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Comparative Analysis on the Influence of the Economic Crisis on Education in some European Countries

Marian Zaharia, Prof.
Department of Cybernetics, Economical Informatics, Finance and Accounting
Faculty of Economics, University of Oil-Gas from Ploiesti, Romania
marianzaharia53@gmail.com

*Cătălin Popescu, Prof.
Department of Business Administration Faculty of Economics,
University of Oil-Gas from Ploiesti, Romania
cpopescu@upg-ploiesti.ro
**Corresponding author*

Abstract
Purpose – This study intends to present some influences developed during the economic crisis related to the education area in some European countries. The study wants to present a comparative analysis among these European countries.
Design/Methodology/Approach – This study is based on the Eurostat data series and is designed due to the statistical data processing.
Findings – The study revealed some information and ideas about certain aspects as: changes of population structure by educational attainment level, evolutions of the shares with first and second stage of tertiary education, investments in education and training, age distributions for teachers and trainers, participation rates in education.
Research Limitations/Implications – This research is based on Eurostat data series considered relevant by the authors and on some other related analyses or research studies. The paper describes case studies from most of European countries but focuses only on few of them.
Practical Implications – This study clarifies the influences of the economic crisis on education in some European countries in order to present a real image related to the evolution of education among Europe.
Originality/Value – Even though different studies in the education field were developed, this subject was not analyzed in the manner carried out in this paper.
Keywords – economic crisis, first and second stage of tertiary education, USM education level, public expenditure on education, Lisbon objectives in education, ISCED 1_6.
Paper Category – Research paper.

1. Introduction

Lisbon European Council Conference (23 to 24 March 2000) established a strategic objective: "(...) Europe (...) has to become (until 2010) the most competitive and dynamic

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knowledge-based society in the world, capable of sustainable economic growth with more jobs and better and greater social cohesion". Among the objectives declared in the strategic document could be mentioned:

- substantial increase of investments in education;
- halving by 2010 the number of persons of age 18–24, who do not go beyond compulsory education;
- establishment of training centres connected to the Internet, as part of local networks multifunctional learning;
- creating a European framework for defining key competences for lifelong learning (ICT, foreign languages, technological culture, entrepreneurship, social skills, etc.);
- increasing mobility and mutual recognition of qualifications (formal, informal etc.);
- European "common" CV as a vehicle of assessing the equivalence of one's ability to get a job in Europe.

In 2006, during the course of the results reviewing process of the Lisbon Strategy, the European Council reaffirmed the key factors that can ensure Europe's productivity growth: knowledge, research, innovation, and education.

Since 2007, due to the beginning of the economic crisis, the education area has to face new challenges. Therefore, many European countries have to adapt to the new conditions and propose new objectives and new measures to change their educational system related to these new key factors in order to improve, even in difficult situations, Europe's productivity growth (Barakat *et al*., 2010; EI, 2009; OECD, 2010; UNESCO, 2009).

In recent years, in EU28 countries there were a number of efforts for the convergence of the economic systems of the member states, efforts somewhat disrupted by the economic crisis started in 2007. Education as a way of action and particularly important area of EU (European Commission, 2010) tends to evolve in the same direction with a focus on developing and implementing IT&C (Enăchescu, 2014). However, dropout remains a major problem (Rumberger, 2001) as a process which is accentuated in times of recession.

Taking into account the EU objectives on education and discontinuity caused by the economic crisis in social and economic life of most member states, the paper aims at identifying the impact of the economic crisis on the convergence of EU education levels. It also aims at answering the question of how Romania is positioned in this process, highlighting, from a contrastive analysis with other countries, some aspects of education spending, and public participation in education and teacher distribution while taking age into account.

The paper analyzes the developments of training levels of the population in many European countries in the period 2004–2012 in accordance with the International Standard Classification of Education (ISCED, 1997), focusing on first and second stage of tertiary education. We look at the developments of labour status by educational attainment level, number of foreign languages known (self-reported) by educational attainment level, and aspects of progress towards the Lisbon objectives in education correlated with expenditure on education as % of GDP or public expenditure.

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2. Work hypothesis

In order to analyze the convergence of the economic crisis on education levels, the following hypotheses were tested:

Hyp. 1. There is a convergence process in EU28 on the share of population with upper secondary and post-secondary education (levels 3 and 4) and first and second stage of tertiary education (levels 5 and 6);

Hyp. 2. The convergence process of the levels of training in EU28 was significantly influenced by the economic crisis.

In order to highlight particular aspects and Romania's position in relation to other countries in the EU convergence process in education levels we tested the following hypotheses:

Hyp. 3. Economic crisis has led to significant reduction in the share of education expenditure in GDP;

Hyp. 4. Existence of significant correlations in Romania, between GDP evolution and expenditure on education as % of GDP, respectively between GDP and expenditure on education (current prices);

Hyp. 5. Economic crisis has influenced the distribution of EU states on the share of population with first and second stage of tertiary education (levels 5 and 6);

Hyp. 6. Economic crisis has influenced the weights of students (ISCED 1_6) by sex aged 15–24 years as % of corresponding to age population.

In order to test these hypotheses, analyses of EU28 countries (convergence of the level of education, developments in the distribution of EU countries in terms of population share with first and second stage of tertiary education) are supplemented by comparative analysis (the impact of the economic crisis on education spending, developments in the evolution of the age structure of teachers, public participation in education) both in Romania and in some former communist countries, and at the level of Western European countries with more developed economies. When choosing them, both representativeness and/or their particularity and comparability of values resulting from the indicators resulted from their compatibility calculation methodologies adopted by different countries were taken into account.

3. Research methodology

Data analysis and interpretation of results involved the use of several methods and econometric models including determination and testing models, as well as statistical hypotheses testing on the analyzed parameters. In order to emphasize the characteristics of the indicators analyzed, we used linear models. Thus, in order to shape the evolution of the share of people with secondary or tertiary level of education, we used an exponential model:

$$Y = 100 - \alpha \cdot e^{-\beta \cdot t} + \varepsilon \qquad (1)$$

where $\alpha, \beta \in R$, residual variable $\varepsilon \sim N\left(0, \sigma_\varepsilon^2\right)$, and shapes the evolution of the share of population with only pre-primary, primary and lower secondary education (levels 0–2).

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It is assumed that in the long term, the share of the population with this level of training will decrease to zero:

$$\lim_{t\to\infty} \alpha \cdot e^{-\beta \cdot t} = 0 \quad \Rightarrow \quad \lim_{t\to\infty} 100 - \alpha \cdot e^{-\beta \cdot t} = 100 \tag{2}$$

This corresponds to the case where the entire population has upper secondary and post-secondary education (levels 3 and 4), or first and second stage of tertiary education (levels 5 and 6).

