

THE ANALYSIS OF SCHOOL EXPECTANCY INFLUENCE ON THE GROSS DOMESTIC PRODUCT AT THE LEVEL OF THE ROMANIAN ECONOMY

Delia, Teselios¹
Mihaela, Savu²
Ioana-Iulica, Mihai³

Abstract:

At the level of the Romanian economy, Gross Domestic Product is one of the most important indicators. Analyzing its evolution we observe that the effects of the economic and financial crisis strongly influenced it, the year 2009 representing the proof that the Romanian economy was not stable. Along with the Gross Domestic Product variation, in this paper we present school life expectancy indicator, one of the components of the education indicator in the Human Development Index. The link between the two indicators is analyzed using regression for the period 2002-2012. The independent variable is considered school expectancy and the dependent variable is Gross Domestic Product.

The calculations led to the conclusion that the variation of Gross Domestic Product is explained at a rate of 41% by the variation of school expectancy.

Keywords: school expectancy, GDP, economic and financial crisis, Human Development

JEL Code: A10, C25, O15

1. Introduction

The evolution of mankind, and especially the cyclical economy shows that in order to successfully overcome the difficult times, we must be informed. In this sense, today more than ever, education makes the difference, and the power of education, in general, the highest education, in particular, increases the level of welfare and hence the competitiveness of a nation. (Badea, Rogojanu, 2012, p.123).

Education allows us to make informed choices, to adopt the best decisions for us and for the close ones. The benefits of education are evident, first, for the one who holds it, but it also generates an effect on the quality of life of people interacting with that person. (Pană, 2012, p.117)

However, it should not be limited the connection between the individual and labor market link that confirms skills and experience held by each of us. Currently, the economy based on knowledge requires an education system that significantly contributes to the development of knowledge and skills. People need to prepare for jobs that are rapidly changing due to dynamic developments in technology and work organization. (Șerban, 2012, p.134) We note that today's business environment has undergone rapid change with consequences that affect the business organizations around world. (Ducu, 2013)

Clearly, increasing education positively affects the living standards of the individual, the welfare that he enjoys. One way of quantifying the welfare is the Human Development Index, indicator introduced in the early 90s. The Human Development Index "is a quantitative measure of the degree of success of a country to develop human capital", being considered useful because of the coverage degree, higher than that of the Gross Domestic Product (GDP) (9).

The index represents the geometric mean of three indicators. As illustrated (Figure 1), the first indicator takes into account life expectancy at birth, the second takes into account the level of education and the third takes into account the gross national income per capita (in U.S. Dollar power parity) (11).

¹ PhD Lecturer, "Constantin Brancoveanu" University of Pitesti, Romania, delia_teselios@yahoo.com

² PhD Associate Professor, "Constantin Brancoveanu" University of Pitesti, Romania

³ PhD Associate Professor, "Constantin Brancoveanu" University of Pitesti, Romania



Figure 1. Human Development Index
 Source: Human Development Report 2010, p.215

The value of human development index belongs to the interval (0,1) and is presented annually in the Human Development Report (10), published by the United Nations Development Programme

Alongside “mean years of schooling”, school life expectancy (SLE) (also called “expected years of schooling”) represents the second education indicator used in the calculation of the Human Development Index (8).

Below is presented the way of calculating school life expectancy, as shown in (Rigotti, 2013)

$$SLE_a = \sum_a^b n \times {}_n m_v, \text{ with} \tag{1}$$

$${}_n m_v = \frac{{}_n f_v}{{}_n P_v}, \text{ where} \tag{2}$$

a = age at the beginning of school

b = the upper limit of age

n = age range

${}_n m_v$ = Rate of enrollment of students aged between v and $v+n$ in the year t

${}_n f_v$ = Number of pupils aged between v and $v+n$ and enrolled in school in the year t

${}_n P_v$ = population aged between v and $v+n$ in the year t

The values of human development index for Romania in the period 2002-2012, are shown in (Figure 2).

