Education’s Contribution to Sustainable Economic Growth in Romania

Camelia Burja a *, Vasile Burja a

a 1 Decembrie 1918” University of Alba Iulia, 11-13, Nicolae Iorga Street, Alba Iulia 510009, România

Abstract

This paper investigates the relationship manifested between GDP growth within the group of the EU’s new member states (NMS) and some indicators specific to the educational system, using regression analysis. We identify some educational factors that influence the GDP’s sustainable growth rate in the EU’s NMS and Romania, such as percentage of persons with lower secondary education attainment and employment rate of persons with tertiary education. The study recommends that in order to boost sustainable development in the EU area it is necessary in the future for EU’s new member states to encourage the increase of human capital’s value and macroeconomic development and stability.

Keywords: Economic Growth, Education, Sustainable Development, Regression

1. Introduction

Europe 2020 strategy fixes the main priorities and directions of action that EU’s member states must implement to transform the European Union into a smart, sustainable and inclusive economy. The perspective of a coherent development of the EU’s member states is conditioned on further implementation of the sustainable development strategy in each of the countries.

Considering education as a key tool for achieving the economic, social and ecological objectives associated with sustainable development, the present paper aims to highlight the connection between sustainable economic growth and the educational systems of the countries of Central and Eastern Europe that have recently joined the European Union (2004 and 2007), paying a special attention to Romania. At the same time, the paper seeks to identify those significant variables that influence the sustainable economic growth in recently integrated countries. The research was performed using regression analysis for a panel with observations related to the 12 new EU’s member states, in the period 1997-2011. The resulting econometric models characterize educational factors with a significant contribution to the sustainable development of the analyzed countries, such as: level of education, persons who leave early from education and training, and life-long learning. We find out that there are others educational factors that don’t have a significant influence on the growth rate within the period.
1. Literature review

In the last two decades, the tendency to change the contribution of production factors to gross domestic product formation is manifested more strongly in developed economies. Of these factors, human resources are considered today as the most important elements generating value for companies, sectors of activity or economy as a whole (Gu & Lev, 2001; Daum, 2003).

The quality of human capital, increasing the labour force’s knowledge, skills and competencies by attending education and training systems, contribute more and more to the improvement of a country's growth potential.

In the more recent specialized literature there are many studies that present and analyze the determinants factors of economic growth in different parts of the world. The regression techniques sought the key elements of development among the economic, social, financial and government factors, such as: energy consumption (Lee, 2005), unemployment rate (Kreishan, 2011), exports, foreign direct investment, government spending, investment and debt, inflation (Kowalski, 2000), financial liberation (Eichengreen, 2002), state ownership (La Porta et al., 2002), government policies (Rodrik, 2005) etc.

The causal relationship between economic growth and education is also the subject of many econometric analyses. It is considered that the progress of mankind, especially in the last two hundred years, is largely due to education (Stevens & Weale, 2004), and economic growth is directly influenced by both qualitative and quantitative elements of education levels (Schlottmann, 2010).

Numerous studies highlight the economic effects of the education system, with help of indicators that express its main characteristic aspects. A common approach used by professionals is based on a simple correlation between an educational activity index and an index of economic activity (Bowen, 1968).

Some authors test the interdependence between government expenditure on education and economic growth in order to identify a cyclical educational pattern (Nunez, 2003). Other studies present the education quality or quantity contribution, measured by cognitive skills and years of attainment on growth (Hanushek et al., 2008). Other variables used in the analysis are: enrolment rates in primary, secondary and tertiary education, years of education, data on technical education, analyses of gender gap, etc.

For Romania, the existing studies generally treat theoretical aspects of education, or research the interdependence of wage effects of schooling (Andrén et al., 2004). The econometric approaches of interdependence of education with economic growth are relatively few. Of these, a study based on the number of enrolled students and GDP per capita, using VAR methodology, highlights the existence of a long-term impact of gross domestic product per capita on higher education in the period 1980-2008 (Dâncu et al., 2010). This paper provides added knowledge in the field, by researching the connection between educational variables that are part of the sustainable development indicators evaluated by the European Commission, and GDP per capita.

2. Methodology and analytical framework

The study was performed on a panel of data collected from the database of the European Commission. It contains a total of 180 countries-year observations, consisting in 12 EU recently joining countries - Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia, Slovakia, Bulgaria and Romania - for which data were recorded for the period 1997-2011.

The expression of the functional form of the connection between educational factors and sustainable economic growth was performed using variables that represent indicators selected from the theme "Sustainable Development Indicators" of the EU’s database. Selection of variables was based on previous researches regarding the impact of education on economic growth.

