

Contribution of Education Funding to Economic Growth in Romania

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Abstract: : The present paper tries to investigate the impact of education funding over the economic growth in Romania during the interval of time 1991-2009. It also attempts to answer the following question: does investment in education help the economic growth in Romania? If the answer is positive, then, how important are the allocations of investments in education matter? For a complete analysis, we have applied the regression method, and the statistical data have been provided by the National Institute of Statistics and the Romanian Ministry of Education.

JEL classification: H52, E22, C82

Key words: education expenditure, economic growth, statistical analysis, linear regression.

1. Introduction

According to a traditional outlook of public finance, public expenditure infers a slightly paradoxical situation: on one hand, it is conferred a crucial importance starting from the idea that funding should be a priority, followed by the search for necessary resources meant to cover it. On the other hand, the traditional outlook of public finance is not concerned with the *nature of public expenditure* and its influence over the social-economic life.

According to a modern view on public finance, public expenditure is analyzed and assayed primarily through its nature; what really matters is not its size, but its *effects on the social-economic life*.

Public expenditures are heterogeneous in nature, therefore, if considered according to their effect on social-economic life, then, they could be classified in: negative expenditure; positive expenditure and neutral expenditure.

Negative expenditures represent a real and permanent consumption of national income and register no subsequent effect on the ensuing GDP. Positive expenditures are those expenditures registered within the economic area, as well as those performed within the social-cultural area. The positive expenditures within the social-cultural field

influence, in one way or another, the future economic growth, even if their effects do not seem to indicate a material structure in the next future: expenditures for education or health sector.

In Romania, member country of the European Union (2007), till 2006, **the expenditure level allocated to the education sector** was highly decreased as compared to that indicated by other countries. The expenditure distribution is less significant when considering elementary and secondary education, while the level of expenditures in favor of higher education is significantly high. When budget increase was achieved, they were mostly expended for investments in infrastructure or equipment (“hardware”), and only a small amount was invested in system modernization (in its “soft” features) for providing a high quality education.

In the year of accession to the European Union (2007), according to the Report of the Presidential Commission for the analysis and elaboration of policies within education and research sectors, Romania was facing up to the following issues¹:

1. an *irrelevant* education system as related to future economy and society. The status of Romania reported to indicators for the knowledge-based economy („Lisbon indicators”) is configured in table 1. Considering these data, a clear conclusion may be drawn: the existing education system is not able to provide Romania a competitive status in the knowledge-based economy.

TABLE 1. Status of Romania reported to Lisbon indicators

LISBON INDICATORS	ROMANIA (%)	EU (%)	EU OBJECTIVE (2010), (%)
Early leaving of educational system*	23.6	14.9	Max. 10
22-year-old population share including individuals who have graduated at least the highschool (secondary school)	66.5	77.3	Min. 85
15-year-old population share including pupils who do not succeed to achieve the lowest level of performance (PISA 2001)	41.0	19.4	15
Graduating students share tested in mathematics, science and technology competence fields.	23.0	24.1	+10
Adults involvement in permanent education	1.6	10.8	12.5

* The indicator refers to 18-24-year-old individuals who have graduated only lower-secondary education (or less) and do not follow any other form of education or professional training.

2. an *unfair* education system, unable to provide students equal access to opportunities of studying and graduating, with no reference to their social-economic and cultural status. For example, the education status of people living in rural areas registers a widening imbalance: only 24.54% of students living in in rural areas, follow up highschool. The range of students living in rural areas and registering poor results in Romanian language, Mathematics and Science, is twice to six times higher than that of

¹ According to the Report of the Presidential Commission for the analysis and elaboration of policies within education and research sectors (2007)

students belonging to urban areas; the range of students achieving very good results for the same subjects is twice-three times lower! In addition, vulnerable groups continue to exist, greatly, disadvantaged by unfair education and training. Approximately 80% of uneducated youth are Rroms, and 38% of these are functionally illiterate individuals. The range of Rrom children attending elementary school is 64%, compared to 98.9% - national average.