In order to test the existence of possible differences (failures) in the convergence process caused by the economic crisis, linear regression model was used:

$$y = a + b \cdot x + \varepsilon, = \hat{y} + \varepsilon \quad a, b \in R \,. \tag{3}$$

Determining the model parameters (1) and (3), we used least square method (Andren, 2007). Testing was performed using ANOVA model (Zaharia and Gogonea, 2008). The confidence intervals for parameters are:

$$\begin{aligned} &b \pm t_{\frac{\alpha}{2},n-k-1} \cdot s_b, \quad where \quad s_b = s_e \cdot \frac{1}{\sqrt{\sum \left(x_i - \bar{x}\right)^2}}, \quad and \quad s_e = \sqrt{\frac{\sum (y_i - \hat{y}_i)^2}{n-k-1}} \\ &a \pm t_{\frac{\alpha}{2},n-k-1} \cdot s_a, \quad where \quad s_a = s_e \cdot \sqrt{\frac{\sum x_i^2}{n\sum \left(x_i - \bar{x}\right)^2}} \end{aligned} \tag{4}$$

The quality of the regression models was evaluated by correlation values of the ratio (Multiple R) and the coefficient of determination (R Square) $R^2 = \dfrac{\sum \left(\hat{y} - \bar{y}\right)^2}{\sum \left(y_i - \bar{y}\right)^2}$.

Statistical hypothesis testing about averages was performed with t-Test: Two-Sample Assuming Unequal variances: $t = \dfrac{x - y}{\sqrt{\dfrac{s_x^2}{n_x} + \dfrac{s_y^2}{n_y}}} \sim t_{n_x + n_y - 2}$, and for the ratio of two dispersions, the F test was used: $F = \dfrac{s_1^2}{s_2^2} \sim F_{n_1 - 1, n_2 - 1}$. Materiality used was $\alpha = 0.05$.

In order to test least square method we used Jarque-Bera normality test (Jarque and Bera, 1987), Durbin-Watson statistic (Verbeek, 2012) and ARCH test – Autoregressive Conditional Heteroskedasticity Test.

In order to check normality distribution laws of the analyzed variables, JB test (Jarque & Bera, 1987) was used:

$$JB = n\left[\frac{S^2}{6} + \frac{(K-3)^2}{24}\right], where \quad S = \frac{\mu_3}{\sigma^3}, and \quad K = \frac{\mu_4}{\sigma^4} \tag{5}$$

In case of normal distribution, the skewness coefficient S = 0, and the value of vaulting (Kurtosis) K = 3.

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Also, in order to test the hypothesis of least square method we used Durbin-Watson statistic (Verbeek, 2012) and ARCH test – Autoregressive Conditional Heteroskedasticity Test.

Processing and data analysis were conducted with statistics packages were EViews, SPSS (Jaba and Grama, 2004) and Excel (Oprea and Zaharia, 2011).

4. Results and discussion

4.1. A brief outline of the characteristics of the economic crisis triggered in 2009 in relation to education

According to the follow-up survey conducted by Education International published in December 2009 and updated in February 2010, Central and Eastern European countries have specifically been affected by economic and financial crisis that has reached a critical level in the late 2008. These countries have proven vulnerable to cross-border financial services failure because their savings had a high exposure to domestic markets and were largely dependent on foreign investment in their desire to integrate into the EU economic space. Rapid decrease in demand of any kind in Western Europe combined with the disappearance of cheap credit provided in the past by Western banks obviously led to a severe economic recession in some countries of Eastern and Central Europe. By having the desire to reduce deficits, these countries, by governments at that time, reduced public expenditure, including severe measures such as cutting public budgets, reducing budget salaries or "freezing" employment in the public sector. In Western European countries, the impact was less in education, maybe except Iceland and Ireland, the economies of which have suffered substantially. On the other hand, other countries (e.g. France, Germany and the UK) have increased their public debt to invest in public services, even announcing significant investments in education. Northern European countries like Sweden and Norway have invested in education, particularly higher education, as a strategy for economic recovery.

As an overall assessment of the situation, one can say that the overall Western European countries have adopted different approaches of the crisis compared to Central and Eastern European countries. Thus, most countries in Central and Eastern Europe have reduced spending on education, almost at all levels, including often higher education (Croatia, Estonia, Latvia, Lithuania, Romania, and Macedonia). In addition, in Serbia the state budget allocated to education was reduced by 25% in April 2009, 10% in Hungary and in the Czech Republic to the level of 2010 by 5% (in the latter case including reduction of teachers' salaries). Latvia is a particular case in this respect, as cuts in education sector were the largest (e.g. the state budget allocated for teachers at primary and secondary level was reduced by 50.9%). Another relevant example is the case of Romanian wage cuts starting June 1, 2010, which decreased the salaries by 25% for the whole public staff. In the case of Croatia, the total budget allocated to education in 2009 was reduced by 9%. As a general and constant observation, in these countries can be said that in addition to spending cuts in education, other sectors have suffered significant declines (in particular health and social care).

In Western Europe as well as in Northern Europe, most countries have resorted to significant cuts of education budgets (the case of Belgium, Denmark, Germany, Norway,

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Spain, and the UK) and this was possible because the impact of the crisis on education sector was relatively limited. An example to follow is that of Norway, as in the period of 2009–2010 the government decided to increase spending by 9% in vocational education and by 2.15% in higher education. On the opposite side, there were Iceland and Ireland. For example, in Iceland all levels of education have suffered, as well as health and social care sector. In Ireland, expenditure at primary level was reduced by 10%.