From (Figure 2) it is noted that in 2012 Human Development Index in Romania reached a peak of 0786, placing our country at position 55 of the 187 countries considered. According to data provided by the United Nations Development Programme, the first three positions are occupied by Norway (HDI = 0.943), Australia (HDI = 0.931) and Switzerland (HDI = 0.916). The last places are Central African Republic (HDI = 0.365), Congo (HDI = 0.335), and Niger (HDI = 0.333).

In this paper we want to highlight the existence of a link between two of the indicators by means of which it is calculated the Human Development Index, namely between school expectancy and GDP. A determination of the relationship between these indicators is followed by establishing the direction and its intensity, as well as to obtain a regression function. We believe that education has a strong impact on macroeconomic results recorded at the state level, but especially that increasing the level of education leads to GDP growth.

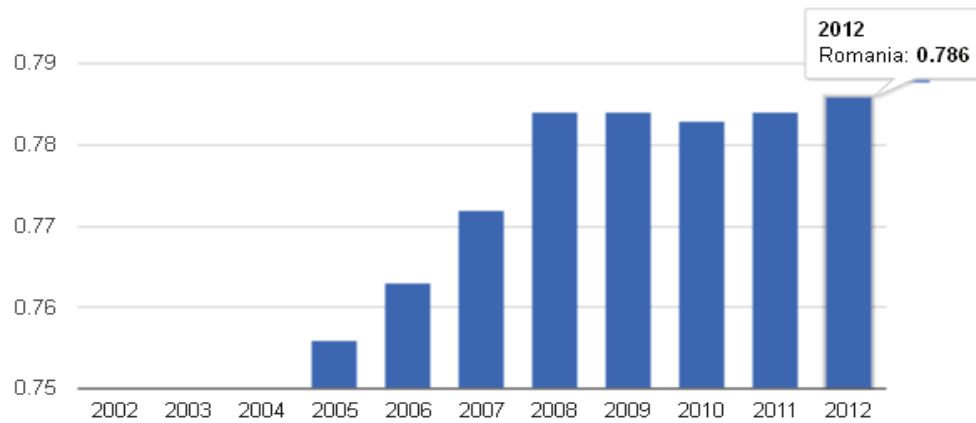


Figure 2. Romania Human Development Index

Source: http://www.theglobaleconomy.com/Romania/human_development/

2. School expectancy and GDP in Romanian economy

According to the National Institute of Statistics and Economic Studies, “expected years of schooling are the number of years during which a child entering infant school can expect to spend in full-time and part-time schooling in the course of their life cycle, based on the school enrolment rates of the time”(13).

The advantages of the use of this indicator are represented, on the one hand, by the relatively simple calculation method and, on the other hand, by the fact that does not require standardization in comparisons involving countries with different age structures. Below is the evolution of school expectancy for Romania between 2002-2012.

Table 1. School expectancy for Romania

Year	School expectancy
2002	14.7
2003	15.3
2004	15.5
2005	15.8
2006	16.1
2007	16.6
2008	17.6
2009	18
2010	17.9
2011	17.5
2012	16.9

Source: http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/dataset?p_product_code=TPS00052

School expectancy in Romania in the analyzed period registered an upward trend, even if the obtained values do not have a significant increase. In 2002 the school expectancy was 14.7, in 2012 to reach the value of 16.9.

If we divide the analyzed period in two intervals depending on the evolution of the indicator, it is observed from (Figure 3) an increasing trend of school expectancy for Romania in 2002-2009, followed by a downward trend in 2010-2012. For the studied period, the maximum is reached in 2009, with an increase of 3.3 years, from 14.7 to 18.

