

Study on Financial and Outcome Measures of Education Sector from Romania

Adrian Cosman
Monica Logofătu
Elena Cristina Cernătescu
University of Craiova, Romania
cosmanadriancv@gmail.com
monicalogofatu15@gmail.com
cernatescuelenacristina7@gmail.com

Abstract

In Romania as a consequence of a policy that did not establish education as a priority area, the rates of financial allocations for education related to budget revenues and GDP decreased, which had an bad effect on the outcomes in education sector bringing a change in some measures calculated on the basis of graduates' number, school population, the number of students who passed the baccalaureate exam, graduates' employment rate, enrollment in education, and the leaving rate. This paper aims to investigate the evolutions of educational expenses and outcome measures that describes the education sector in Romania and the principal influences that are established between these measures.

Key words: educational system, financial measures, outcome measures, Romania

J.E.L. classification: O15, I20, H52

1. Introduction

Teachers (employees of educational institutions) are important actors in society and contribute to the formation of social attitudes and policies, being vectors of societal change. It is important for teachers to be aware of this pro-active social role having a major responsibility for the formation of the future society (Eurydice, 2018). This allegation emphasizes the decisive role that teachers must occupy in the process of social transformation, while emphasizing the difficult position, as they face changes for which they cannot be solely responsible (Barbu and Barbu, 2012).

A deep understanding of the need to increase the effectiveness in education may be the motivating aspect to inspire both the establishment of a policy for rethinking education and elaboration of a HRM strategy aligned to it (Eurydice, 2004). It is absolutely necessary that, in Romania, a strategy for improving education should also include new approaches on organizational governance and HR management.

Within this paper we propose to investigate the evolution of some financial and outcome measures from education.

The paper is organized into five sections. First section is an introduction of the research theme. In the second section we review on short the literature. The third section set up the methodological lines. The fourth section expose the influences among variables. The fifth section offer the conclusions.

2. Literature review

Romania is considering a series of strategies aimed at modernizing the educational system, in order to respond to the challenges that are manifested at European and specific, at national level. However, the implementation of these strategies is progressing at different speeds, and policies to

improve participation rates, considering that the education system fails to keep up with the demands of a modern economy (OECD, 2005, 2014).

The commitment of public authorities towards improving and maintaining the level of education, consequently, must be associated with a commitment to improve and maintain the financing of education, since teacher salaries are by far the largest part of budget (Eurydice, 2015).

In Romania, education system face problems of deficiency of teachers. Although there has been an increase since 2016, spending on education remains low. Primary and secondary education is essential for a beginning in life under conditions of equality and in order to combat the phenomenon of early school leaving, a phenomenon that remains a problem in Romania (OECD, 2009).

The salaries of teachers in Romania are among the lowest in Europe for all categories. In Romania, starting with January 2011, the basic salaries have recorded significant increases, however, still being among the lowest in Europe. A bonus system was created to encourage teachers to work in rural areas (OECD, 2014).

3. Research methodology and hypotheses

Starting from the allegations of the previous studies, we formulated a hypotheses concerning the trends in the education sector in Romania: *The main outcome measures (the rate between the number of graduates and the school population - RGP, the degree of enrollment in education - DEP, the leaving rate - LRP, the pupils' numbers who passed the baccalaureate exam - PPB, the graduates' employment rate - GER) suffer influences from financial measures (expressed by the share of educational expenditure in budgetary income - PEEBI and the share of the educational expenditure in GDP - PEEGDP) at the pre-university level.*

This hypothesis will be validated or invalidated, and the resulting conclusions will allow to formulate recommendations. As research tools we will use descriptive statistics, correlations and analyze the artificial neural networks that are established between the variables to identify their influences.

4. The effects of educational expenses on the main outcome measures

In order to investigate the validity or invalidity of the hypothesis proposed in the paper, we collected for the period 2003-2017 at the level of Romania data which characterizes the financial and outcome measures from education. The state regarding the analyzed measures at the level of Romania is displayed in table 1.

