IS THERE ANY CORRELATION BETWEEN THE ECONOMIC GROWTH AND BUDGET EXPENDITURE ALLOCATED TO EDUCATION? CASE STUDY ROMANIA

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1. Introduction

The analysis of the effects of governmental policies on the economic growth, represents a greatly debated subject of interest for theorists, and the speciality literature includes a series of empirical evidence dealing with the causality relationship between government expenditure and the economic growth (Barro, 1997; Gemmel, 1983; Grossman, 1998; Hansen, 1994; Landau, 1985), using the regression model as a method of analysis.

To the empirical level, most of the effects determined by public expenditure over the economic growth indicate a negative value, in this case, the causality relationship being inversely proportional, exception the studies of Cronovich (1998), Ram (1986) and Romer (1989).

The fact that the *structure of public expenditure* is completely ignored represents the flaw of these studies, its global value being considered as explanatory variable.

For this reason, the paper intends to test the correlation between the economic growth and budget expenditure allocated to education, in Romania, due to the fact that, according to the results inferred from empirical studies of the economic literature (Barro, 1991; Evans şi Karras, 1994; Hansson şi Henrekson, 1994; Landau, 1986), it directly and positively influences the work productivity.

2. Research Methodology

2.1. Research methodology specification

The statistical testing of correlations between the economic growth and public expenditure, namely, the economic growth and budget expenditure allocated for education, will be undertaken by means of the Matlab 7.6. software which includes different function modules.

The file used for this study contains the analyzed data sets organized on columns (each column corresponding to a macroeconomic indicator). The results are achieved by applying adequate functions according to the analysis to data sets.

For graphical representations, the function used is *plot* (vector1, vector 2), where vector 1 and vector 2 are taken from the file, by reading the columns containing data meant to support the charts.

The function corresponding to the correlation coefficient is ([R,P]=corrcoef(vector 1, vector 2).

The results are displayed as a set of 2x2 matrices, one matrix for R results and the other for p results, to each of these matrices, the results of R and p parameters are arranged on the second diagonal, all the entries on the main diagonal being equal to 1. Considering the coefficients of the entries of the matrix, the entries on the main diagonal, having 11 and 12 as coefficients for a 2x2 matrix, it indicates the fact that the

value 1 corresponds to the situation where the data set is correlated to itself.

The outcomes of R and p parameters achieved through Matlab may be interpreted considering the following aspects:

- R value may be interpreted according to the R table (a statistical instrument including standard values calculated according to data sets dimension, subject of suitable probability degree distributions);
- The probability degree is previously selected (for this study we have considered a probability degree of 0.05 – which practically suggests that, as a result of 100 experiments, just for maximum 5 circumstances, we achieve random outcomes);
- The following formula introduces the degrees of freedom df=n-2 (where n represents the dimension of each data set studied), thus, the achieved value for R is compared to R value from the table, which corresponds to the degrees of freedom calculated and to the probability degree;
- The correlation will be significant (meaning: there exists a correlation between data sets submitted to the study) if the value achieved for the R parameter is higher than the value selected from the table;
- If the value corresponding to the p parameter is lower than 0.05, the correlation is strong (the closer it gets to the zero value, the stronger correlation). If its value gets higher, the correlation will become weak (the maximum value of p may be 1, which indicates the lack of correlation between data sets).

2.2. Data series

In order to provide the comparability of data, all values used are real values, representing comparable costs, related to the year 1990.

Table 1. Evolution of GDP and public expenditure in Romania, 1990-2007, (costs comparable to 1990, thousand million lei)

Year	GDP	Total public expenditure
1990	857.9	332.0
1991	747.2	289.1
1992	681.5	286.2
1993	691.7	236.5
1994	718.7	247.2
1995	769.8	267.1
1996	800.0	270.4
1997	751.2	252.4
1998	715.3	246.7
1999	706.6	245.1
2000	721.2	254.5
2001	762.2	253.8
2002	799.6	258.2
2003	828.9	256.3
2004	837.4	260.4
2005	872.4	271.3
2006	917.8	288.1
2007	983.1	295.9

Source: Authors' calculation considering data provided by the National Institute of Statistics