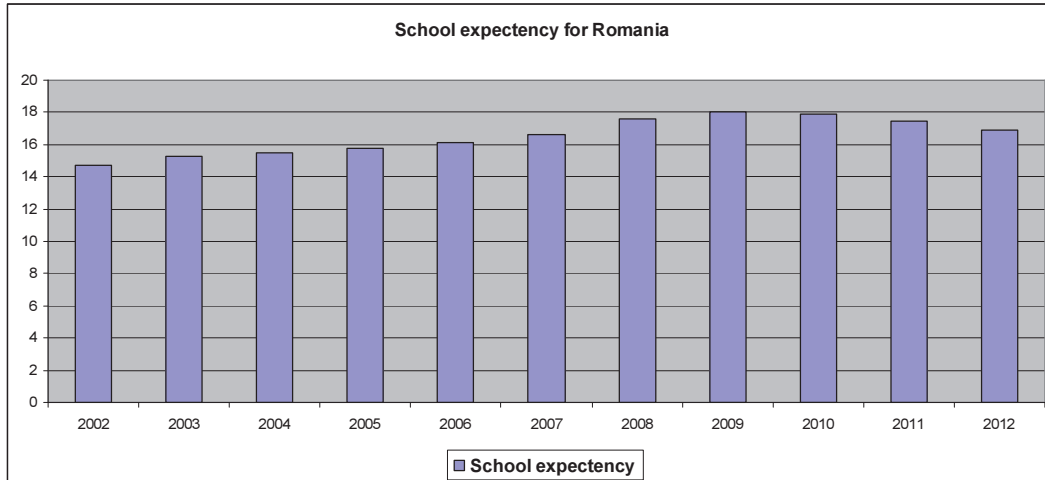


Figure 3. School expectancy for Romania

Source: Created by authors based on the values in Table 1

In (Table 2) is shown the evolution of the Gross Domestic Product of Romania during 2002-2012.

Table 2. Real Gross Domestic Product per capita, growth rate of Romania

Year	Gross Domestic Product
2002	8.60
2003	5.70
2004	9.10
2005	4.80
2006	8.50
2007	7.90
2008	9.20
2009	-5.80
2010	-0.60
2011	2.80
2012	1.00

Source: <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdec100>

In the analyzed period GDP recorded a downward trend, despite existing fluctuations, particularly in 2004, 2006 and 2008. In 2002 the GDP reached the value of 8.6%, opening the next 10 years of high values.

The graph shown in (Figure 4) illustrates the fluctuating evolution of GDP in the period under review. Higher levels of GDP in the period 2002 - 2008 are recorded before the effects of the financial crisis to hit the Romanian economy. The year 2009 illustrates clearly how strong and stable was the economic growth of our country. Dramatic decrease of GDP by 5.8% has demonstrated the fragility of the Romanian economy, but especially emphasized that crisis does not forgive anyone in this time of globalization. The year 2010 also registered a negative value of the indicator, but this time very close to 0, so that the next two years to have positive values. In 2011 and 2012 the GDP values, even if they are positive, can not reach the figures recorded in the first years of the analyzed period.