Table no 1. Evolution of the outcome measures and the educational expenses of Romania at pre-university level

	PEEBI (percent)	PEEGDP (percent)	RGP (ratio)	DEP (percent)	LRP (percent)	PPB (number)	GER (percent)
2003	15.03	2.02	17.7	73.2	1.7	156076	69.2
2004	14.81	1.93	19.8	72.7	1.8	162556	70.4
2005	15.64	1.93	19.5	74.4	1.9	168058	70.8
2006	18.99	2.02	19.0	76.7	2.1	171015	72.6
2007	19.44	1.97	19.4	81.1	2.4	181589	73.8
2008	19.10	2.36	18.9	85.9	1.3	199972	75.5
2009	17.81	2.30	18.7	86.5	1.1	199006	72.6
2010	13.61	2.31	18.2	88.3	2.0	162482	69.8
2011	11.35	1.86	15.3	83.9	2.6	110412	67.8
2012	11.18	1.56	15.4	82.9	2.6	101655	68.1
2013	11.39	1.55	15.1	82.6	1.9	112223	67.1
2014	12.43	1.62	16.2	73.6	2.0	102718	68.6
2015	11.96	1.71	14.8	72.4	2.5	118313	67.5
2016	12.15	1.69	14.9	72.1	2.4	95940	67.1
2017	13.00	1.53	15.0	72.3	2.0	100774	69.7

Source: Data collected from INS (2019) and Eurostat (2019)

In order to determine the effects of the educational expenses on outcome measures, we calculated the correlations recorded between the evolutions of the values of these measures recorded during the period 2003-2017 (table 2).

Table no. 2. The correlations among the educational expenses and the main outcome measures

		PEEBI (percent)	PEEGDP (percent)	RGP (ratio)	DEP (percent)	LRP (percent)	PPB (number)	GER (percent)
PEEBI (percent)	Pearson correlation	1	0.715**	0.835**	0.207	-0.528*	0.898**	0.950**
	Significance		0.003	0.000	0.460	0.043	0.000	0.000
	Values	15	15	15	15	15	15	15
PEEGDP (percent)	Pearson correlation	0.715**	1	0.748**	0.534*	-0.605*	0.890**	0.723**
	Significance	0.003		0.001	0.040	0.017	0.000	0.002
	Values	15	15	15	15	15	15	15
RGP (ratio)	Pearson correlation	0.835**	0.748**	1	0.185	-0.531*	0.907**	0.798**
	Significance	0.000	0.001		0.510	0.042	0.000	0.000
	Values	15	15	15	15	15	15	15
DEP (percent)	Pearson correlation	0.207	0.534*	0.185	1	-0.228	0.391	0.338
	Significance	0.460	0.040	0.510		0.414	0.150	0.217
	Values	15	15	15	15	15	15	15
LRP (percent)	Pearson correlation	-0.528*	-0.605*	-0.531*	-0.228	1	-0.658**	-0.558*
	Significance	0.043	0.017	0.042	0.414		0.008	0.031
	Values	15	15	15	15	15	15	15
PPB (number)	Pearson correlation	0.898**	0.890**	0.907**	0.391	-0.658**	1	0.874**
	Significance	0.000	0.000	0.000	0.150	0.008		0.000
	Values	15	15	15	15	15	15	15
GER (percent)	Pearson correlation	0.950**	0.723**	0.798**	0.338	-0.558*	0.874**	1
	Significance	0.000	0.002	0.000	0.217	0.031	0.000	
	Values	15	15	15	15	15	15	15

** . The correlation is relevant.

Source: Developed by the author

The examination of the correlations from table 2 allows us to conclude that educational expenses of Romania is strongly correlated with the main outcome measures. We can say that the level of expenditure influences all the outcome measures. PEEGDP shows stronger correlations with the outcome measures compared to PEEBI.