3. education infrastructure and resources were of poor quality. Only 36% of schools were connected to the Internet, the overwhelming majority been composed of highschoools in urban areas. Human resource grows seriously order (the mean age of the didactic personnel indicating 40 years in women and 44 years in men), and the quality of the educational service is generally low. Only 18% of the didactic personnel acquired a major of using information technology in teaching. Moreover, the curriculum is highly awkward and lacks a clear outlook.

4. finally, according to data provided by UNESCO, Romania has allocated, during the interval 2000-2005, a very reduced budget to the Education sector (as a % of GDP), as compared to other member States of the European Union (see table 2).

TABLE 2. Public expenditure for education (% of GDP)

Country	% of GDP representing expenditures allocated to education							
	2000	2001	2002	2003	2004	2005	2006	2007
Bulgaria	3.2	3.5	3.6	4.2	2.5	4.5	4.2	4.8
Czech Republic	4.0	4.1	4.3	4.5	4.4	4.3	4.6	4.9
Estonia	5.4	5.3	5.5	5.3	4.9	4.9	5.1	5.4
Hungary	4.8	5.0	5.3	5.9	5.4	5.5	5.4	5.6
Latvia	5.4	5.5	5.7	5.3	5.1	5.0	5.1	5.3
Lithuania	5.7	5.9	5.8	5.2	5.2	4.9	4.8	4.8
Romania	2.9	3.3	3.5	3.4	3.3	3.5	4.9	5.7
Slovakia	3.9	4.0	4.3	4.3	4.2	3.8	3.8	4.1
Slovenia	5.7	5.9	5.8	5.8	5.8	5.7	5.7	5.7
Greece	3.3	3.5	3.6	3.6	3.8	4.0	4.2	4.3
Cyprus	5.3	5.5	6.0	7.3	6.1	6.3	7.0	6.8
Austria	5.7	5.7	5.7	5.5	5.4	5.4	5.5	5.5
Belgium	6.0	6.0	6.1	6.1	6.0	6.0	6.0	6.0
Denmark	8.36	8.4	8.4	8.3	8.4	8.3	7.9	8.0
Finland	5.9	6.0	6.2	6.4	6.4	6.3	6.1	6.1
France	5.7	5.6	5.6	5.9	5.8	5.6	5.6	5.6
Germany	4.5	4.5	4.7	4.7	4.6	4.5	4.4	4.3
Ireland	4.3	4.3	4.3	4.4	4.7	4.8	4.8	4.8
Italy	4.5	4.9	4.6	4.7	4.6	4.4	4.7	4.6
Netherlands	5.0	5.1	5.2	5.4	5.5	5.5	5.5	5.3
Portugal	5.4	5.6	5.5	5.6	5.3	5.4	5.3	5.1
Spain	4.3	4.2	4.2	4.3	4.2	4.2	4.3	4.2
Sweden	7.2	7.1	7.4	7.3	7.2	7.0	6.9	6.9
United Kingdom	4.6	4.7	5.3	5.4	5.3	5.5	5.6	5.5

Source: UNESCO data

In this context, the paper tries to investigate the impact of education funding over the economic growth in Romania during the interval of time 1991-2009. It also attempts to answer the following question: does investment in education help the economic growth in Romania? If the answer is positive, then, how important are the allocations of investments in education matter? For a complete analysis, we have applied the regression method, and the statistical data have been provided by the National Institute of Statistics, UNESCO and Eurostat.

2. THEORETICAL CONSIDERATIONS

Education plays a major role in creating human capital with a huge contribution to the economic and production growth, similar to physical capital. The analysis of the effects determined by governmental policies within the education sector over the economic growth represents a highly debated subject by ideologists. Economists have investigated the role of education in the economic growth, at micro and macro-economic level, and the results have seldom been combined. Particularly, the issue of allocating educational resources to different education stages (elementary, secondary and tertiary) has been analyzed, first of all, in terms of rate of return of education investments considering aspects of individual income and labor productivity. Labor productivity (and tacitly, economic growth) may be positively influenced through education allocations, considering the fact that highly trained employees are more efficient and more capable to take up specific positions, customizing fastly their activity to technological changes.

