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Measuring the Effects of Human Capital on Growth in the Case of Romania

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ABSTRACT

It is obvious that human capital is critical for economic growth. The exploration of the impact of human capital on growth could bring valuable information for policy makers to substantiate their development strategies and to stimulate factors leading to economic growth. The paper aims to investigate the relationships between human capital and economic growth in the romanian economy by analyzing the correlations between statistical variables measuring human capital and economic growth. Using a regression model, it is analyzed the impact of the educational and health capital on the economic output. In the paper, a linear regression model of the relation of human capital to economic growth is subjet of an empirical analysis, firstly, taking into consideration only education as human capital and secondly, incorporating in the model the both components: health and education. A strong correlation between educational variables and GDP, for 1990-2010, was found. The quality of the educational capital has a determinant role in the economic growth, the highly educated people are influencing more the economic output than the secondary educated ones. GDP per capita is negatively correlated with the number of worked hours and positively influenced by the life expectancy. The most important contribution contained by this article refers to the incorporation of the two components of human capital in the same econometric model explaining the economic growth. The added value of paper consists in offering suggestions and orientation for national educational policies.

1. Introduction

The concept of human capital is complex and multifaceted one. According to Schultz [37], skills and knowledge that people acquire during their formal schooling represent a form of human capital. Laroche et all [26] defined human capital as the aggregation of the innate abilities and the knowledge and skills that individuals acquire and develop throughout their lifetime. Laroche et al proposed five main aspects to be considered: (i) human capital is a non-tradable good, it is embodied in human beings; (i) individuals do not always control the channels and pace they acquire human capital: as young, human capital decisions are made by parents, governments, society(educational institutions), as individuals able to make independent decisions, they internalize the decision process on human capital investments; (iii) human capital has quantitative and qualitative aspects: human capital investments are not qualitatively homogeneous; (iv) human capital can be general (possibly to use in variety of activities and transferable from one employer to another) and specific(can be used in a limited number of activities). According to OECD's experts, human capital represents 'the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being'.

Summarizing, the concept of human capital consists of: native human capital (biological), educational capital, health capital and social skills [31].

There are many studies in the human capital literature analyzing the effects of the education on the economic growth. While education is frequently investigated in its relation with the economic output, health, as human capital, is less explored due to the difficulties in measuring the health status of the active population in a manner to be relevant for the an analysis of its impact on the economic output. Moreover, the two forms of human capital, education and health, were always analyzed separately in the explanatory models of economic growth.

This paper focuses on human capital as a determinant of economic growth. Its aim is to measure the effects of the human capital on the economic growth in Romania, by analyzing how the two main components of the human capital: educational and health capital are influencing the economic output. Their joint effect on

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economic growth is explained through a regression model. The objectives of present are: first, to subject the linear regression model of the relation of education to economic growth to an empirical analysis, and second, to use the same linear regression model of the relation of human capital (incorporating both components: health and education) to economic growth on an empirical analysis.

The paper is organized as follows: after a short literature review on the role of human capital on economic growth, the main theoretical models on this subject are described in the section 3, the approach and the methodology of the study is described in the section 4, the main findings of the study are presented in the section 4 and the last part is dedicated to the final conclusions and further research.

2. Human capital and growth: a short literature review

The studies of Paul Romer [36] regarding the effects of the human capital investment on economic growth concluded that the human capital stock determines the rate of economic growth, meaning that an economy with a higher human capital stock will evolve faster. The model of economic growth developed by Romer explains the fast economic growth of the developed countries in the 20th century, emphasizing that the low levels of human capital explain why are unobservable the progress of the underdeveloped countries, as they could benefit from their integration in the world economic network. He concluded that the rate of return in education can explain the rate of economic growth, through cross country regressions.

Robert Lucas [27] developed growth models with human capital accumulation and specialized human capital accumulation, through activities like learning by doing and in the job training.