The correlations of the share of educational expenditures in GDP with RGP, PPB, GER are strong, while the correlations with DEP, LRP are average, these measures being strongly influenced by other factors (social and cultural). All the outcome measures are positively correlated with the measures that illustrate the state's educational expenses, except the LRP which is negatively correlated. A rise in public educational expenses conduct to a decrease in the LRP and inversely. Likewise, a rise in the state's educational expenses determine an increase in RGP, DEP, PPB, and GER.

To determine the influence of the two independent variables on the dependent variables we proceeded to carry out an in-depth analysis. In this respect, eleven functions were tested to choose the optimal function for estimating the variation curve. Following the analysis of the values recorded by the tested functions we found that the optimal function is a hyperbolic type function.

Based on testing the functions to estimate the variation function, we deepened the investigation by performing a neural network analysis, in which we used as input variables the PEEBI and PEEGDP and as output variables RGP, DEP, PPB, GER and LRP.

Table 3 presents the summary of the MLP (multilayer perceptron) model and the estimated parameters. We used only one hidden layer, and the model generated four units of influence of the layer. The rescaling method used was data standardization.

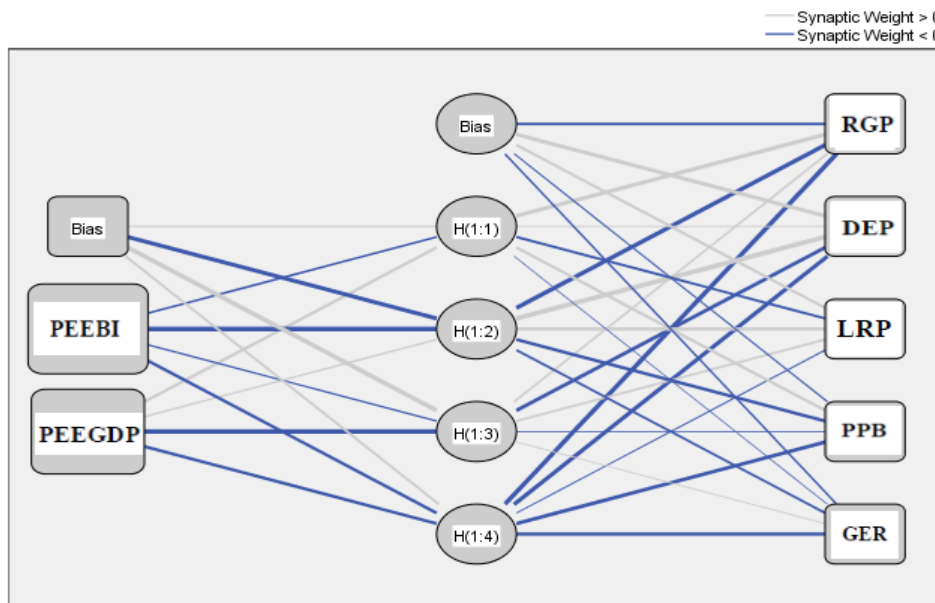
Table no. 3. Multilayer perceptron type model applied to the variables concerning the educational expenses and the main outcome measures in education

Predictor			Input Layer			Hidden Layer 1				
			(Bias)	PEEBI	PEEGDP	(Bias)	H(1:1)	H(1:2)	H(1:3)	H(1:4)
Predicted values	Hidden Layer 1	H (1 : 1)	0.420	-0.484	0.641					
		H (1 : 2)	-1.181	-2.139	0.460					
		H (1 : 3)	1.276	-0.448	-1.369					
		H (1 : 4)	0.545	-0.731	-0.744					
	Output layer	RGP				-0.599	1.065	-1.199	0.476	-1.244
		DEP				1.001	0.199	1.597	-0.927	-1.090
		LRP				0.613	-0.567	0.843	0.488	-0.338
		PPB				-0.360	0.631	-0.757	-0.054	-0.985
		GER				-0.463	-0.050	-0.520	0.112	-0.812

Source: Developed by the author

Following the analysis of the values recorded by the parameters estimated in the model, it is found that there is a directly proportional influence on the values of the variables RGP, DEP, PPB, and GER and inversely proportional to LRP exercised through the four units of the hidden layer by the variables concerning educational expenses. The variables concerning the degree of enrollment in education of the school age population and the leaving rate in pre-university education also bear positive influences that come from the variables that characterize the economic evolution. The hidden layer bias exerts a negative influence on the values of the variables concerning RGP, PPB, and GER and positive on the variables concerning DEP and LRP, being represented by the social and cultural factors which most strongly affect these variables. The input layer bias has mixed influences being represented by factors such as educational policies, the quantity and quality of human and non-HR. These relationships are graphically illustrated in Figure 1.