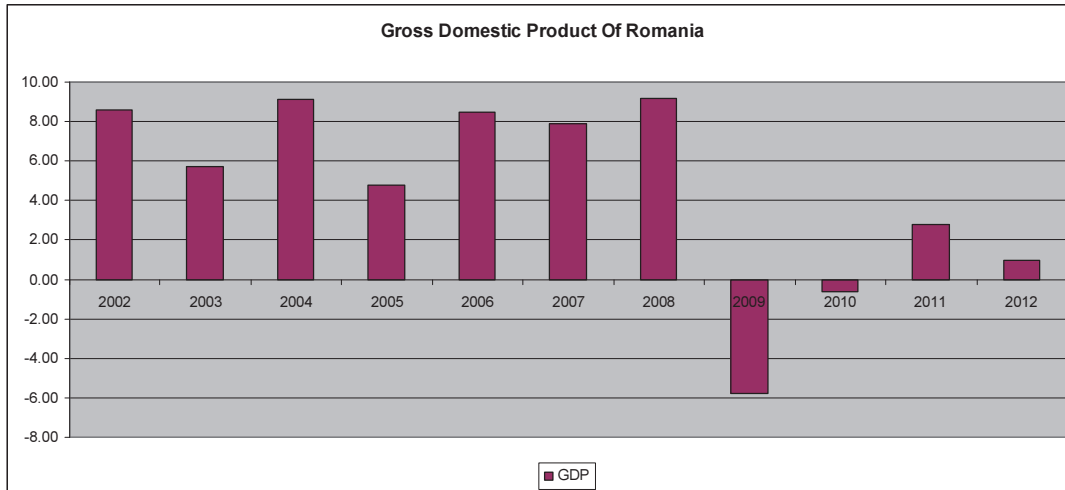


Figure 4. Gross Domestic Product of Romania

Source: Created by authors based on the values in Table 2

3. Interdependencies between school expectancy and GDP

For the analysis of the interdependence between the Gross Domestic Product and school expectancy for Romania in the period 2002-2012, we use Data Analysis in Tools menu of the Microsoft Excel spreadsheet program.

The existence of the link between the two indicators is shown in Table 3.

Table 3. Table of results – The statistic correlation method

	GDP	School expectancy
GDP	1	
School expectancy	-0,64257	1

Source: Created by authors based on the values in Table 1 and Table 2

The computations show that between Gross Domestic Product and school expectancy there is a reverse link, because the result is -0.64257, being negative. This value allows us to establish the intensity of the relationship between the two indicators, which is a moderate connection.

SUMMARY OUTPUT	
<i>Regression Statistics</i>	
Multiple R	0.642574847
R Square	0.412902434
Adjusted R Square	0.347669371
Standard Error	3.924704477
Observations	11

Figure 5. Summary of data processing

Source: Created by authors based on the values in Table 1 and Table 2

The value of the correlation coefficient between time series of Gross Domestic Product and school expectancy for Romania is $r = 0.64257$, the significance is that between the two variables is an average positive correlation.

The coefficient of determination (R Square) being of 0.41290 indicates that the variation of Gross Domestic Product is explained at a rate of 41% by the variation of school expectancy.

To counter the effect of increasing the coefficient of determination by including more variables in the model, it is determined the adjusted value of determination coefficient (Adjusted R Square), here with the value of 0.34766.

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	97.49752562	97.498	6.3296	0.032990948
Residual	9	138.6297471	15.403		
Total	10	236.1272727			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	50.10624824	18.10464375	2.7676	0.0218	9.150698777	91.0617977	9.150698777	91.061798
School expectancy	-2.748591152	1.092497138	-2.516	0.033	-5.219991374	-0.277190931	-5.219991374	-0.277191

Figure 6. The results of regression method

Source: Created by authors based on the values in Table 1 and Table 2

To show the relationship between the two variables, we use a linear model of simple regression of the form:

$$Y = a_0 + a_1X + \varepsilon, \text{ where} \quad (3)$$

Y = Gross Domestic Product in Romania during 2002-2012
(endogenous variable)

X = School expectancy for Romania during 2002-2012
(exogenous variable)

ε = random variable that summarizes the influence of other variables (unspecified in the model) on the Gross Domestic Product

Using the values from Coefficients column, we obtain:

$$Y = 50.10624824 - 2.748591152X \quad (4)$$

To validate the model, in the ANOVA table (Figure 6) there are calculated the values for the F-test, respectively the significance limit. Since F is 6.3296 and Significance F is 0.032990948 (lower than 0.05) we conclude that the regression model is valid and we can use it to analyze the relationship between the two variables.

The free term equal to 50.10624824 represents the value of the dependent variable when the independent variable is equal to zero. Since $t \text{ Stat} = 2.7676$ and $P\text{-value} = 0.0218 < 0.05$, means that the coefficient is significantly different from 0, and the confidence interval is [9.150698777; 91.0617977]. The coefficient for the independent variable, recorded the value of -2.748591152, is negative and indicates a reverse link between Gross Domestic Product and school expectancy.

In this case, $P\text{-value} = 0.033 < 0.05$, the coefficient is significant and the confidence interval for the variable is [-0.277190931; -5.219991374].