Nancy Birsdall, Thomas Pinckney and Richard Sabot studied the economic growth and education in countries with abundant resources and concluded that these countries expend less for education, in average, than other countries. The explanation resides in the "virtouous growth circle" , in which education, as investment in human capital, has direct and indirect effects on the economic output. In rich countries the yearly increase by 1,4% of the the enrollment rate in primary and secondary education has lead, in 25 years, to a difference of 40% in GDP per capita.

Hanushek and Kimko (2000) concluded that the results to mathematic and science in 31 countries are positively and strong related to the growth of the macroeconomic output.

The international organizations and several economists are suggesting that the investment in education have to be a priority of the governments in the developing countries [9, 20, 48, 49].

In the OECD countries, several studies highlighted the positive impact of the human capital on the GDP per capita growth. The absolute value of the differences between the human capital stocks in rich and poor countries is the right factor determining the convergence of the poor countries towards the rich countries[8].

Several studies explored the relationship between the accumulation of human capital and the economic output. Schultz, Barro(1991), Bils and Klenow(2000), Mankiw et al(1992) identified a significant contribution of human capital (measured by the schooling rate) at the GDP growth. Robert Barro(2001) emphasized the role of education on economic output. In his analysis used the variable 'quantity of education', measured by years of school attainment, and the variable 'quality' expressed by scores on internationally comparable examinations. According to Barro (2001) at given the level of GDP, a higher initial stock of human capital signifies a higher ratio of hu-man to physical capital. This higher ratio tends to generate higher growth through at least two channels. First, more human capital facilitates the absorption of superior technologies from leading countries. This channel is likely to be especially important for schooling at the sec-ondary and higher levels. Second, human capital tends to be more difficult to adjust than physical capital. Therefore, a country that starts with a high ratio of human to physical capital (such as in the aftermath of a war that destroys primarily physical capital) tends to grow rapidly by adjusting upward the quantity of physical capital.

Barro and Sala-i-Martin (1995) found that the average schoolling years have a significant positive impact on the economic output. Mamuneas, Stavides and Stengos(2002) concluded that the sensitivity of the human capital to the economic output is diferentiate between countries, is positive for developed countries and for developing and underdeveloped is lower or zero.

The literature of human capital is less focused on health and its impact on the economic output. There are some studies carried out by Grossman(1972, 1999), Schultz(1962), and Gary Becker(2007) which are considering health as a form of human capital.

3. Main theoretical models on the role of human capital in the economic growth

Much of attention of economists has focused on long term issues, notably on the determinants (as human capital) of the long-term growth. The economic growth literature is extremely abundant in models and theories trying to clarify the link between different economic variables (inclusively human capital) and economic growth rate. These models and theories can be divided in several groups according different

criteria. Considering the time as criterion, there are 'statistical' (short run) and 'dynamic'(long run) models. As purpose, there are 'structure' , 'forecasting' and 'decision' models.

The keynesian Harod-Domar growth model takes into consideration three independent variables: population growth, technological progress and labour productivity growth and as dependent variables economic growth rate and capital requirements for investments. The model is based on the equation:

$$G = \frac{S}{K} \tag{3.1}$$

where: *G* -economic growth rate, *S*-capital accumulation rate, *K*- capital coefficient.

Inspired of this model, Solow (1956) developed another model of long-run growth, considered by many economists as fundamental for the economic growth literature. The model shows how the savings rate, population growth rate and technological change influence the level of production and the economic growth on the long-run. The starting point of the model is the aggregate production function with three factors of production:

$$Y = F(K, L, T) \tag{3.2}$$

where: *Y*-economic output (income), *K*-physical capital, *L*- labour, *T*-technology.

The basis of the model is the function production in per capita terms:

$$y = f(k) \tag{3.3}$$

where: $k = \frac{K}{L}$ is the capital stock per inhabitant, $y = \frac{Y}{L}$ is the output(income)per inhabitant.

In a extension of the model, human capital was included. As a Cobb-Douglas type, the production function in this model is:

$$Y = AK^{\alpha}H^{\eta}[T(t) \cdot L]^{1-\alpha-\eta} \tag{3.4}$$

where: *K*-physical capital, *H*-human capital, *L*-labour, *T(t)*-technology.