The original meaning of the famous collocation of “human capital” is given by A. Smith (1723-1790). In his attempt to discover “*nature and reasons for nations wealth*”, the brilliant Scottish thinker includes in the meaning of capital “*learnt and usefull skills of all the inhabitants or members of the society*” seen as “*returned expenditure, however, including a benefit*” (Smith, 1962). The attitude of the economic science parent is right if we consider the fact that he was reasoning and writing under the power of philosophical ideas of the Enlightenment, meant to restore confidence in human being as supreme value.

Despite this new approach, all the economists following Smith have neglected the study of this particular kind of capital, considering that the real contribution to the growth of capital of goods and services consists in facilities, estates, buildings etc. and their corresponding investments. The economic science field needed almost two centuries to review the Smithian remark according to which, the investments in individuals’ knowledge and skills generate benefit and directly contribute to a nation enrichment.

Almost two centuries later, Solow’ researches (1956, 1957) indicated the fact that economic growth determining factors are not limited to capital and labor efficiency. The initial purpose of his researches was to determine the contribution of each production factor (labor and capital) to the economic development and to reveal the role of technical progress influence over the rate of economic growth.

Theoretical basis attesting the fact that education generates a positive effect over the economic growth, derive from the human capital theory. Initially illustrated by Becker’s (1962) and Schultz’s (1963) works, this theory points out that performance, experience, knowledge and skills represent human capital and generate, in a similar manner as physical capital, a series of future benefits on labor productivity. Later,

Lucas (1988) developed a pattern of economic growth including the human capital as one of the production factors, and education as a means of human capital accumulation. According to Lucas (1988), education was defined as a vehicle for human capital accumulation and was treated as a factor of production correlated to labor and physical capital.

In addition to Lucas' pattern, the economic theory provides a series of patterns regarding the correlation between economic growth and education (Barro, 1991, 2001; Romer, 1990; Rebelo, 1991; Grossman-Helpman, 1991).

In his study, Barro (1991, 2001) focused on a series of approaches according to which human capital determines the economic growth. Barro (1991) submitted to his study a number of 98 countries, revealing that during the interval 1960-1985, the rate of economic growth is positively reliant on the initial level of human capital determined through schooling rates, and simultaneously, it is negatively reliant on the initial level of GDP.

Judson (1998) has analyzed the efficiency of resource allocation to education sector within a group of states, during the interval 1970-1990, by testing a pattern which combines the rates of return in the education sector considering the way of allocating resources. The study has indicated the existence of a powerful correlation between human capital accumulation and economic growth within states registering significant allocations for education investments, while, the states registering a reduced level of allocations, have inferred a weak correlation.

According to most of the theoretical patterns, the limiting factor of economic growth consists in the expenditure meant for accepting new approaches, a society spends few resources in research and renewal than for the implementation of new ideas. On the other hand, the developed states which import technology, the constraint over the economic growth is highlighted by the quality of manpower.

The studies concerning wage inequality, between individuals with different levels of education and training, also, indicates the fact that education features a high rate of return. According to Dahlin (2005), the investment in education is very beneficial for the society, both at micro and macro level and affects the system both directly and indirectly. While the individual's wage increase represents a direct effect, the increasing externalities associated to education are an indirect effect (Heckman and Klenow, 1997).

As we have already noticed, in general, the empirical studies concerning the impact of expenditures allocated to education, over the rate of the economic growth, reflect a positive relation, however, there are studies revealing an inconclusive (Levine and Renelt, 1992; Easterly and Rebelo, 1993) or negative effect (Devarajan, Swaroop and Zou, 1996). These results may be explained by considering the combined value of education expenditures for all stages, on one hand, and on the other hand, by taking into account the long interval of time which generates between schooling period and finding an appropriate job. Another possible explanation might be the lack of correlation between expenditures for education and the rate of economic growth in treating uniformly the education sector, rather as a whole than divided in three stages (elementary, secondary and tertiary).

3. DATA SOURCES AND METHODOLOGY

The analysis focuses on the interval 1991-2009, all data being provided by the National Institute of Statistics, UNESCO and Eurostat. As a research method, we have applied the linear regression within SPSS 17.0, and the variables used were GDP/inhabitant and education expenditure volume reported to GDP.

The linear regression method implies, on one hand, the statistical analysis of the correlation between the dependent variable and the free variable, and, on the other hand, the attainment of coefficients used for determining the regression equation.