4.2. Was the process of convergence of EU education level influenced by the economic crisis?

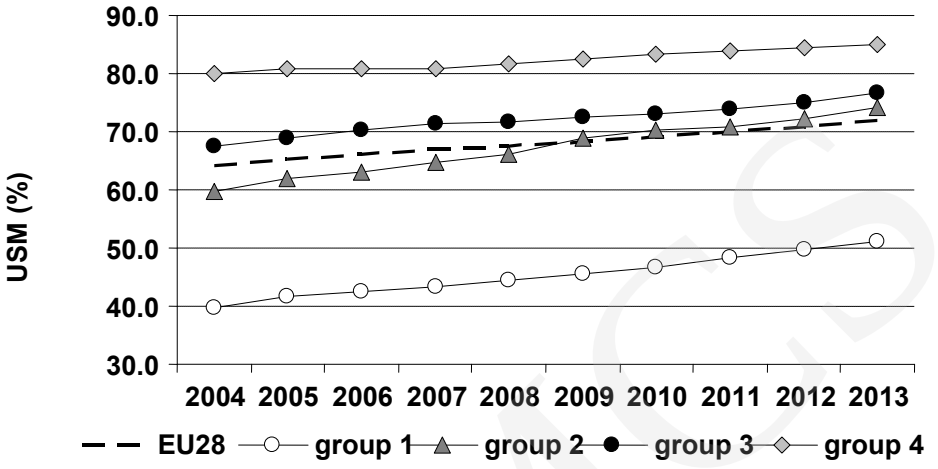
Upper secondary and post-secondary education (levels 3 and 4) and first and second stage of tertiary education (levels 5 and 6) are two significant indicators in characterizing a country's level of instruction and education, as well as the living standard and level of civilisation, on the whole. In the brief analysis presented next, we have combined these two indicators and elaborated, based thereon, the indicator upper secondary and more education level (levels 3–6), henceforth USM. During the last decade, the values, as well as the evolution followed by the share of population aged between 25 and 74 years old, with education levels 3–6, structures of the countries EU28 in relation to the average EU28, into 4 groups (Figure 1): countries with more than 5 percentage points below the average, with 0–5 percentage points below the average, with 0–10 percentage points above the average and with more than 10 percentage points above the average (Zaharia *et al*., 2014).

The countries in the first group (Malta, Portugal, Spain, Italy, Greece, and Belgium), characterized by a significant difference, compared with the average EU28, included Malta and Portugal, where only 21.3%, respectively 22.2% of the total population aged between 25 and 74 years old, had USM education level. The gap between these ones and the average UE was respectively 42.8 and 41.9 percentage points. Nevertheless, note that in the period 2004–2013, the growth rates of the population with USM education level out of the total population aged between 25 and 74 years old has doubled, compared with the one registered at the European level; hence, in the year 2013, the gap was 35.0 percentage points for Malta and 36.4 percentage points for Portugal.

The second group of countries, with gaps in the share of population with USM education level ranging between 5 and 0 percentage points, compared with the average EU28, in 2004, included Ireland (59.2%), Cyprus (59.6%), Luxemburg (59.9%) and France (60.6%). The steps taken in these countries, with a view to improving the population's attainment levels, made the improvements in this area (between 10.9 percentage points in France and 18.6 percentage points, in Luxemburg) to be above the average EU. As a consequence, in 2013, the share of population with USM education level, of the total population aged between 25 and 74 years old, in Ireland, Cyprus and Luxemburg, exceeded the average EU.

A somewhat similar situation is encountered in the countries where the share of population with USM education level, out of the total population, exceeded the average EU by at most 10 percentage points. In 2004, this group consisted of Croatia (64.2%), Romania (64.4%), Bulgaria (65.6%), the Netherlands (67.7), Hungary (68.5%), UK (70.3%), and Finland (71.9%). Between 2004 and 2013, they were joined by Ireland,

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Source: Our own processing, based on Eurostat data series: http://ec.europa.eu/eurostat/data/database, Population by educational attainment level, gender and age (%) [edat_lfs_9903], accessed on January 18, 2015

Figure 1. Evolutionary trends followed by the averages of the performance groups, in terms of USM, compared with the average EU28, in the period 2004–2013

Cyprus and Luxemburg. Unfortunately, because of less successful evolution in the area (a gain of only 7 percentage points), Romania drops below the European average, by 0.5 percentage points; the share registered in 2013 amounting to only 71.4%.

Finally, the fourth group, characterized by shares of the population with USM education level, out of the total population aged between 25 and 74 years old, in 2004, consisted of the rest of the 11 UE28 member countries; four thereof had shares of over 80%: Germany (81.0%), Slovakia (82.3%), Estonia (83.7%), and the Czech Republic (86.4%). Only 8 countries remained in this category, in 2013. Given that the EU average in the area was 71.8%, significant values were registered in the Czech Republic (91.2%) as well as in Slovakia and Lithuania (89.5%).

The analysis upon the share of population with USM education level in the total population aged between 25 and 74 in the EU28 countries leads to an important conclusion: the countries where the registered shares were below the average EU, were characterized, in the decade under analysis, by improvements ranging between 9.2 percentage points in Greece and 18.6 percentage points in Luxemburg, superior to the advancement at EU level (7.8 percentage points). At the same time, the countries situated in 2004 above the EU average in the area, achieved improvements inferior to the EU average, yet with a few exceptions (Bray and Varghese, 2009).

Testing Hypothesis 1 on convergence of education levels in EU28 focusing on USM education level was performed based on the following secondary hypotheses:

$H_{0:}$ USM education level developments are not converging;

$H_{1:}$ USM education level developments form a convergent system in the EU28.

In order to test these, patterns of development were identified as averages of the four groups of type (X), models which highlight the asymptotic developments. The patterns are:

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$$USM_{G1} = 100 - 60.254 \cdot e^{-0.0221t} + \varepsilon_{G1} \quad (6)$$

$$USM_{G2} = 100 - 40.347 \cdot e^{-0.0479t} + \varepsilon_{G2} \quad (7)$$

$$USM_{G3} = 100 - 32.147 \cdot e^{-0.0323t} + \varepsilon_{G3} \quad (8)$$

$$USM_{G4} = 100 - 20.500 \cdot e^{-0.0336t} + \varepsilon_{G4} \quad (9)$$

In models (6–9) , for t = 0 we obtained the average values of the four groups recorded in 2004. The characteristics of patterns (6–9) are shown in Table 1.

Model	Coefficients		t_statistic	Sig. t	F_statistic	Sig. F	Multiple R	R Square
USM_{G1}	α	60.254	219.538	0.000	668.544	0.000	0.994	0.988
	β	-0.0221	-25.856	0.000				
USM_{G2}	α	40.347	116.930	0.000	895.348	0.000	0.995	0.991
	β	-0.0479	-29.992	0.000				
USM_{G3}	α	32.147	108.889	0.000	352.650	0.000	0.989	0.978
	β	-0.0323	-18.779	0.000				
USM_{G4}	α	20.500	13.710	0.000	176.694	0.000	0.978	0.956
	β	-0.0336	-13.217	0.000				

Table 1. Statistical significance of test results of models (6–9) and their coefficients for materiality $\alpha = 0.05$

Source: authors' own processing, resorting to SPSS

Taking into account the values of F_statistic and that Sig.F = 0.000 for all models, it comes out they are statistically significant, a fact emphasized by the very close values to 1 of Multiple R and R_Square. Average USM education level in the total population of 25–74 years old, generated with the models (6–9) are shown in Figure 2.