The recognition that the determinants of long-term economic growth were the central macroeconomic problem was accompanied in the late 1980s by important advances in the theory of economic growth. The feature of this period is the development of 'endogenous-growth' models, in which the long-term rate of growth was determined within the model. A key feature of these models is a theory of technological progress, viewed as a process that can lead over time to new and better products and methods of production and to the adoption of superior technologies. One major contributor in this area is Romer (1989). The models developed by Romer and others gave focused on the role of human capital (i.e., ideas) as a main source of non decreasing returns to scale. In the new growth theory, growth may continue indefinitely because the returns to capital in a broad class of capital goods, including human capital, may not necessarily diminish as economies grow. The endogenous growth theory focuses on the economic forces underlying technological progress. The long-run growth is driven primarily by the accumulation of knowledge (or human capital). Lucas(1988) draws on the theory of human capital in which each individual acquires productivity-enhancing skills by devoting time to such acquisition and away from paying work. The acquisition of skills by a worker not only increases his productivity but has a spillover effect on the productivity of all workers by increasing the level of skills in the economy as a whole.

In the early 1990s, apart of the theories based on technological changes, focused on understating how the world, as a whole, can continue to grow indefinitely in per capita terms, economists tried to explain the relative rates of growth across countries, through cross-country statistical analyses, dealing with empirical estimation of growth models using cross-country and cross-regional data. The framework for the applied research was inspired from the neoclassical model, which was developed in the 1950s and 1960s (Solow, 1956; Cass 1965; Koopmans, 1965; Barro and Sala-i-Martin, 1995).

Inspired by the neo-classical model, in his cross-country empirical work on growth, Robert Barro(1997) makes an extension, including government policies, human capital, fertility rate and diffusion of technologies. He used a panel regression estimates for determination of growth rate of per capita GDP. The growth rate is measured over three ten-year periods, 1965- 1975, 1975 -1985, and 1985-1995, in 100 countries. Estimation was by three-stage least squares, using lags of the independent variables as

instruments. The independent variables were: log(GDP), square of log(GDP), measures of government consumption, rule of law, international openness, the inflation rate, the fertility rate, the ratio of investment to GDP, the terms of trade, and the quantity and quality of schooling. The model explains, as well, the convergence force whereby poor countries tend to catch up the rich ones.

There are three paradigms appeared in the literature and discussions of the role of education in economic growth: the first has emanated from human capital theory; the second is considered as catch-up models; and the third takes into consideration the interactions between education and technological innovation and change.

Human capital theory views schooling as an investment in skills and as a way of augmenting worker productivity (see, for example, Schultz, 1960, 1961, 1971; Becker, 1975). From this view, growth accounting models were developed, in which productivity or output *growth* is derived as a function of the *change* in educational attainment. The early studies on this subject showed very powerful effects of educational change on economic growth [18, 17, 23, 12].

The second strand views the role of education in the context of a productivity 'catch-up' or convergence' model. Through the constant transfer of knowledge, countries learn about the latest technology from each other, but virtually by definition the followers have more to learn from the leaders than the leaders have to learn from the laggards. Abramovitz (1986) introduced the concept of 'social capability' to characterize the ability of the less developed countries to increase their productivity performance toward the level of leading nations. Social capability means strong investments, educated and well trained labour force, R&D activities, developed trading relations with advanced countries, a receptive political structure, low population growth. In this context, education is viewed as one index of the social capability of the labor force to borrow existing technology. Education may be viewed as a *threshold effect* in that a certain level of education input might be considered a necessary condition for the borrowing of advanced technology. Moreover, varying levels of schooling might be required to implement technologies of varying sophistication. On an econometric level, was explored how the rate of productivity growth to the level of educational attainment and several studies (45) reported an extremely strong effect of educational level on the growth in per capita income among a cross-section of countries covering all levels of development.