The statistical characterization of the variables used in modelling the interdependence between education and sustainable economic growth among countries that have recently joined the EU (new member states NMS) and Romania is presented in Table 1. The characteristics of the educational systems of the 12 countries show significant differences. Standard deviation for the variables considered is different in time and space. The highest variation of the indicators was recorded for Persons with lower secondary education attainment (14.1%), the lowest variation (2.9%) being for Employment rate of persons with tertiary education.
Comparative analysis of the education systems’ characteristics in the NMS group and Romania shows that for most of the indicators the situation is unfavourable. It can be observed that in Romania during 1997-2011, the proportion of people with a lower level of education is high (33.5%) being with 4.7% higher than the average recorded in the EU’s new member countries. Greater number of people with lower education has as main cause school abandoning. Early leavers from education and training are higher in Romania than the average level in countries analyzed by 5.2%. Important differences appear among persons with skills in using computers and modern communication systems, their weight being about 3 times lower than in EU’s NMS. Another worrying aspect is a particularly low share of the adult population who desires professional development through the life-long learning system. For this indicator, the lowest level within the group of analysed countries was registered in Romania in 1999. Employment rate of persons with tertiary education is the only indicator comparable to the average of the other countries.

In Romania, the level of the other economic indicators that count in the identification process of the relationship between the educational system and sustainable growth is closer to the characteristics of the NMS economies. The growth rate of labour productivity per hour worked in the analyzed period was an average of 5.6% exceeding the average rate of the other countries studied. In Romania, the highest level (16.0%) was recorded in 2002, and the lowest level of -5.1% was recorded in 2009. The average of investments was 22.8%, with a maximum level of 31.9% in 2008; average growth rate of GDP per capita was about 3%, maximum value (8.8%) was recorded in 2004.

### Table 1. Descriptive statistics of educational and economic variables in EU's NMS and Romania, 1997-2011

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean NMS</th>
<th>Mean Rou</th>
<th>Maximum NMS</th>
<th>Maximum Rou</th>
<th>Minimum NMS</th>
<th>Minimum Rou</th>
<th>St.Deviation NMS</th>
<th>St.Deviation Rou</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable: Growth rate of real GDP per capita, % change on prev. year (RGDP)</td>
<td>3.6</td>
<td>3.0</td>
<td>13.1 (Lithuania 2000)</td>
<td>8.8 (in 2004)</td>
<td>-17.3 (Latvia 2009)</td>
<td>-6.4 (in 2009)</td>
<td>4.7</td>
<td>4.9</td>
</tr>
<tr>
<td>- Individuals’ level of computer skills, % (COMP)</td>
<td>19.5</td>
<td>7.2</td>
<td>32.0 (Estonia 2011)</td>
<td>10.0 (in 2011)</td>
<td>5.0 (Romania 2006 and 2007)</td>
<td>5.0 (in 2006; 2007)</td>
<td>7.5</td>
<td>2.6</td>
</tr>
<tr>
<td>- Individuals’ level of Internet skills, % (INT)</td>
<td>9.4</td>
<td>3.0</td>
<td>27.0 (Lithuania 2011)</td>
<td>7.0 (in 2011)</td>
<td>1.0 (Romania 2010)</td>
<td>1.0 (in 2010)</td>
<td>6.3</td>
<td>2.7</td>
</tr>
<tr>
<td>- Life-long learning, % (LIFE)</td>
<td>5.3</td>
<td>1.2</td>
<td>16.2 (Slovenia 2004)</td>
<td>1.6 (in 2005; 2011)</td>
<td>0.8 (Romania 1999)</td>
<td>0.8 (in 1999)</td>
<td>3.5</td>
<td>0.3</td>
</tr>
<tr>
<td>- Early leavers from education and training, % (EAR)</td>
<td>14.5</td>
<td>19.7</td>
<td>54.4 (Malta 2001)</td>
<td>23.0 (in 2002)</td>
<td>4.1 (Slovenia 2007)</td>
<td>15.9 (in 2008)</td>
<td>10.3</td>
<td>2.4</td>
</tr>
<tr>
<td>- Employment rate of persons with tertiary education (level 5 and 6), % (EMP)</td>
<td>83.5</td>
<td>84.2</td>
<td>89.7 (Slovakia 1998)</td>
<td>87.2 (in 1998)</td>
<td>75.2 (Bulgaria 2001)</td>
<td>81.5 (in 2003)</td>
<td>2.9</td>
<td>1.8</td>
</tr>
<tr>
<td>- Total investment on GDP ratio, % (INV)</td>
<td>23.6</td>
<td>22.8</td>
<td>35.9 (Estonia 2006)</td>
<td>31.9 (in 2008)</td>
<td>15.04 (Malta 2010)</td>
<td>17.59 (in 1999)</td>
<td>4.4</td>
<td>4.2</td>
</tr>
<tr>
<td>- Growth rate of real labour productivity per hour worked, % change on previous year (RW)</td>
<td>4.0</td>
<td>5.6</td>
<td>119.8 (Poland 1999)</td>
<td>16.0 (in 2002)</td>
<td>-47.5 (Poland 2000)</td>
<td>-5.1 (in 2009)</td>
<td>10.8</td>
<td>5.3</td>
</tr>
</tbody>
</table>


3. Results

In order to determine the impact of the educational system on sustainable economic growth in Romania and new EU member states, the multifactor regression method was used, being considered one of the most valuable methods for establishing the interdependence relations between variables, because of its high degree of generality and applicability (Albright et al., 2006).