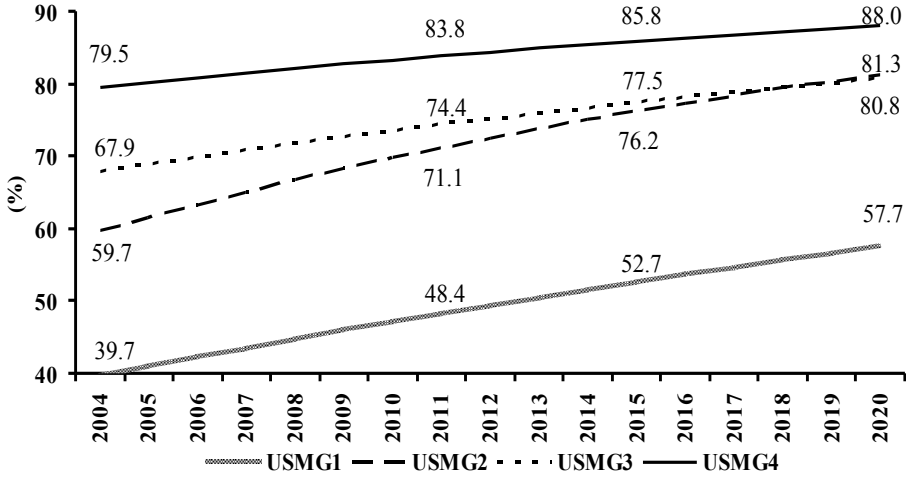


Figure 2. Development of USM educational level generated by models (6–9).

Source: own use of SPSS and Excel

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The validity of the models obtained allows their use to test the hypothesis about convergence of UE28 education levels. In 2004, the gap between the maximum average of USM education level (79.5% for USMG4 and the minimum (39.7% for USMG1) was 39.8 percentage points. In 2011 the gap was down to 35.4 percentage points. If trends persist, this gap is reduced to 33.1 percentage points and 30.3 percentage points in 2020.

In view of the above, we conclude that the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted: USM education level developments are converging. The convergence process is much too slow. In order to accelerate it, firm action must be taken.

In order to test Hypothesis 2 on the influence of the economic crisis on the convergence of USM educational level, the data series was generated resulting from differences between the values USMG4 and USMG1 for the period 2004–2013, which was used to build the linear regression model:

$$\Delta_{G4,G1} = 39.692 - 0.609 \cdot t + \varepsilon \qquad (10)$$

Test hypotheses are:

$H_{0:}$ (null hypothesis) Convergence process was not significantly affected by the economic crisis (model 10 is valid).

$H_{1:}$ Convergence process was significantly influenced by the economic crisis (model 10 is invalid).

The results of the test are shown in Table 2.

Table 2.
Results of testing hypothesis on the influence of the economic crisis on the convergence of USM educational level in EU28, for materiality $\alpha = 0.05$

	Coefficients	t Stat	P-value	Lower 95%	Upper 95%	Significance F	R Square
Intercept	39.692	2432.255	5.24E-22	39.65426	39.73143	1.45E-14	0.999842
t	-0.609	-210.302	1.45E-14	-0.61674	-0.60302		

Source: our own processing, resorting to SPSS and Excel

Significance_F values lower than 0.05 certifies the validity of model (10). The two values of P_value are less than 0.05, the result being that both coefficients of the regression model (10) are statistically significant. Therefore, the null hypothesis is accepted: the convergence of USM educational level was not significantly affected by the economic crisis.

The final conclusion on hypotheses 1 and 2 is that in EU28, there is a (relatively slow) process of convergence at upper secondary and post-secondary education (levels 3 and 4) and first and second stage of tertiary education (levels 5 and 6).The convergence process was not significantly affected by the economic crisis.

4.3. Was the impact of economic crisis significant on education expenditure?

In order to test this hypothesis, we took into account the compatibility of its determination and the available data. Apart from Romania (RO), four former communist countries were chosen: Bulgaria (BG), the Czech Republic (CZ), Lithuania (LT), and Hungary (H) and four Western European countries Germany (D), France (F), Italy (I), and the Netherlands (NL).

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During the period preceding the economic crisis, in the countries under analysis (Table 3), the share in GDP of the expenditure on education, during the period 2004–2009, had a slightly oscillating evolution; the annual modifications, in percentage points, falling between -0.40 points in Italy (a drop from 4.67% in 2006 to 4.27% in 2008) and 0.76 points in Lithuania (from 4.88% in 2008 to 5.64%) in 2009.

The economic crisis which began in 2009 exerted different effects upon the EU27 States. Hence the increases and decreases registered in each State, at EU average level, compensated each other. In most States under analysis, in 2010, the share of the expenditure on education in GDP dropped in percentage points with values ranging between -0.04 points in France and 0.71 points in Romania.

Table 3.
Total public expenditure on education as % of GDP, for all levels of education combined

GEO/TIME	2004	2005	2006	2007	2008	2009	2010	2011
Bulgaria (BG)	4.40	4.25	4.04	3.88	4.44	4.58	4.10	3.82
Czech Republic (CZ)	4.20	4.08	4.42	4.05	3.92	4.36	4.24	4.51
Germany (D)	4.62	4.57	4.43	4.49	4.57	5.06	5.08	4.98
France (F)	5.80	5.67	5.61	5.62	5.62	5.90	5.86	5.68
Italy (I)	4.56	4.41	4.67	4.27	4.56	4.70	4.50	4.29
Lithuania (LT)	5.17	4.88	4.82	4.64	4.88	5.64	5.38	5.17
Hungary (H)	5.44	5.46	5.44	5.29	5.10	5.12	4.90	4.71
Netherlands (NL)	5.50	5.53	5.50	5.32	5.50	5.95	5.98	5.93
Romania (RO)	3.28	3.48	:(u)	4.25	:(u)	4.24	3.53	3.07

u - low reliability
Source: http://ec.europa.eu/eurostat/data/database, Investments in education and training [educ_thexp], accessed on January 28, 2015

In 2011, the decreases lessened. Nevertheless, the negative leaders were still Bulgaria (a reduction in the share of the expenditure on education in GDP by 0.28 percentage points) and Romania (a reduction in the share of the expenditure on education in GDP by 0.46 percentage points).

Testing the first hypothesis of the existence of a significant difference between the percentage of education expenditure in GDP during the economic crisis (x) compared with the period prior to it (y) was performed by t-Test: Two-Sample Assuming Unequal variances (t Critical one-tail), with the following assumptions derived:

$H_{0:}$ the share of education expenditure in GDP in the two periods did not differ significantly

H_1: the share of education expenditure in GDP during the crisis is significantly lower than the previous period.

The results are shown in Table 4. The significance level used was.

