HUMAN CAPITAL – A SOURCE OF ECONOMIC GROWTH IN ROMANIA. QUANTITATIVE INDICATORS FOR QUANTIFYING HUMAN CARITAL

Pribac Loredana Ioana PhD
Associate Professor Anghelina Andrei PhD
"Vasile Goldiş" Western University of Arad
pribacloredana@yahoo.com
a_anghelina@uvvg.ro

(Received April 2014; accepted July 2014)

Abstract
Our study had a double objective: to highlight the causal relationship between human capital and economic growth, and then identify which of its dimensions or quantitative measures perform better in explaining the influence on the income per capita in Romania.
The conclusions after analyzing the results of econometric patterns estimates obtained make us see human capital as an important factor in economic increase, even if with certain specifications and measures of education we also obtained negative or inconclusive results.
Key words: human capital, education, economic growth, Romania
JEL Classification: O40; O52; I25

Introduction

The development of human society, the permanently changing economic, social and political conditions, have led to the increase of the role of the knowledge and skills of individuals, generically called *human capital*; in time human capital was given a fundamental role in the progress of individuals and communities. Moreover, the internationalization and globalization of business, through modern information and communication technologies and the relatively wide access to these, as well as the increased need for individuals' autonomy and for rendering them responsible on competing markets had major implications on the restructuring of the supply and demand for human capital, and, essentially on education and training.
The new conditions and the strategies of the economic actors (individuals, companies, countries, organizations and so on) led to profound changes in the education system, which should provide information, knowledge and methods adapted to the current market development and opportunities.
This article is structured in three chapters (theory, methodology and the description of the model studied, and one part which explains the data), plus introduction and conclusion.

1. Defining the notions concerning human capital

Since the 1950s, once the interest was manifested in various studies on economic growth and starting from the low power to explain the increase through the

standard factors of production, the idea that stood at the genesis of the concept of human capital took shape. Moses Abramovitz is quoted in literature as being the one who, ever since 1956, described this inability to accumulate traditional factors (capital, labour, land) in explaining economic growth, calling the unexplained part "*a measure of our ignorance*" (Abramovitz, 1956, page 11).

In the production process, the classical economists have identified and defined three factors of production: land, physical capital and working capital (labour force). Land is the sine qua non condition for the existence of crops, plantations, agricultural development; it is on land that industrial enterprises, farms etc., and generally speaking, sites necessary for the development of the entire economic activity of a society are built on. To achieve all that another factor is also needed, namely labour force. In the classical perspective, physical capital was seen, *in corpore* or separately, as non-financial and financial assets used to purchase everything necessary to achieve a production, some constructions and the proper functioning of the economic activity. These traditional production factors that got into the production process in different combinations along goods and services were used by individuals who were pursuing their own interests by obtaining the maximum efficiency possible. Under the influence of Adam Smith, classics considered that by combining these individual efforts as an invisible hand, the distribution of economic resources for a most productive use of them was achieved to a large scale. The workers formed an undistinguished collective mass and were not considered in terms of their knowledge and skills. However, Adam Smith estimated that it was not the collective weight that was useful in the economic activity, but "acquired and useful abilities of all the inhabitants or members of the society" (A. Smith quoted in Brian Keeley, 2007, page 27). These talents and skills also had a cost for each individual, and once acquired, they are a kind of capital, respectively "capital fixed and realized, as it were, in his person" (A. Smith quoted by Brian Keeley, 2007, page 27).

Essentially, research on the role of (education-driven) human capital in the process of economic growth started right from the fact that the production functions with ordinary factors (Y = F (K, L)) could not explain the advance in growth. The results showed that a great part of the increase belonged to one or more unidentified factors expressed by the residual of a specification of the productive function. Such a factor, which was not perceived as such, made it be impossible to establish a viable growth policy.

The idea took time to establish itself and only in the 1960s economists began to systematically integrate it into their works; thus was born *the concept of human capital*, when it was possible to demonstrate the contribution of education in the economic increase.