Table 2. Evolution of GDP and budget expenditure allocated to education, in Romania, 1990-2007, (costs comparable to 1990, thousand million lei)

Year	GDP	Total public expenditure
1990	857.9	24.0
1991	747.2	26.8
1992	681.5	24.5
1993	691.7	22.8
1994	718.7	22.2
1995	769.8	26.1
1996	800.0	28.8
1997	751.2	24.7
1998	715.3	23.6
1999	706.6	26.8
2000	721.2	20.9
2001	762.2	24.3
2002	799.6	27.9
2003	828.9	31.4
2004	837.4	30.1
2005	872.4	32.2
2006	917.8	46.5
2007	983.1	56.6

Source: Authors' calculation considering data provided by the National Institute of Statistics

3. Results and Discussions

3.1. Analysis of correlation between GDP and the total amount of public expenditure in Romania (1990-2007)

Using the function defining the correlation coefficient ([R,P]=corrcoef(the column including the data set indicating the values of GDP, the column containing the data set concerning the values revealing public expenditure), the following results are achieved: R=0.56, p=0.014.

These results point out the fact that there is a correlation between the registered values corresponding to GDP and public expenditure, but *it is not a strong correlation*, this feature being determined by the value of R (0.56) which is very close to the value given in the table, namely, (0.468).

The value in the table has been achieved considering a probability degree of 0.05 and caluclating the degrees of freedom df=n-2=18 (number of years included by the analyzed period)-2=16.
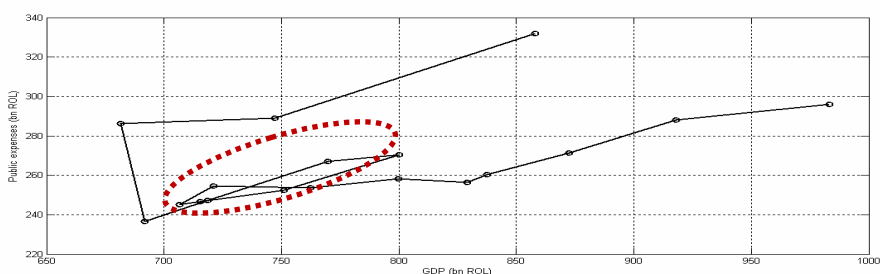

Figure no 1. Correlation between the evolution of GDP and public expenditure in Romania (1990-2007)

For a detailed evolution of GDP and of public expenditure, the two data sets have been presented by means of correlation, for all the years of the studied period.

The chart achieved in this manner (figure no 1) illustrates the fact that the evolution of the two data sets may be divided into three different stages:
- taking into account the analyzed data, the first 3 years indicate a more or less linear evolution;
- a period of 8 years succeeds indicating a high degree of nonlinearity

(this interval corresponds to the encircled period in figure 1);
- the last 7 years also represent a period of more or less linear evolution.

For an additional analysis of the correlation between these two data sets, in figure no 2, data have a parallel distribution along the studied period (1991-2007).

One may notice that the two curves are dynamically distinct, confirming the conclusion according to which *there is not a strong correlation* between the two data sets.
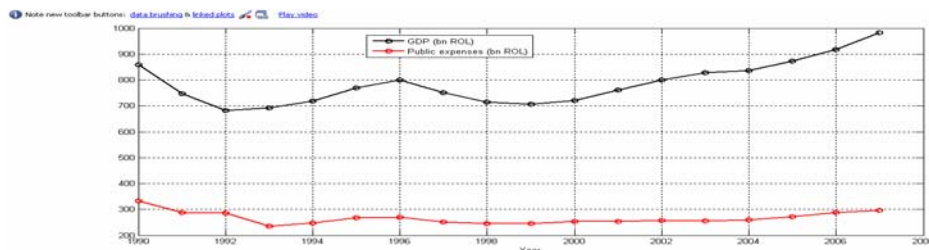