From the results shown in Table 4, in most countries analyzed, it can be concluded that the recession did not influence the share of expenditure on education in GDP. Exceptions are Hungary and Romania where the share of education expenditure in GDP during the economic crisis is significantly lower than in the previous period.

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Although the submitted figures are not very high, if we consider the different levels afferent to the share of the expenditure on education in GDP for each State in Romania and others, the decreases are downright dramatic. For instance, in Italy, after two consecutive years of decreases in the share of the expenditure on education in GDP in 2011 they were lower only by 8.7% than in 2009. In Romania, the share of the expenditure on education in GDP in 2011 was lower by 27.6% than in 2009 (Prakash, 2009). This emphasizes a governmental policy totally unfavourable to education, with possible long-term effects in Romania.

In the developed economies under analysis, the impact of the economic crisis on education was much lower; the share of the expenditure on education in GDP in 2011, as against 2009, fell between 96.27% in France and 99.66% in the Netherlands. The effects of the economic crisis on these countries were virtually nonexistent.

Table 4. The results of t-Test: Two-Sample Assuming Unequal variances (t Critical one-tail, left side). Null hypothesis: The share of education expenditure in GDP in the two periods did not differ significantly

	BG	CZ	D	F	I	LT	H	NL	RO
T_Stat	-1.272	1.036	2.579	0.720	-1.078	1.144	-3.485	2.835	-3.415
t Critical one-tail (left side)	-2.132	-2.132	-2.132	-2.132	-2.132	-2.132	-2.132	-2.132	-2.132
Accepted Hypothesis	H_0	H_0	H_0	H_0	H_0	H_0	**H_1**	H_0	**H_1**

Source: authors' own processing, resorting to SPSS

A special case, as shown by the above analyses, is the Czech Republic where in 2011 the share of the expenditure on education in GDP was higher by 3.44% than in 2009.

In order to test the fourth hypothesis regarding the influence of the economic crisis on expenditure for education in Romania, we determined the Pearson's correlation coefficient and the Spearman and Kendall nonparametric correlation coefficient (Table 5). Testing their significance was performed with t test (two-tail) for a significance threshold α=0.05.

Test hypotheses are:

$H_{0:}$ The correlation coefficient is not statistically significant (not significantly different from zero).

$H_{1:}$ The correlation coefficient is not statistically significant.

Table 5. Null Hypothesis Testing for correlations coefficients

	Expenditure on education as % of GDP			Expenditure on education (comparable prices, 2004=100%)		
	Coefficient	Signification (2-tailed)	Accepted Hypothesis	Coefficient	Signification (2-tailed)	Accepted Hypothesis
Pearson	0.631	0.179	H_0	0.896	0.015	**H_1**
Kendall	0.733	0.039	**H_1**	0.999	0.005	**H_1**
Spearman	0.892	0.042	**H_1**	1.000	0.000	**H_1**

Source: authors' own processing, resorting to SPSS

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Analyzing the results, it comes out that for the Pearson's coefficient the correlation between GDP volume and Expenditure on education as % of GDP is not statistically significant (accepting the null hypothesis), which would highlight the lack of a significant correlation between the two variables. On the other hand, considering that Significance_ (2-tailed) values for the Kendall and Spearman nonparametric correlation coefficient are lower than materiality (α=0.05), one may accept the alternative hypothesis: between the GDP volume and Expenditure as % of GDP on education there is a significant correlation.

Regarding the correlation between GDP and Expenditure on education volume in comparable prices, the results show a strong correlation intensity, the null hypothesis is rejected.

For refining the analysis of the influence of the economic crisis on education spending, it is useful to highlight its influence on the distribution of annual expenditure on public and private educational institutions per student in purchasing power standard (PPS) by level of education. Since Romania together with Bulgaria occupy the last position in EU28 at the level of expenditures for education, we have limited the analysis at their level.

In Romania, the expenditure in tertiary education per student was in 2011 at the level registered in 2009. However, with its 3255 Euros, Romania is far both from the EU level, and from the expenditures made by other former communist countries on tertiary education. They are 2.15 times lower than in the Czech Republic and circa 2 lower than in Lithuania and Poland, and even 1.2 times lower than in Bulgaria.

The policies of expenditure – allocation on the three levels significantly differed in Romania and Bulgaria (Figure 3). In this period, Bulgaria mostly paid attention to the secondary level of education; the expenditure per student rose from 2262 Euros in 2009 to 2291 Euros in 2011 (an increase of 1%). In the primary level of education, the expenditure per student was only 2% lower in 2011 than in 2009. In the same period, the expenditure per student in the tertiary education dropped by 19.4% (from 4961.2 Euros in 2009 to 3997.9 Euros in 2011).

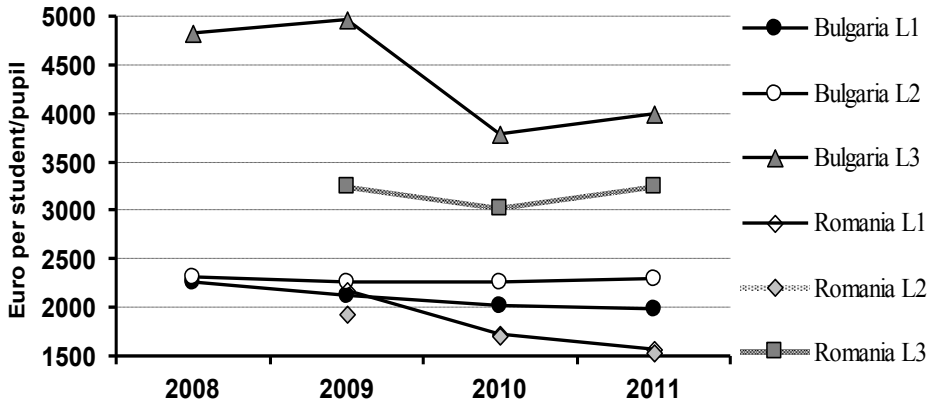


Figure 3.
Distribution of annual expenditure on public and private educational institutions per student in PPS, level of education

Source: authors' own processing based on Eurostat data series: http://ec.europa.eu/eurostat/data/database, Investments in education and training [educ_thexp], accessed on January 28, 2015