**Model 1.** Taking into account the variables specified, a regression model has been identified to express the contribution of educational factors to economic growth for the assembly of the newly EU-joining economies. Model parameters are estimated using the regression-based framework with fixed effect OLS and panel data type.
Countries fixed effects assume countries specific intercepts and are meant to control the model by the action of the other time-invariant factors that can however influence a particular economic growth in each country.

\[ RGDP_i = a_i + b_1(LOW_i) + b_2(EAR_i) + b_3(LIFE_i) + b_4(EMP_i) + b_5(RW_i) + b_6(INV_i) + \epsilon_i \]

where: \( a \) is the intercept; \( b_1, b_2, b_3, b_4, b_5, b_6 \) are regression coefficients of the independent variables; \( \epsilon_i \) is the error term and \( i \) and \( t \) are country and year for which data was recorded.

The model explains 52.8% of the variance of economic growth in the EU new member states (1997-2011) by the influence of several educational variables. The F-statistic value indicates that the regression has the explanatory power for the phenomenon studied. In practice, it is considered that if the DW-statistic is close to 2, this indicates no autocorrelation of residuals (Cassin, 2009). In the specific case of the regression performed, DW-statistic is 2.04, which recommends the model as valid.

Performing the unit root tests shows that all variables are stationary, which is a premise for obtaining the correct estimators coefficients. At the same time, the absence of unit roots means that the economies of the 12 countries recently joined the EU were not characterized by shocks with persistent effects.

Because the variables LIFE, COMP and INT have a low significance level and worsen the quality of model, they were excluded from the regression.

On the other hand, not all variables have the adequate estimators in statistical terms. The calculated value of the t-statistic for the variables EAR is lower than the table value. This means that for the 12 new countries that joined the EU during the period, the number of early leavers from education and training did not significantly influence growth rate of GDP. Factors with significant contribution to GDP growth rates were LOW, EMP, RW and INV.

The LOW variable had a positive contribution on GDP growth rates, which means that the economic growth of recently joined countries to the EU in the analyzed period was influenced with 0.49% (p-value is 0.023) by the reduction of share of persons with a lower level of education.

An educational indicator that had a negative impact on GDP growth rate is variable EMP. The decrease of the employment rate of persons with tertiary education over time within the group of countries led to lower economic growth by -0.51% (p-value 0.024).

The economic factors have exerted a positive action on economic development. Growth rate of labour productivity contributed to GDP growth rates with 0.66% (p-value 0.033), and investment rate had influenced growth rates by 0.73% (p-value 0.022).

**Model 2.** The second regression model estimates the economic impact of educational factors on sustainable economic growth in Romania. GDP growth rate is run using explanatory variables LOW, EAR, EMP and RW.

\[ RGDP_i = a_i + b_1(LOW_i) + b_2(EAR_i) + b_3(EMP_i) + b_4(RW_i) + \epsilon_i \]

The regression’s result shows that for Romania only two variables are statistically significant and produced a favourable impact on GDP growth rate. EMP variable has influenced Romania’s economic growth during 1997-2011 to 1.09% (p-value 0.014) and RW contributed with 0.76% (p-value 0.000). This means that the increase or decrease in labour productivity and the employment rate of people with tertiary education will have noticeable effects in growth rate of GDP in the future.

5. **Conclusions**

In the paper an analysis was performed to identify the relationship between the growth rate of GDP and the main elements of the educational systems, in the context of sustainable economic development of the group of 12 countries that recently joined the EU.

Considering the assembly of EU’s NMS for the period 1997-2011, a sufficiently strong connection was found (about 53%) between the growth rates of GDP and educational factors such as: the share of “Persons with lower secondary education attainment” and “Employment rate of persons with tertiary education”, with the addition of the
indicator “Growth rate of labour productivity”. This last indicator expresses the economic performance of the labour force that largely depends on their skills and capabilities achieved through education.

The dimension of the estimators for the explanatory variables identified suggests that the economic growth of the group of 12 countries in the analyzed period was positively influenced by the reduction of the population segment that forms the workforce with a lower qualification. In the same time, the decreasing of the employment rate of persons with tertiary education led to the decreasing of the growth rate of GDP.

In the future, the 12 states will be able to improve their economic situation by measures meant to increase the value of workforce such as: reducing the share of early leavers from education, managing well the system of professional training in order to correlate qualifications obtained with the needs of society, stimulate the labour productivity.

Regressional multifactor analysis performed for Romania during 1997-2011 reveals the existence of a positive evolution in growth rate of GDP per capita, which in proportion of 57.0% is due to the contribution of “Employment rate of persons with tertiary education” and to the “Growth rate of labour productivity”. The influence of these factors is direct, so that improvement of the general formation of workforce and obtainment of higher professional qualifications, become ways to improve people's access to employment, increase productivity and create value to the whole economy.

The findings may serve as support for decision makers at the national level in formulating appropriate economic and educational policies in order to implement the EU 2020 strategy for achieving a sustainable and inclusive growth in the EU area.

References