The concept of human capital enables a theorization of the well established empirical relationship between the level of education and the salary, the attempts to explain the economic growth being actually at the base of the genesis of human capital theory. Theoretical and especially empirical studies, as well as obvious facts brought again in discussion the traditional assumptions of growth, showing the

factors labour and capital alone were not sufficient to sustain economic growth (the GDP growth per capita) and that a quantitative increase of these two factors could only partly explain the increase achieved. In this direction, Edward Denison has had a special contribution; in his 1962 work entitled *The Sources of Economic Growth in the United States*, he investigated in detail the sources of growth in the U.S., between 1909 and 1959; he showed that if part of the increase is related to standard causes (increasing the supply of capital, scale economies), perhaps the most important factor is the benefits of investment in education and knowledge. More specifically, he introduced education (as a main investment in human capital) in the equation of a production function, as a reflection of improving the quality of the labour factor. Thus Denison identified that as much as 23% of the economic growth results from an increase in the level of education of the workforce and 2% as a result of the advance of knowledge (North, 1963).

Since the 1960s, work has been looked at more and more in terms of quality, especially considering the level of education and training of the workforce. The qualities of the labour force, symbolized by human capital, become an important factor for the competitiveness of an economy. The concept of capital includes skills and other attributes of individuals that generate personal, economic and social benefits. Part of these qualities, of the knowledge, competencies and different skills are acquired through education and learning and / or through the experience gained in the working life. Human capital also includes certain innate abilities of the individuals which can be enriched and capitalized on the labour market. Also, some aspects of motivation and well-being, as well as attributes such as physical, emotional and mental health of individuals, are regarded as human capital. The OECD report entitled *The Well-being of Nations – The Role of Human and Social Capital*, human capital is defined as "the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being" (OECD, 2001, page 18).

Along time human capital has been defined in multiple ways by various economists, academics and practitioners, but also by organizations with broad international representation. All these definitions outlined a complex and multidimensional concept and therefore difficult to measure and to evaluate in terms of its role in the development of society. Each approach has contributed to the completion of the contents of the concept of human capital.

The concept of human capital is systematically present and has been developing since the 1960s, through the works of Théodore W. Schultz (1961, *Investment in Man: An Economist's View*), Gary Becker (1975, *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education*) and Jacob Mincer (1958, *Investment in Human Capital and Personal Income Distribution*; 1974, *Schooling, experience and earnings*). The latter developed a pattern in which he proved that training and knowledge (having as variables the years of training and the experience) are determinant factors for the inequalities of the revenues in the U.S.. Also, in Mincer's opinion, when someone gives up work and thus gives up his/her wages in order to attend some sort of education, he / she makes a rational

act, and will be compensated by the higher salary that he / she will get later (Mincer, 1958). Mincer highlights the importance of one of the properties of human capital, i.e., as a source of new knowledge which influences production and thus the economic growth. However, people's own investment was not recognized; by improving their level of education, people have better economic efficiency, which could bring them extra incomes and benefits in terms of welfare.

"However, it is important to highlight the correlation between GDP (i.e. economic growth) and the living standard. GDP per capita is not the only way of measuring the living standard of an economy. Moreover, it is often used as an indicator which reflects the overall citizen benefit, based on the increasing economic growth of a country (Dumiter, 2011, pp. 161)".

Human capital is a central element of the empirical theory and patterns of growth. The empirical analysis is particularly abundant and dynamic, and their results range from strongly supporting the influence of human capital on economic growth to denying it. Human capital is most of the times defined by education, which in turn is measured both quantitatively and qualitatively. The most common approximation of the human capital in the growth regression is represented by the mean of the school years; there were also used other quantitative approximations and one thought that through them one can better explain the increase of the income per capita. A series of empirical studies which have reached a positive conclusion in the causal relationship of human capital with the growth have become reference points for such analysis, as the results obtained by Mankiw, Romer and Weil (1992) are.

2. Presenting the patterns developed

Our analysis is developed based on the augmented pattern of Solow (the pattern Mankiw, Romer and Weil, 1992). By using the MRW pattern specification we set the target to analyze the relationship human capital - economic growth, following the validation of the positive influence of education. The form of the pattern resulted from adding human capital accumulation to the specification of the Solow pattern (1956), based on the relationship:

$$Y(t) = K(t)^{\alpha} H(t)^{\beta} \left(A(t)L(t)\right)^{1-\alpha-\beta} \quad (2.1)$$

where: *Y* is the income; *K* is the capital; *L* is the labour force; *A* is the technology level; *H* is the stock of human capital; α is the proportion of the income invested in physical capital; β is the proportion of the income invested in capital.