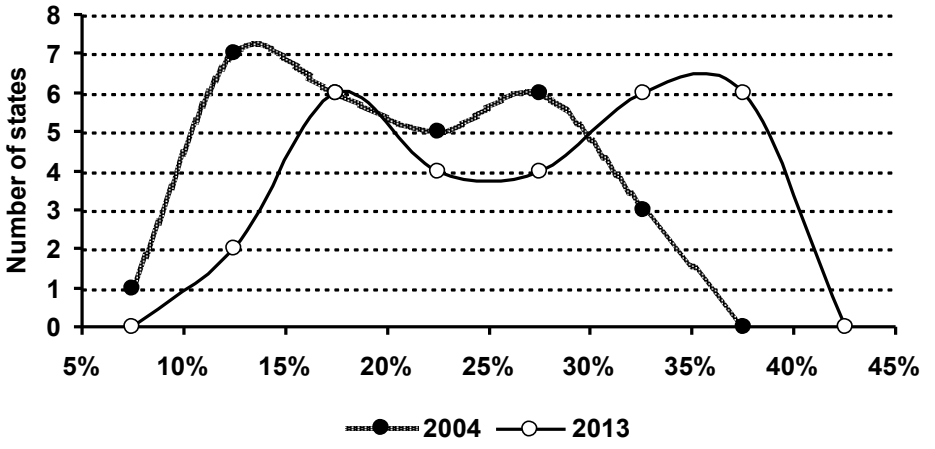
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In Romania, as opposed to Bulgaria, the policy of fund distribution per student was diametrically opposed. In Romania, primordial attention was paid to the tertiary education; the expenditure per student was in 2011 at the level registered in 2009. Instead, the shock of the crisis was taken by the primary level of education, where the expenditure per student dropped from 2177.9 Euros in 2009 to 1567.6 Euros in 2011 (a reduction of 28%), as well as by the secondary level of education, where the expenditure per student dropped from 1937.1 Euros in 2009 to 1538.2 Euros in 2011 (a reduction of 21%). Which of these two policies was better will be seen in the future.

4.4. Impact of economic crisis on the share of population with tertiary first and second stage of education was significant

It goes without saying, the vast majority of European countries have had, over time, educational policies meant to raise its level. Hence, in 2013, in 26 out of the 28 EU member States, over 50% of the population aged between 25 and 74 years old had at least USM education level. Nevertheless, significant differences are noticed regarding the shares of population with upper secondary and post-secondary non-tertiary education (levels 3 and 4) and first and second stage of tertiary education (levels 5 and 6). On this line, it should be emphasized that, excepting Lithuania and Estonia, in all the other former communist countries, which are EU28 members, the share of population with first and second stage of tertiary education is below the EU.

In order to test the fifth hypothesis about the impact of economic crisis on the distribution of EU28 member states according to population share of first and second stage tertiary education (levels 5 and 6), whose graphical representation is illustrated in Figure 4, we analyzed the characteristics of their distributions in 2004 and 2013.



Source: authors' own processing based on Eurostat data series: http://ec.europa.eu/eurostat/data/database, Population by educational attainment level, gender and age (%) [edat_lfs_9903], accessed on January 18, 2015

Figure 4. Distribution afferent to the shares of population with first and second stage of tertiary education registered in 2004 and 2013

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The derived hypotheses are:

$H_{0:}$ The economic crisis did not significantly affect the distribution of EU states on the share of population with first and second stage of tertiary education (levels 5 and 6).

$H_{1:}$ The influence of the economic crisis on the distribution of EU states on the share of population first and second stage of tertiary education was significant.

The main features of these distributions are shown in Table 6.

Table 6.
Values of the parameters and of the normality test for the distributions of the shares of population with first and second stage of tertiary education registered in the years 2004 and 2013

Year	Mean	Minim	Maxim	Standard Deviation	Skewness	Kurtosis	Jarque Bera	Probability
2004	19.98	9.6	30.7	6.6245	-0.03142	1.7895	1.7139	0.4244
2013	27.15	14.5	38.7	7.6759	-0.06057	1.7525	1.8325	0.4000

Source: authors' own processing, resorting to EViews

A first, conclusion drawn from the analysis of the data in Table 6 and Figure 4 points to the shift in the average of the distribution afferent to the values of the shares of population with first and second stage of tertiary education registered in the year 2013 (27.15) to the right compared with the one corresponding to the year 2004 (19.98) – a fact which emphasizes the significant rise in the share of population with first and second stage of tertiary education, out of the total of population EU28 aged between 25 and 74 years old.

A second conclusion that emphasizes the observation above regarding the relative divergence of the evolution followed by the shares of population with first and second stage of tertiary education results from both the fact that the range of the series 2013 (24.2) is higher than the one corresponding to the series 2004 (21.1), and the fact that the Standard Deviation of the series 2013 (7.6757) is higher than the Standard Deviation of the series 2004 (6.6245).

In the third place, given the values of the test Jarque–Bera, as well as the values Probability, both much higher than the value of the significance threshold (α=0.05), it follows that the Null Hypothesis is accepted; and, therefore, both distributions are normal, symmetrical (Skewness≈0) and platykurtic (Kurtosis<3).

Consequently, we accept the null hypothesis: the economic crisis did not influence the shape of distribution EU28 member states with first and second stage of tertiary education in the analyzed period. Moving to the right of distribution for the year 2013 (with mean 27.17 and standard deviation 6.6245), compared to the corresponding 2004 (with mean 19.98 and standard deviation 7.6759) is the result of increased education in the EU28 member states and of the policies in the field of education.

The analysis, in the dynamics, of the weights for population with first and second stage of tertiary education, in some countries, has certain features. Thus, the difference between the extreme values registered in 2004 (-10.6 percentage points in Romania and 11.3 percentage points in Finland) and the values registered in 2013 (-12.2 percentage points in Romania and 11.5 percentage points in the Czech Republic) increased.

Along with Romania, among the states where the share of population with first and second stage of tertiary education went off (negatively) the EU average, there are Italy

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(from -9.9 percentage points, in 2004, to -11.8 percentage points in 2004), Croatia (from -5.5 to -7.6 percentage points), Hungary (from -4.6 to -5.2 percentage points), Austria (from -2.5 to -7.1 percentage points), and Bulgaria (from -0.5 to -2.5 percentage points). Note, however, that the size specific to the range of values registered in 2013 regarding the share of population with first and second stage of tertiary education (23.7 percentage points) is much lower than regarding the share of population with upper secondary and post-secondary non-tertiary education (54.1 percentage points).

4.5. Was the impact of economic crisis significant on participation rates in education?

In order to test the hypothesis on the impact of the economic crisis on weights students (ISCED 1_6) by sex aged 15–24 as % of corresponding age population, we chose for this analysis Romania, four former communist countries (Czech Republic, Latvia, Lithuania, Hungary) as well as France and Austria. Their choice was based on their position to EU average and to the fact they had different political systems before 1990.