Considering the analysis of the correlation between dependent variable, *GDP/inhabitant ratio (in euro)*, and the predictor, *the volume of education expenditures reported to GDP*, table 3 presents all the results achieved. The table is structured in three different parts, thus, for the analysis of the correlation considering all data achieved for Pearson's coefficients and the significance threshold (significance – for short Sig.).

Correlation coefficient (Pearson) as resulting in table 3 is applied for square interpretations in order to provide its value of [0.1]. Similar to the value of the coefficient of R correlation, a value closer to 1 indicates a stronger correlation. Adjusted Square represents a coefficient applied for collinearity analysis.

Table no 4 shows basic indicators of linear regression, while table no 5 presents ANOVA test. The computing applied in simple ANOVA consists in the analysis of dependent variable dispersion. According to this analysis, the total dispersion includes two components: dispersion inside each resulting group and dispersion between means of groups and total mean (total mean ignoring resulting groups).

Figure 1 presents the histogram specific to dependent variable. The histogram, generally, presents the frequency of values assumed by the dependent variable, on different intervals. Moreover, the normal distribution plot overlaps the plot resulting from the distribution on equal intervals of the number of values corresponding to these intervals. For a final graphical statistical analysis, a P-P plot of regression standardized residuals (figure 2) will be considered in order to conclude whether the resulting equation of linear regression may be validated.

4. RESULTS AND DISCUSSIONS

Theoretically speaking, Pearson's coefficients may be considered within the interval [-1,1]; when their value is oriented towards the limits of the interval, the correlation becomes stronger. As well, a positive value implies a direct correlation, while a negative value implies a reverse correlation. Simultaneously, the significance threshold should register a value inferior to a pre-determined significance threshold. For the present study, the pre-determined significance threshold value is established to 0.05.

TABLE 3 Correlation coefficients and significance threshold for the dependent variable and the predictor

Correlations

		GDP_inhabitant_euro	Volume_expend_education_GDP
Pearson's Correlation	GDP_inhabitant_EURO	1.000	.915
	Volume_expend_education_GDP	.915	1.000
Sig. (1-tailed)	GDP_inhabitant_EURO	.	.000
	Volume_expend_education_GDP	.000	.
N	GDP_inhabitant_EURO	18	18
	Volume_expend_education_GDP	18	18

The resulting values reveal a very strong and direct correlation between GDP/inhabitant and education expenditure volume reported to GDP (0.915).

TABLE 4 Correlation coefficient

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.915a	.838	.828	7.084996390277114E2

a. Predictors: (Constant), Volume_expend_education_GDP

b. Dependent Variable: GDP_inhabitant_EURO

TABLE 5 ANOVA Test

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.158E7	1	4.158E7	82.837	.000a
	Residual	8031547.816	16	501971.739		
	Total	4.961E7	17			

a. Predictors: (Constant), Volume_expend_education_GDP

b. Dependent Variable: GDP_inhabitant_EURO

According to table 5 the significance threshold is 0 (sig.<0.05), and F registers the value 82.83 inferior to 161 (the table value for df=1) and a pre-determined significance threshold of 0.05. This case reveals a strong correlation between the two variables, registering a reduced level of dispersion.

TABLE 6 Coefficients for the linear regression model

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-4236.091	764.077		-5.544	.000		
Volume_expend_education_GDP	1767.726	194.225	.915	9.101	.000	1.000	1.000

a. Dependent Variable: GDP_inhabitant_EURO

The influence of the education expenditure volume reported to GDP over the GDP/inhabitant ratio is adequate (sig.=.00), the tolerance value is 1, superior to 1-Adjusted R square (1-0.828=0.172), fact which *excludes the risk of non-colliniarity*. VIF (Variance Inflation Factor = 1/Tolerance) also contributes to the colliniarity analysis, making possible the expression of non-colliniarity, when exceeding 6 value.

Considering this analysis, as well as the tolerance value, related to which, VIF represents an additional significance in interpretation, VIF is 1, which, certainly, implies the fact that non-colliniarity is absent.