By linearization, the relationship becomes:

$$log\left[\frac{Y}{L}\right] = \beta_0 + \beta_1 log(s_k) + \beta_2 log(s_h) + \beta_3 log(t + g + \delta) + \varepsilon_t \quad (2.2)$$

Where: *Y/L* is the ratio between the GDP and the total number of population, respectively the income per capita; s_k represents the physical capital (expressed as the rate of investment); s_h is the human capital (expressed in several ways by the product of the rate of enrolment in the secondary / tertiary education system of the population aged between 15-19 years / 20-24 years and its share in total

population; $t + g + \delta$ represents the sum of the total population growth rate (t) and the growth rate of technology (g) and the capital depreciation (δ), equal to 0.05.

$$log\left[\frac{Y}{L}\right] = \beta_0 + \beta_1 log(s_k) + \beta_2 log(s_h) + \beta_3 log(t + g + \delta) + \beta_4 log(openk) + \varepsilon_t \quad (2.3)$$

where: *openk* – the international openness.

$$log\left[\frac{Y}{L}\right] = \beta_0 + \beta_1 log(s_k) + \beta_2 log(s_h) + \beta_3 log(n + g + \delta) + \varepsilon_t \quad (2.4)$$

where: $n + g + \delta$ represents the sum of the activ population growth rate (n) and the growth rate of technology (g) and the capital depreciation (δ), equal to 0.05.

The non-financial quantitative variables used for defining human capital in the whole EU, and in groups of member countries, according to time periods of minimum 20 years are either the result of some calculations based on primary indicators from education or they are to be found in different international databases, being used in most studies on this topic.

Mankiew, Romer and Weil (1992) emphasize the importance of adding the human capital to the pattern of Solow (1956), because it leads to improved results. Also by this pattern it is highlighted the influence that the increase of the active population, of the physical and human capital have on the growth of the GDP per capita.

The data used are collected from the database of Barro-Lee, the World Bank and Eurostat. The model was applied for EU countries for the period 1991-2010. Data processing was performed in Stata statistical software.

3. The results of the analysis of the influence of human capital in the case of Romania

3.1. Analysis results for Romania

In Table 3.1 we presented the values of the coefficients of the variable from the specifications of the patterns applied to Romania.

Besides the variables of the physical capital, of the human capital, of the population growth rate there was introduced a control variable too, namely the degree of international openness. The openness affects economic growth through several channels (Petrakos, Arvanatidis, Pavleas, 2007): the exploitation of the comparative advantage, technology transfer, dissemination of knowledge, increasing scale economies. Openness is usually measured by referring the exports to the gross domestic product. In this direction there is a very rich literature investigating the relationship openness - growth: on the one hand, much of the literature reveals that those economies that are more open to trade and capital flows have a higher GDP per capita and at the same time have more rapid growth data (Dollar, 1992; Dollar and Kraay, 2002). On the other hand, other authors have brought criticism, especially on grounds of indicators methodology, pattern and measurement (Levine and Renelt, 1992; Vamvakidis, 2002).

The expected sign is plus for the coefficients of the physical capital per worker, for those of human capital, of the degree of international openness and the share of the working population in the overall population, whereas for the coefficients of the

variables regarding the growth rate of the active population and the total population growth rate is mi
nus.

Table 1. Results of analysis models the relationship of human capital - Economic growth for Romania (1991-2010)

	Model 1	Model 2	Model 3	Model 4	Model 5
	b/se	b/se	b/se	b/se	b/se
logfbcf	0.437***	0.292***	0.308***	0.271***	0.274
	(0.03)	(0.03)	(0.05)	(0.03)	(0.13)
logedu	-1.061***		-0.322		
	(0.13)		(0.27)		
logeduter		0.202***		0.088	
		(0.02)		(0.08)	
logpoptotala	0.213	0.108	0.205	0.175	
	(0.09)	(0.08)	(0.10)	(0.10)	
logopenk			0.184**	0.147	
			(0.06)	(0.09)	
logeducomplet					0.441
					(0.26)
logpondereapopact					-0.562
					(0.81)
Constanta	7.274***	6.237***	6.391***	6.132***	7.950***
	(0.53)	(0.41)	(0.55)	(0.45)	(4.42)
R-squared	0.942	0.958	0.964	0.964	0.767
F	86.323	121.029	100.797	100.163	17.551
N observations	20.000	20.000	20.000	20.000	20.000