At EU28 level, the total participation rates in education by age 15–24 years old, as % of corresponding age population during the period 2004–2008, had a linear increase of approximately 0.4 percentage points annually from 58.9% in 2004 to 62.0% in 2012. At EU28 average level, this indicator was not influenced by the economic crisis which broke out in 2009. This statement is emphasized by the fact that during the period 2008–2012 it increased, on the average, by 0.46 percentage points annually – even greater than the average annual advancement of the entire period.

By gender, the male participation rates in education by age 15–24 as % of corresponding age population, are inferior to the ones corresponding to the female population. In this way, while the participation rates in education of the male population were on the increase, annually, in the period under analysis, on the average, by 0.38 percentage points (from 58.8% in 2004 to 59.9% in 2012), the participation rates in education of the female population were on the rise, annually, by 0.42 percentage points (from 61.0% in 2004 to 64.2% in 2012).

A comparative presentation of the evolutions followed by the students (ISCED 1_6) by gender aged 15–24 as % of corresponding age population, compared with the average EU28, is shown in Table 7. The values registered in 2004 for the eight countries, cover a relatively wide range (21.7 percentage points); Romania and Bulgaria rank in the bottom with respectively 11.5 and 10.0 percentage points.

During the period 2004–2008, in terms of students (ISCED 1_6) by gender aged 15–24 years old, a certain convergence occurs and the interval is reduced to 17.1 percentage points, thanks to the varied manifestations of the economic crisis in different countries, as well as to their specificity. Yet, although in 2008 the values were below the EU28 average, during the period 2008–2012 the evolution of the values is divergent.

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At the level of the total population, the difference between the share of the students aged between 15 and 25 years old as % of corresponding age population and the average EU27, during the period 2008–2012, was on the increase in absolute value by 0.7 percentage points in Austria, by 1.1 percentage points in France and by 4.8 percentage points in Romania – this last case being the most unfavourable. Unlike these countries, in terms of the indicator under analysis, in Bulgaria, where the gap in 2008 was at the total level of -8.4 percentage points, it reduced to -6.8 percentage points in 2012.

Table 7. Differences, in percentage points, between the shares of the students (ISCED 1_6) by gender aged 15–24 years as % of corresponding age population at the level some member countries as compared to EU average during 2004, 2008 and 2012

Year / Country	2004			2008			2012		
	Total	Males	Females	Total	Males	Females	Total	Males	Females
Bulgaria	-10.0	-7.9	-12.0	-8.4	-8.2	-8.6	-6.8	-6.6	-7.0
Czech Republic	0.3	1.6	-1.1	1.3	0.2	2.5	1.5	0.2	2.9
France	0.8	1.1	0.6	-1.6	-1.4	-2.0	-2.7	-2.3	-3.1
Latvia	5.9	4.4	7.5	0.7	-2.2	3.7	4.9	3.5	6.3
Lithuania	10.2	9.2	11.2	8.7	7.2	10.3	12.8	11.2	14.4
Hungary	0.8	0.8	0.9	4.2	4.3	4.1	4.6	5.1	4.1
Austria	-7.1	-6.1	-8.0	-5.8	-5.5	-6.2	-6.5	-7.1	-5.9
Romania	-11.5	-11.8	-11.0	-3.4	-5.2	-1.5	-8.2	-9.0	-7.5

Source: our own processing, after http://ec.europa.eu/eurostat/data/database, participation rates in education by age and gender [educ_thpar], accessed on February 4, 2015

In terms of the values registered by gender, during the period 2008–2012, the share of the female population aged between 15–24 years old enrolled in a form of education (ISCED 1_6) as % of corresponding age population for all eight countries under analysis is higher than the one corresponding to the male population.

Nevertheless, seen in the light of the negative gap, as against the corresponding average EU28, during the same period in France and Romania, the registered values regarding the female population aged between 15–24 years old enrolled in a form of education, had a more divergent evolution than the one corresponding to the male population. This emphasizes, to a certain extent, its vulnerability during crisis.

In Romania, the economic crisis exerted a strong impact upon the students (ISCED 1_6) 15–24. The gap against the corresponding UE28 averages increased in absolute value in 2012, compared with 2008, by 3.8 percentage points for the male population and by 6.0 percentage points for the female population. Despite the progress in drawing Romania closer to the EU28 average, in terms of this indicator, these last few years' evolutions led Romania back to the level of the year 2007.

In view of the above, it can be stated that economic crisis negatively influenced the weights of students (ISCED 1_6) by sex aged 15–24 only in some EU countries. The negative impact on certain member states on the rate of participation in education cannot be blamed on the legacy of the past, but on the one hand on the economic downturn, unemployment and thus reduction of the living standard, and on the other

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side on a worrying attitude that diminished the role of education including high-level corruption.

Unlike in other countries (including Bulgaria), in Romania the impact of economic crisis on weights students (ISCED 1_6) aged 15–24 years was significant.

4.6. Mutations of teachers and trainers weights

The mainstream in EU countries, regarding the age distribution of the teachers and trainers, is to diminish the share of the ones aged below 30 years old in all three levels of education. This tendency does not seem to be significantly influenced by the economic crisis but is rather a consequence of the ever higher level of qualification necessary for working in the field of education. Nevertheless, in states such as Romania, Poland or Hungary, the process of reduction in the proportion of teachers aged < 30 teaching in public and private of total teachers teaching in ISCED level 2–3 is more pronounced than in the period preceding the economic crisis.

	Bulgaria		Germany		France		Hungary		Poland		Romania	
Aged	2008	2012	2008	2012	2008	2012	2008	2012	2008	2012	2008	2012
<30	7.0	3.9	3.2	5.1	9.3	6.8	12.5	7.1	17.6	10.5	20.6	14.9
30–39	25.5	20.2	21.2	20.6	30.2	28.9	28.1	27.5	34.8	34.5	26.6	33.0
40–49	32.0	31.6	25.2	25.5	26.2	31.5	30.2	31.1	27.9	30.4	19.2	23.1
>50	35.5	44.3	50.4	48.8	34.3	32.8	29.2	34.3	19.7	24.5	33.6	29.0

Table 8. Structure by age group of the teaching in public and private at ISCED levels 2–3 as % of total teachers teaching in ISCED levels 2–3 in the years 2008 and 2012

Source: http://ec.europa.eu/eurostat/data/database, teachers and trainers; age distributions – pupils to teachers ratio [educ_thpertch], accessed on February 2, 2015

Except Romania, where the share of the teachers aged 30–39 teaching in public and private schools at ISCED levels 2–3 was higher in 2012 than in 2008, their share either dropped or remained approximately constant in the other countries shown in Table 8. For the age group 40–49 years old, in all countries under analysis, their share was on the rise. For the age group above 50 years old, a significantly high rise was noticed in Bulgaria, where almost half of the teachers and trainers are aged above 50 years old in 2012. Instead, in Romania, the share of teachers and trainers aged above 50 years old is 29.0%, which may be a strength for the future development and increased performance of the Romanian education.