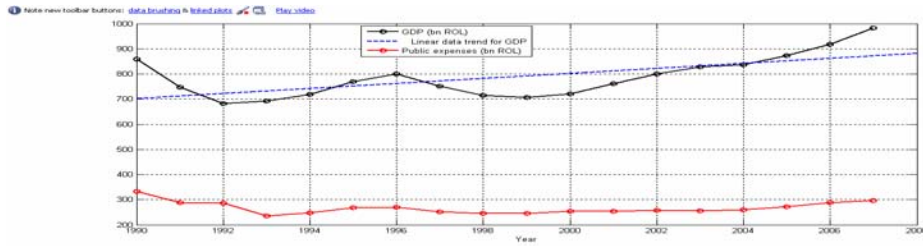**Figure no 2. Evolution of GDP and public expenditure in Romania (1990-2007)**

**Figure no 2.1. Evolution of GDP and public expenditure in Romania
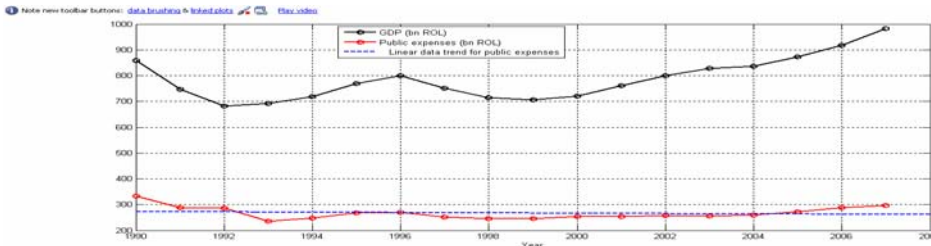(fitting GDP tendency through linearization)**

**Figure no 2.2. Evolution of GDP and public expenditure in Romania
(fitting public expenditure tendency through linearization)**

Observing figures 2.1 and 2.2, the tendencies of the two data sets, adjusted through the linearization method, display different evolutions. This observation associated to previous hypothesis lead to the final conclusion, according to which the correlation existing between the two data sets is extremely weak. Therefore, *the evolution of the two variables infers, so far, an irrational budgetary policy adopted by the Romanian governments, unable to determine the adequate level of expenditure according to the real potential of the national economy.*

3.2. Analysis of correlation between GDP and budget expenditure allocated to education, in Romania (1990-2007)

Using the function defining the correlation coefficient ([R,P]=corrcoef(the column including the data set indicating the values of GDP, the column containing the data set concerning the values revealing the costs for education), the following results are achieved: R=0.8526; p=1.

According to the methodology applied in this study, the results remain inconsistent: R value is higher than that indicated in the table (18 years are considered, so df=18-2=16, for 16 the R value is 0.468), and p=1, therefore, there are significant discrepancies between the two data sets.

In order to verify the degree of correlation between these two data sets, the test t, two samples, has been applied. The score is 1 considering the null hypothesis and the significance level, the calculated p-value is near 0. Therefore, the null hypothesis being rejected, it is merely a fluke to assume that the existence of the correlation between data sets is the product of chance alone (statistically speaking). The test Kolmogorov-Smirnov has been also applied and has also indicated 1 as the resulting value, which defines a good correlation between data sets (significance level - 0.05).

The achieved scores determine *a direct correlation* between the evolution of GDP in Romania and the evolution of budget expenditure for education.
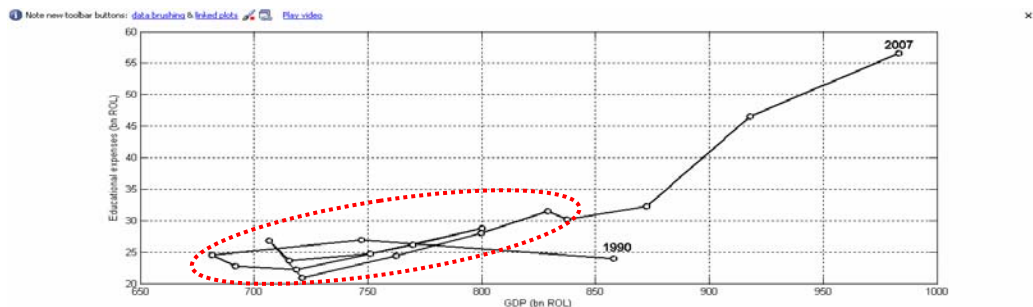
Figure no 3. Correlation between the evolution of GDP and that of budget expenditure allocated to education in Romania (1990-2007)