Resulting equation:

$$PIB / loc = ch_invatamant(\% PIB) \times 1767.726 - 4236.091 \quad (1)$$

$$GDP/inhabitant = education_expenditures(\%GDP) \times 1767.726 - 4236.091$$

In order to validate the resulting regression equation, the histogram is generated. Results are contradictory because within the intervals [-2, -1.5) and [0, 0.5) values are fewer than within the attached intervals.

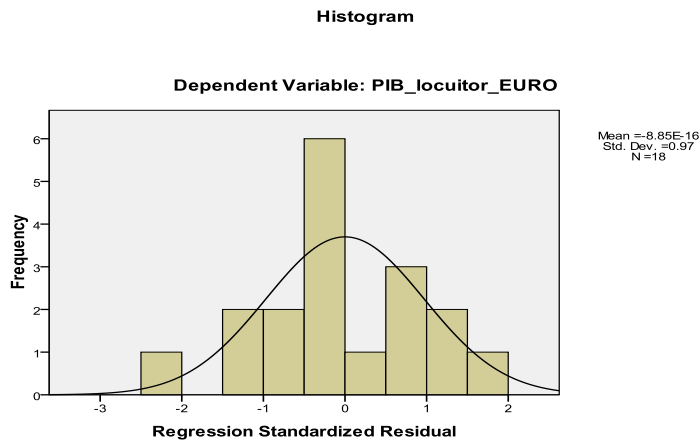


Figure no 1 Histogram for dependent variable

Normal P-P Plot of Regression Standardized Residual

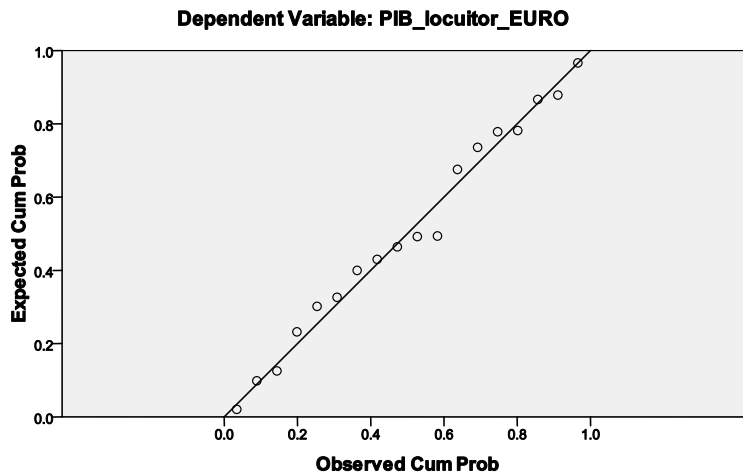


Figure no 2. P-P plot of regression standardized residuals

The graphical analysis of residuals implies the fact that linear regression may be applied, residuals been placed along the line of normal distribution, with insignificant disparities, which confirms the law of normal distribution of Gauss.

5. CONCLUSIONS

The interpretation of coefficients resulting from the regression equation, confirms the fact that, for the analyzed interval (1991-2009), the *doubling of education expenditure volume* (an increase of 100%) *would imply an increased value of the ratio GDP/inhabitant of 1767.72 euro.*

In Romania, until the year 2006, the volume of expenditures allocated for the education sector was reduced, compared to that registered in other countries. The level of expenditure is reduced when dealing with elementary and secondary education, while for high school education, the volume of expenditure is significantly increased. When budget increase took place, they were mostly expended for investments in infrastructure or equipment (“hardware”), and only a small amount was invested in system modernization (in its “soft” features) for providing a high quality education.

The weakness of this study which considers the regression as analysis method, consists in the fact that budget constraint imposed by the government is not an analyzed aspect. A fast enhancement of the level of education expenditures may involve certain effects over the public debt level (the case when the increase of expenditure level is not accompanied by a corresponding increase of taxes) which may affect companies and home economics conduct.

Therefore, an estimation of the effects generated by the education expenditures over the economic growth does not bring forward all the aspects of this issue, due to the fact that a separation of consequences, determined by budget policy considering the way of funding these expenditures, is not possible.

ACKNOWLEDGMENTS

This work was supported by CNCSIS –UEFISCSU, project number 299/01.10.2007, PNII – IDEI, ID_91/2007

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