On the whole, at the three levels of education, the ratio of students to teachers, during the period under analysis, no significant changes occurred. In the analyzed states, the ratio of students to teachers was between 8.1 in Lithuania and 15.4 in Romania.

The values of the ratio of students to teachers, at each of the three educational levels in the year 2012 display both similarities and dissimilarities. Thus, apart from Hungary, the ratio of students to teachers in primary education (level 1) is greater for each of the other two levels. Their values fall between 10.1 students to teacher in Lithuania and 18.1 in Romania.

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For the secondary education, the ratio of students to teachers falls between 7.5 in Lithuania and 15.5 in France. High values are also registered in Germany (13.9), Romania (13.0), and Bulgaria (12.8).

The ratio of students to teachers, for the tertiary education, in the analyzed countries, falls between 7.8 in Lithuania and 15.9 in Romania. Note that, apart from France where the ratio of students to teachers in the tertiary education is 9.9 compared with 15.5 in the secondary education, and from Bulgaria where the ratio in the tertiary education is 12.3 in the tertiary education compared with 12.8 in the secondary education, the ratio of students to teachers in tertiary education is much higher than in secondary education. The greatest difference may be noticed in Romania where in 2012 the number of students to teachers in tertiary education was 15.9 compared with 13.0 in secondary education. For Romania, this is a negative fact.

Mutations occurring in the age distribution of teachers and trainers, especially reducing the percentage of those under 30 years old, is due, at least in tertiary education, to a significant increase of standards that must be met by the candidates for such jobs (to hold a PhD), standards the fulfilment of which requires further study with master's and doctorate. On the other hand, in some countries, the relatively low salaries of teachers make this field less attractive. In Romania, it is the main cause of reduced share of young staff in education.

5. Conclusions

Main ideas and findings of the paper could be summarized as follows:

- the first conclusion drawn from the analysis stated that in EU28, there is a (relatively slow) process of convergence at upper secondary and post-secondary education (levels 3 and 4) and first and second stage of tertiary education (levels 5 and 6). The convergence process was not significantly affected by the economic crisis;
- the economic crisis which began in 2009, exerted different effects upon the EU27 states; hence the increases and decreases registered in each state at EU average level compensated each other; in most states under analysis in 2010 the share of the expenditure on education in GDP dropped, in percentage points, with values ranging between -0.04 points in France and 0.71 points in Romania;
- in most countries analyzed, it can be concluded that the recession did not influence the share of expenditure on education in GDP. Exceptions are Hungary and Romania where the share of education expenditure in GDP during the economic crisis was significantly lower than in the previous period;
- in the developed economies under analysis, the impact of the economic crisis on education was much lower; the share of the expenditure on education in GDP in 2011 as against 2009 fell between 96.27% in France and 99.66% in the Netherlands; the effects of the economic crisis on these countries were virtually nonexistent;
- another conclusion drawn from the analysis of the data in Table 6 and Figure 4 points to the shift in the average of the distribution afferent to the values of the shares of population with first and second stage of tertiary education registered

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in the year 2013 (27.15) to the right, compared with the one corresponding to the year 2004 (19.98) – a fact which emphasizes the significant rise in the share of population with first and second stage of tertiary education, out of the total of population EU28 aged between 25 and 74 years old;
- other conclusion emphasizes the observation above, regarding the relative divergence of the evolution followed by the shares of population with first and second stage of tertiary education results from both the fact that the range of the series 2013 (24.2) is higher than the one corresponding to the series 2004 (21.1), and the fact that the Standard Deviation of the series 2013 (7.6757) is higher than the Standard Deviation of the series 2004 (6.6245);
- at the level of the total population, the difference between the share of the students aged between 15 and 25 years old as % of corresponding age population and the average EU27 during the period 2008–2012 was on the increase in absolute value by 0.7 percentage points in Austria, by 1.1 percentage points in France and by 4.8 percentage points in Romania – this last case being the most unfavourable;
- in terms of the values registered by gender, during the period 2008–2012, the share of the female population aged between 15–24 years old who enrolled in a form of education (ISCED 1_6) as % of corresponding age population for all eight countries under analysis, is higher than the one corresponding to the male population;
- the mainstream in EU countries, regarding the age distribution of the teachers and trainers, is to diminish the share of the ones aged below 30 years old, in all three levels of education; this tendency does not seem to be significantly influenced by the economic crisis; but it is rather a consequence of the ever higher level of qualification, necessary for working in the field of education;
- the ratio of students to teachers for the tertiary education in the analyzed countries falls between 7.8 students to teacher in Lithuania and 15.9 in Romania; also, apart from France, where the ratio of students to teachers in the tertiary education is 9.9 compared with 15.5 in the secondary education, and from Bulgaria where the ratio of students to teachers in the tertiary education is 12.3 in the tertiary education compared with 12.8 in the secondary education, the ratio of students to teachers in tertiary education is much higher than in secondary education.

In terms of recommendations, some measures for Romania case in terms of future steps in education are required:
- improve the rate of participation in education by increasing the role of education in the society and decreasing the level of corruption along with the gradual improvement of living standards;
- improve the share of young staff in education by creating an attractive salary policy for entire staff in education and developing appropriate standards and requirements for the jobs in education that could be fulfilled by young graduates;
- improve attention and focus on the secondary level of education by increasing the expenditure per student as well as on the primary level of education, in order to build a solid base to educate children for the new informational society and for the future.

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Biographic Notes

Marian Zaharia is Professor at the Department of Cybernetics, Economical Informatics, Finance and Accounting, Faculty of Economics, University of Oil-Gas, Ploiesti, Romania. He obtained his Ph.D. (Cybernetics and artificial intelligence modeling. Expert system for the development and quality analysis of cybernetic-economic models) in Cybernetics in 1994. Marian has been teaching a variety of undergraduate and master courses and his areas of research interests including Econometrics, Managerial Informatics, Economics dynamics and Object Oriented Programming.

Cătălin Popescu is Professor at the Department of Business Administration, Faculty of Economics, University of Oil-Gas, Ploiesti, Romania. He obtained his Ph.D. (Modelling and Simulation of manufacturing systems redesigning) in Control systems area in 2001. He participates in various team research projects and conferences. Cătălin has been teaching a variety of undergraduate and master courses and his areas of research interests including Project Management, Human Resource Management, Investments projects' financing in oil and gas industry, Energy Management and Quantitative Methods for Business and Management.