* p<0.05, ** p<0.01, *** p<0.001
OLS Regression
Note: Standard errors are in parentheses.
Source: Working in the software Stata 11.0

If, in general, reporting the education enrolment rate of the school-age population does not have good results as far as the impact on growth is concerned, reporting to the adult population leads to more significant effects of education in increasing the income per capita. Thus the results obtained from the assessment of the specification of the *Pattern* 1_{ROsec_pop}, the coefficients of the human capital variable (the education enrolment rate in the secondary education level of the population aged between 15-19 years) are not favourable, even if the statistical relevance is at the level of 0.1%, yet the minus symbol of the coefficient shows a negative effect on the growth rate.

The investment rate expressed through the physical capital per worker has a favourable influence (the symbol of the coefficient is plus) on the GDP per capita, being statistically relevant at the level of 0.1% (in the case of an increase of 1% it leads to an increase of 0.44 % of the GDP per capita). The coefficient of the total

population growth rate does not have the expected symbol, nor does it statistically have a significant relevance.

On the whole, the variation in the GDP per capita can be explained as much as 94% through the variation of the explanatory variables of the pattern, the determination coefficient being very high.

Rewriting the equation (2.2), by replacing the values of the estimated coefficients is:

$$log(PIB/capita) = 7,274 + 0,437log(fbcf) - 1,061log(edu) + 0,161log(t+g+\delta) + \varepsilon_t$$

In the *Pattern* 2_{ROter_pop} the result obtained for the human capital approximated by the rate of enrolment in tertiary education of the people aged 20-24 has a coefficient with the plus sign, having a positive effect on the growth of the GDP per capita. The relevance of the statistical significance is at 0.1%, so we can say that with a 1% increase in the value of the human capital coefficient the influence on the growth rate will be by 0.20%.

The physical capital per worker has the expected coefficient sign and the statistical significance is by 0.1%, so the positive effect on the growth of the GDP per capita is by 0.29% in case of a growth of 1%. The variable in the pattern which does not have the expected coefficient sign is the growth rate of the total population and which by the low statistical significance produces an indirect effect on the growth rate. The high value of R^2 (0.96) shows that one can explain the variation of the GDP/capita as much as 96% by the variation of the exogenous variables.

The equation (2.2) may be rewritten according to the values of the coefficients as follows:

$$log(PIB/capita) = 6,237 + 0,292log(fbcf) + 0,202log(eduter) + 0,108log(t+g+\delta) + \varepsilon_t$$

Starting from estimates based on the augmented Solow pattern used by MRW (1992), several authors (Knight, Loaysa and Villaneuva, 1993; Islam, 1995 etc.) indicate that the positive results on human capital, defined by the enrolment rate in secondary education or by the human capital stock, are not confirmed on the increase of the GDP per capita, but by introducing a temporal dimension of the explanatory variables, the effect is a negative one. The result was explained either by formulating an inappropriate specification of the pattern or by the impact of other variables that could affect the role of human capital. Thus Berthelemy and Varoudakis (1997) indicate that the incidence of human capital on growth is real once the influence factor of trade openness is introduced. In the pattern suggested below (*Pattern* 3_{ROsec_openk}), we introduced such a control variable defined by the international openness. Human capital expressed as *the product of the rate of enrolment in the secondary education system of the population aged between 15-19 and its share in the total population* has a coefficient with a minus sign (similarly to the results obtained in patterns in which it has been used before) and a very low statistical significance, while the effect on the growth rate is negative.