The chart achieved in this manner (figure no 3) illustrates the fact that the evolution of the two data sets may be included into *two different stages*:
- the first 13 years indicate a period with a high level of nonlinearity (this interval corresponds to the encircled period in figure 3);
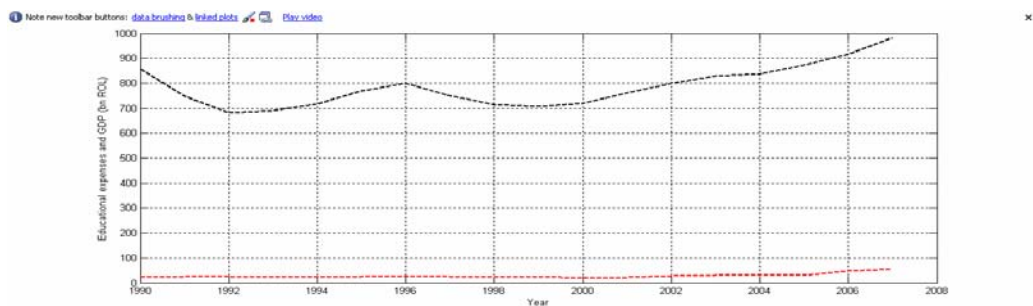- the last 5 years reveals a more or less linear period.

Figure no 4. Variation of GDP and of budget expenditure allocated to education in Romania (1990-2007)

The analysis undertaken in this case confirms the hypotheses developed by the speciality literature, according to which the budget expenditure allocated to education determines the economic growth by improving work productivity of employees.

4. Conclusions

This study points out the lack of a direct correlation between the evolution of the GDP and that of the total amount of public expenditure in Romania, during the interval of time 1990-2007. This aspect reflects *an irrational budgetary policy adopted by the Romanian governments, unable to determine the adequate level of expenditure according to the real potential of the national economy.* The negligible effects of public expenditure on the economic growth in Romania may be explained by the fact that costs distribution is more relevant than their global value. This hypothesis being confirmed by the analysis of the correlation between GDP and budget expenditure for the educational system. The outcomes achieved lead to the idea that, *the economic growth rate in Romania may be positively influenced through funds for the educational system.*

REFERENCES

Barro, R., (1996)	"Determinants of Economic Growth: A Cross-Country Empirical Study," MIT Press Books, The MIT Press, edition 1, volume 1, number 0262522543;
Drăcea, R., Cristea, M., Tomescu, I., (2009)	„The Evaluation of the Impact of Macroeconomic Variables over the Real Economy. Statistical Aproaches for Romania", International Conference on Applied Business and Economics, ICABE, Kavala, Greece;
Gemmell, N., (1983)	"International comparisons of the effects of nonmarket-sector growth," Journal of Comparative Economics, Elsevier, vol. 7(4): 368-381;
Grossman, P.J., (1988)	"Government and economic growth: A nonlinear relationship" Public Choice, 56: 193-200;
Evans, P., Karras, G., (1994)	"Is government capital productive? Evidence from a panel of seven countries," Journal of Macroeconomics, Elsevier, vol. 16(2), pages 271-279;
Hansen,A., (1939)	"Economic Progress and Declining Population Growth," American Economic Review, Vol. 29, March 1939, online at JSTOR: 1-7;
Hansson, P., Henrekson, M., (1994)	"A New Framework for Testing the Effect of Government Spending on Growth and Productivity," Public Choice, Springer, vol. 81(3-4), pages 381-401, December;
Landau, D.L., (1985)	"Government expenditure and economic growth in the developed countries", 1952-76. Public Choice, 47: 459-477;
Ram, R., (1986)	"Government size and economic growth: a new framework and some evidence from cross-section and time-series data", The American Economic Review, Vol. 76 No.1: 191-203;
Romer, M.P., (1989)	"Human Capital And Growth: Theory and Evidence," NBER Working Papers 3173, National Bureau of Economic Research, Inc.