Figure no. 1. MLP network applied to the variables concerning the educational expenses and the main outcome measures



Hidden layer activation function: Hyperbolic tangent
 Output layer activation function: Hyperbolic tangent

Source: Developed by the author

The analysis of the neural network that is established between the input layer defined by the variables on educational expenses and the output layer defined by outcome measures illustrates the influence of financial measures on the outcome measures. As a result of a policy that did not establish education as a priority area, the rates of financial allocations for education related to budget revenues and GDP decreased, which had an effect on the quality of the educational act, leading also to a decrease RGP, DEP, PPB, and GER and the increase of LRP.

Analyzing data we can conclude that the hypothesis is validated for the period studied (2003-2017). The reduction of budgetary allocations for education (related to total budget revenues and to GDP) had negative effects on education, reducing the quality and disturbing the main outcome measures.

5. Conclusions

In our paper we study the developments of the financial and outcome measures from Romania education system. In this regard, we formulated a hypothesis that were subjected to a validation process, during the research. According to the hypothesis, the main outcome measures in education (RGP, DEP, PPB, LRP and GER) are influenced by the evolution of the educational expenses of Romania (expressed by PEEBI and PEEGDP).

Using correlation analysis and neural network analysis, we observed that all outcome measures are positively correlated with the measures illustrating the state's educational expenses, less the LRP which is negatively correlated. A rise in public expenditures leads to a reduction in the leaving rate and vice versa.

As a result of a policy that does not place particular emphasis on rewarding HR, the teachers' motivation lessened what had a consequence on the quality of the educational act leading to the decrease of RGP, DEP, PPB, LRP and GER.

Government spending on education increased from 2011-2018, reflecting the increase in teachers' salary incomes. Despite wage increases, Romania continues to invest low financial resources in this area. The expenditures allocated to pre-university education related to GDP were constantly inferior than the European mean reported to the share of higher education expenditure.

6. References

- Barbu, R.M.C. and Barbu M.C., 2012. Training of personnel in leadership positions in sport organizations. *Studia Universitatis Babeș-Bolyai, Educatio Artis Gymnasticae*, 57(3), pp. 41-51.
- EUROSTAT, 2019, *Database Education and training*. [online] Available at: <<https://ec.europa.eu/eurostat/web/education-and-training/data/database>> [Accessed 22 July 2019].
- Eurydice, 2004, *Key topics in education in Europe. Volume 3 - The teaching profession in Europe: profile, trends and concerns*. Brussels: Directorate-General for Education and Culture.
- Eurydice, 2015, *Profesia de cadru didactic în Europa: Practicile, Percepțiile și Politicile. Raportul Eurydice*. Final report. Luxembourg: Publications Office of the European Union.
- Eurydice, 2018, *Carierele cadrelor didactice în Europa: acces, progres și sprijin*. Brussels: Directorate-General for Education and Culture.
- INS, 2019, *Baza de date TEMPO-Online*. [online] Available at: <<http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table>> [Accessed 14 July 2019].
- OECD, 2005, *Teachers Matter: Attracting, Developing and Retaining Effective Teachers*. Paris: Organisation for Economic Cooperation and Development.
- OECD, 2009, *Creating Effective Teaching and Learning Environments: First Results from TALIS*. Paris: Organisation for Economic Cooperation and Development.
- OECD, 2012, *Preparing Teachers and Developing School Leaders for the 21st Century - Lessons from around the world*. Paris: Organisation for Economic Cooperation and Development.