The physical capital per worker leads to a favourable increase in the GDP/capita (the coefficient has the plus sign), thus in the case of an increase of 1% it leads to

an increase of 0.31% of GDP/capita. This value is supported by the significant statistical relevance at the level of 0.1%.
The variable regarding the international openness has a positive effect (0.18%) on the growth of the GDP per capita and in terms of statistical relevance, it is by 1%.
The result obtained for the total population growth does not lead to a positive and relevant effect on the increase of the GDP per capita (the sign is not the expected one, and the statistical significance is very low). This is due to the variations regarding the demographic changes that existed during 1990-2009 in Romania.
The change in the GDP per capita is by 96% explained by the variation in human capital, physical capital, the growth rate of the total population and the degree of international openness.
Rewriting the equation (2.3) with the values obtained for the coefficients is:
$log(PIB/capita) = 6{,}391 + 0{,}238log(fbcf) - 0{,}322log(edu) + 0{,}205log(t+g+\delta) + 0{,}184log(openk) + \varepsilon_t$
The *Pattern* 4_{ROter_openk} is similar to the specification of the *Pattern* 3_{ROsec_openk} where we have introduced the variable regarding the degree of international openness, but the results obtained for the human capital are different in terms of the human capital coefficient sign expressed by *the rate of enrolment in the tertiary education system of the population aged 20 -24 years*, which has an increasing effect on the growth rate of the income per capita.
The estimated coefficients of physical capital per worker confirms the expected results, the coefficient has the plus sign and the statistical significance level is by 0.1%. Therefore, in case of an increase of 1% the positive effect on the GDP per capita is 0.27%.
A positive influence on the GDP per capita also has the international openness degree (0.15% in the case of an increase of 1%), but at a low statistical significance, so the effect produced is indirect.
Regarding the estimated coefficient of the growth rate of the total population, it is similar to that of the *Pattern* 3_{ROsec_openk}, i.e. the sign of the coefficient is not the expected one, and the statistical significance is low, resulting in a less significant effect on the growth rate.
The value of R^2 is very high (0.96) and it shows that the variation of the GDP per capita is explained by the variation in the independent variables of the pattern.
The equation (2.3) depending on the values of the estimated coefficients is:
$log(PIB/capita) = 6{,}132 + 0{,}271log(fbcf) + 0{,}088log(eduter) + 0{,}175log(t+g+\delta) + 0{,}147log(openk) + \varepsilon_t$
In the *Pattern* $5_{RO\_sec25\text{-}64}$, human capital has been defined as *the proportion of the people aged between 25-64 who have completed the secondary school education*, its coefficient has the plus sign; this indicates a positive effect on the GDP per capita, but a low statistical significance and a reduced effect (in the case of a 1% increase the influence on the growth rate is by 0.44%).
The coefficient of the demographic variable expressed in the percentage of the active population in the total number of the population has the minus sign and in

the case of an increase of 1% it leads to an indirect increase (the absence of relevant statistical significance) of the GDP per capita of 0.56%.
The value of R^2 shows a strong correlation of the pattern variables, thus the variation in GDP per capita can be explained in proportion of 77% by the variation in the human capital, physical capital and the share of the working population in the overall population.
The rewriting of the equation (2.2) is this:
$log(PIB/capita) = 7{,}950 + 0{,}274log(fbcf) + 0{,}441log(edusec_{24\text{-}64}) - 0{,}562log(ponderepopact) + \varepsilon_t$
For Romania, we have analyzed the patterns developed on the basis of some macroeconomic indicators by which human capital has been estimated, and the results led to the conclusion that the rate of people aged 15-19 enrolled in secondary schools is not a good performer for the growth of GDP per capita, as compared to the other measurements of human capital.

3.2 Results analysed comparatively for the European Union and Romania
The results in Table 3.2 are in conflict with those estimated by Mankiw, Romer and Weil (1992), whose pattern have recorded the plus sign for the human capital variable, expressed by the rate of enrolment in the secondary level education. MRW (1992) conclude that an increase by 1% in the enrolment rate of the population between 12-17 years of age leads to an increase in the GDP / capita by 0.66% for the countries which don't produce oil (98 countries), by 0.73% for an intermediate group consisting of 75 countries and 0.75% for 22 OECD countries. Thus, in our analysis based on the MRW pattern the estimation of the human capital by the rate of enrolment in secondary education system of the population aged between 15-19 does not lead to results that have a positive effect on the GDP per capita, as shown in the results obtained by Barro (1991) and MRW (1992) in their studies.
The results obtained in this study are comparable with those established by Islam (1995), which conclude on an opposite effect related to what had been expected. In fact, more and more authors indicate that the results of the MRW pattern become less convincing outside the period in which they were analyzed, respectively, after the Second World War and until 1985.
The situation changed when we considered human capital through the rate of tertiary education enrolment of the population aged between 20-24; the plus sign of the coefficient of the variable regarding human capital from the *Pattern* 2_{ter_activ} confirms the theoretical predictions regarding a positive influence on the GDP per capita, for all the groups of EU countries. This indicates that a greater number of (highly) qualified people contribute to the economic growth; the countries can apply high technologies that will be reflected in the increase of the productivity or even in the creation of new technologies.
The estimated elasticity coefficients show by what percentage the GDP per capita changes in the case of a 1% change in the variable that is represented by a coefficient. For Romania, an additional 1% of the people enrolled in higher

