recorded, and in 2016 the value of EUR 70861.3 million, resulting in an increase of 15926,3 million euro.

Analyzing the evolution of the gross domestic product over the same period, the trend of its value is observed, having as a basis the year 2007, thus recording a difference of 38261,4 millions euro between 2016 and 2007.

In the case of Slovakia, there is an increase in the value of tax revenues recorded in 2016 as compared to 2007, with a difference of EUR 12568,5 millions. The value of Gross Domestic Product shows an increase in the analyzed range, so the highest value of 81154 million euros was registered in 2016.

Analyzing the situation in the case of Slovenia, there is a tendency to increase the value of tax revenues by an increase of 2682,5 million euro in 2016 compared to 2007. However during this interval there are negative variations in 2009 when there is a higher value respectively, EUR 15325,8 millions, compared to EUR 16112,7 millions in 2008. In the case of Gross Domestic Product, the general trend is growth, thus comparing the values in 2016 and those in 2007, there is an increase of 5265,5 millions euro.

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