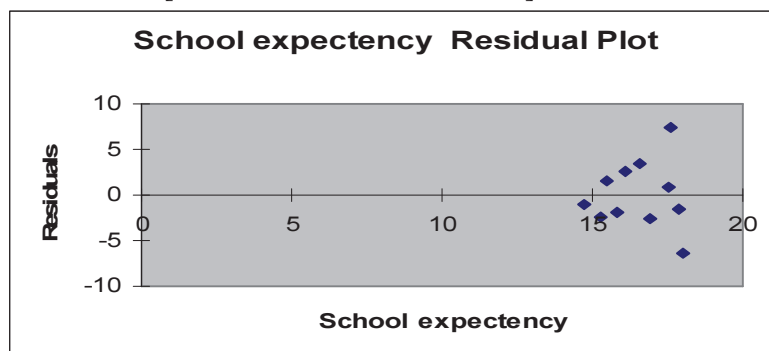


Figure 7. Independent variable diagram versus residue

Source: Created by authors based on the values in Table 1 and Table 2

The lack of correlation between the independent variable and the residue is shown in (Figure 7) and it means that the model is well chosen.

4. Conclusions

Through the Microsoft Excel spreadsheet we highlighted the existence of a link, its purpose and its intensity between Gross Domestic Product and school expectancy. Following the calculations performed, it was obtained the existence of an inverse link between the two indicators in the Romanian economy, which leads to the conclusion that reducing school expectancy indicator will result in an increase of Gross Domestic Product and vice versa. This result was obtained by using data recorded by these two indicators in Romania, but we believe that in a stable economy the relationship must be direct.

Clearly, attention given to education is reflected in the obtained macroeconomic results. Increased spending on education, reducing dropout, but especially keeping pupils and students with exceptional results at national and international competitions will lead to sustainable growth in GDP. We believe that what happens in the Romanian economy is an anomaly that should be removed in the next period, because an educated population is an asset for any economy.

5. Bibliography:

1. Badea Liana, Rogojanu Angela (2012), *Controverse privind relația educație superioară – capital umna – competitivitate*, Revista Economie Teoretică și Aplicată, vol. XIX, nr. 12, available at http://store.ectap.ro/articole/811_ro.pdf
2. Ducu Corina Maria, *Importance of internal audit within an entity*, Management strategies, journal published by "Constantin Brâncoveanu" University, Pitesti, Year VI, Special Issue/2013, ISSN 1844-668X, pp.111, available at http://www.strategiimanageriale.ro/images/images_site/categorii_articole/pdf_categorie_9efc544ae6cacf7378b8d651316ddece.pdf
3. Pană Marius Cristian (2012), *Educație și criză*, Revista Economie Teoretică și Aplicată, vol. XIX, nr. 5, available at http://store.ectap.ro/articole/727_ro.pdf
4. Rigotti, J.,I.,R., & co. (2013). *A re-examination of the Expected years of schooling: What can it tell us?*, working paper no.117, International Policy Centre for Inclusive Growth, UNDP, available at <http://www.ipc-undp.org/pub/IPCWorkingPaper117.pdf>
5. Șerban Claudia (2012), *Implicații ale nivelului de educație asupra pieței muncii*, Revista Economie Teoretică și Aplicată, vol. XIX, nr. 3, available at http://store.ectap.ro/articole/703_ro.pdf
6. United Nations Development Programme(2010). *Human Development Report 2010. The Real Wealth of Nations: Pathways to Human Development*. Editing and production: Communications Development Incorporated, Washington D.C.
7. http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/dataset?p_product_code=TPS00052
8. <http://www.uis.unesco.org/Library/Documents/mean-years-schooling-indicator-methodology-2013-en.pdf>
9. http://www.revistadestatistica.ro/old/Revista/2009/sumar%2009_2009.pdf
10. <http://hdr.undp.org/en>
11. <http://hdr.undp.org/en/content/calculating-indices>
12. <http://www.theglobaleconomy.com/Romania/>
13. <http://www.insee.fr/en/methodes/default.asp?page=definitions/esperance-scolarisation.htm>
14. <http://www.ipc-undp.org/pub/IPCWorkingPaper117.pdf>