education would mean an increase by 0.26% of the GDP/capita highlighting the importance of tertiary education in economic growth.

Table 2. The results for models in which human capital was expressed in logarithm base enrollment rate of the population in secondary and tertiary respectively, and the active population was expressed under the logarithm of the growth rate of the active population (1991-2010)

	UE 27		România şi Bulgaria		România	
	Modelul 1_{sec_activ}	Modelul 2_{ter_activ}	Modelul 1_{sec_activ}	Modelul 2_{ter_activ}	Modelul 1_{sec_activ}	Modelul 2_{ter_activ}
logPIB/cap	b/se	b/se	b/se	b/se	b/se	b/se
logFBCF	0.472***	0.287***	0.183***	0.246***	0.430***	0.241***
	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
logEdusec	-0.181***		-1.361***		-1.278***	
	(0.05)		(0.29)		(0.20)	
logpopactiva	0.035*	0.016	-0.030**	-0.011	0.012	0.017
	(0.02)	(0.01)	(0.01)	(0.01)	(0.04)	(0.03)
logEduter		0.281***		0.237***		0.256***
		(0.02)		(0.05)		(0.03)
Constanta	5.295***	6.558***	9.618***	6.301***	7.115***	6.371***
	(0.23)	(0.19)	(0.78)	(0.26)	(0.55)	(0.31)
R-squared	0.705	0.808	1.0000	1.0000	0.944	0.972
F	381.493	621.702			78.364	160.988
Wald			155.95	141.07		
N observations	508.000	473.000	29.000	29.000	18.000	18.000

* p<0.05, ** p<0.01, *** p<0.001
GLS Regression OLS Regresion
Note: Standard errors are in parentheses.
Source: Working in the software Stata 11.

In what regards the physical capital, the sign of the coefficients of the physical capital variable per worker, in both patterns, is plus, showing the influence that it has on economic growth, similarly to the results of the MRW augmented pattern (1992) and other patterns of investigating the relationship education – economic growth. The physical capital coefficients have the highest values being comprised in the range (0.2; 0.6); the growth of the income per capita ranges from 0.2% (in the case of Romania and Bulgaria) and increases to 0.7% in the developed countries, older members of the EU. The average influence (EU27) of this variable is nevertheless double as compared to the impact on income growth in Romania and Bulgaria, the countries with the lowest rate of investment.
The population and the GDP per capita had a different evolution according to the European countries and years, in the period of the years 1990-2009 (the analysed period), as reflected in the results of the patterns. Thus, according to the MRW

pattern, the increase of the population (MRW, 1992, page 418) should lead to a reduction in the income per capita due to lower allocation of the physical capital and of the human capital in the population.

Conclusions

In Romania the analysis of the impact of human capital measured by *the product of the rate of enrolment in the secondary education system and the share of the people aged 15-19* leads to a negative effect on the GDP growth, explained by the fact that in time (the period under review, and especially in the last 20 years), the number of young population decreased and, by it, also the rate of enrolment in the education system. Changing the commercial paradigm, respectively the policies for opening the national borders generally enhances the effect of the human capital. However, in Romania, the combined effect of the secondary education and the degree of trade openness is not good, the possibility of development of international exchanges being unable to support the reduction of human capital enrolled in secondary education. Tertiary education proves to be a good performer in the economic increase process, the results being particularly relevant: for the group of the member countries of the European Union, as well as for Romania. If we also introduce the control variable for trade openness, we can infer a positive influence, but not a significant one.

The patterns used with the variables regarding *secondary and tertiary education* have divergent results: the indicator relative to secondary education is not a good estimator that can explain economic growth. Instead, the results are relevant, meaningful and robust when human capital has as measurement *the enrolment rate in tertiary education relative to the population between 20-24 years of age*. We could explain this by the fact that when human capital accumulates it leads to a positive effect on economic growth.

The proportion of the population according to age groups (25-64 years) who have completed secondary education is an estimation of the human capital which proves to be difficult to be introduced in the growth patterns, not being a way to assess a positive effect of education on the growth of the GDP/capita. Yet, what is relevant is the fact that the education variable, measured this way becomes a good estimator in the case of the group of Eastern and Central European countries, new member states of the EU. The explanation is that part of the population has completed these studies after the school period itself, contributing to the accumulation of human capital and to the increase of the income per capita. We could also infer that this aspect was more prominent within the former communist countries, where the proportion of people who have completed secondary education is lower.

In future studies we will present the results obtained in the case of qualitative indicators by which human capital can be expressed.

Bibliography

[1.] Abramovitz, M. (1956). "Resource and Output Trends in the United States Since" *American Economic Review*, May 1956, 46(2).

[2.] Berthelemy, J.C., Varoudakis, A. (1997) „Financial Development, Savings and Growth Convergence: A Panel Data Approach" in Hausmann, R. şi Reisen, H. *Promoting Savings in Latin America*, OECD, Paris.
[3.] Dollar, D. (1992) „Outward-Oriented Developing Economies Really Do Grow More Rapidly: Evidence from 95 LDCs, 1976-1985", *Economic Development and Cultural Change*, No. 40, (3).
[4.] Dollar, D., Kraay, A. (2002) „Growth is good for the poor", *Journal of Economic Growth, Vol. 7.*
[5.] Dumiter, F. (2011) "Independența băncii centrale", Editura Mirton, Timişoara.
[6.] Islam, N. (1995) „Growth Empicics: A Panel Data Approach", *The Quarterly Journal of Economics*, Vol. 110, No.4.
[7.] Keeley, B. (2007) "God as the Ultimate Conspiracy Theory" *Episteme: A Journal of Social Epistemology*, 4(2).
[8.] Knight, M., Loaysa, N., Villaneuva, D. (1993) „Testing the Neoclassical Theory of Economic Growth: A Panel Data Approach", *International Monetary Fund Staff Papers* Vol. 40 No. 3.
[9.] Levine, R., Renelt, D. (1992) „A Sensitivity Analysis of Cross-Country Growth Regressions", *The American Economic Review*, Vol. 82, No. 4.
[10.] Mankiw, G., Romer, P., Weil, D. (1992) „A contribution to the Empirics of Economic Growth", *The Quarterly Journal of Economics, Vol. 107, No.2.*
[11.] Mincer, J. (1995) „Economic Development, Growth of Human Capital, and the Dynamics of the Wage Structure", *Discussion Paper Series No. 744*, Columbia University.
[12.] North, D.C. (1963) "The Sources of Economic Growth in The United States and the Alternatives Before Us" *The Journal of Economic History*, Cambridge University Press, vol. 23(03).
[13.] Petrakos, G., Arvanatidis, P., Pavleas, S. (2007) „Determinnats of Economic Growth", DYNREG, *Dynamic Regions in a Knowledge - Driven Global Economy: Lessons and Policy, Implications for the European Union.*
[14.] Şoim Horaţiu, "Human Capital, Lifelong Learning and Economic Performance", *Annals of the University of Oradea, Fascicle of Management and Technological Engineering, CD-ROM edition*, Volume V (XV.
[15.] Vamvakidis, A. (2002) „Regional Wage Differentiation and Wage Bargaining Systems: The Case of Italy," *International Monetary Fund, Country Report No. 02/232*, Chapter III.
[16.]***OECD (2001) „The Well-being of Nations The Role of Human and Social Capital", (Bengt-Åke Lundvall, Johnson B.), www.oecd.org.
[17.]*** Eurostat, Statistics 2012, www.eurostat.eu .
[18.]*** Heston, Summers, Aten (2012), Penn World Table 7.,1 pwt.econ.upenn.edu.
[19.]***United Nations, Population Division (2012) World Population Prospects, www.un.org .
[20.]***World Bank (2012) „World Development Indicators, www.worldbank.org