A third strand emanates from the work of Arrow (1962) who introduced the notion of *learning-by-doing*, which implies that experience in the application of a given technology or new technology in the production process leads to increased efficiencies over time. For example, in the Nelson–Phelps model(1966), it is argued that a more educated workforce may make it easier for a firm to adopt and implement new technologies. Several studies suggested that there may be interaction effects between the educational level of the work force and measures of technological activity, such as the R&D intensity of a country(Welch, 1970; . Bartel and Lichtenburg, 1987; Wolf, 2000).

Starting with the idea that health capital has a significant impact on economic growth, McDonald and Roberts (2002) developed an augmented Solow model, that incorporates, both, education and health in a dynamic panel data model. The aggregate Cobb–Douglas production function with three forms of capital can be written as:

$$Y_{it} = [A_{it} L_{it}]^{1-\alpha-\beta-\psi} \cdot K^{\alpha} \cdot E^{\beta} \cdot H^{\psi} \qquad (3.5)$$

where: *Y* is the output, *A* is the technology, *L*-the stock of labour, *K, E, H* are physical, educational and health capital, α, β, ψ are the elasticities of output with respect to the capital terms, and the subscripts denote country (*i*) and time (*t*).

Summarizing the above considerations, two concluding remarks arised. First, even the production function (Cobb-Douglas) was preferred by researchers to emphazise the role of education and health on the economic growth, a variety of regression models (cross-country) were frequently used. As dependent variables were used: lnGDP per capita, log GDP per capita, GDP per capita, GDP. As independent variables, measuring the human capital, were used: school enrolment rates, literacy rate, average years of schooling, public and private spending on education (total, public and private, as % of GDP, costs per students, costs per student as % of GDP per capita, costs by education level), repetition rates, drop-out rates, tests scores, constructed data sets, public and private spending on health(total, as % of GDP) life expectancy, mortality rates, infant mortality, healthy life years. Second, the two main components of human capital were incorporated only in the model of production (McDonald and Roberts, 2002), never being introduced together in a regression model.

The objective of present paper are to subject the linear regression model of the relation of human capital to economic growth an empirical analysis, firstly, taking into consideration only education as human capital and secondly, incorporating in the model the both components: health and education.

4. Theoretical approach and methodology of the study

We measure the effects of the human capital on the economic growth by analyzing how the two components of the human capital: educational and health capital are influencing the economic output.

The educational capital is expressed by two statistical indicators: the percentage of the tertiary graduates (ISCED 5-6) in the population aged 20-24 and the percentage of the secondary and upper secondary(ISCED 3-4) in the population aged 15-29.

For the economic output, we use the GDP per capita.

For the health status of the population, the statistical indicators used in the analysis are: the number of worked hours by the employed population, life expectancy and the standardized rate of mortality due to all death causes.

The sources of data are: National Institute of Statistics and National Insurance House from Romania, EUROSTAT and World Health Organization.

We assume that the growth of GDP per capita is result of the two forms of human capital (education and health) and we use the linear regression model:

$$Y = a + b_1 \cdot x_1 + b_2 \cdot x_2 + \varepsilon \quad (4.1)$$

where: *Y* is the economic output (the dependent variable), expressed by GDP per capita in millions lei;

x_1 is the educational capital, expressed by tertiary and, respectively secondary educated people in the corresponding age population group;

x_2 is the health capital, expressed by life expectancy, in years;

a is constant;

b_1 and b_2 are regression coefficients;

ε is the standard error.

To analyze the effect of education on the economic growth the bellowed equation will be used:

$$Y = \alpha + \beta_1 \cdot x_1 + \beta_2 \cdot x_2 + \omega \quad (4.2)$$

where:

Y is the economic output (the dependent variable), expressed by GDP per capita in millions lei;

x_1 and x_2 are forms of human capital (independent variables) expressed by tertiary and, respectively, secondary educated people in the corresponding age population group;

α, β_1 and β_2 are regression coefficients;

ω is the standard error.

We assume that the human capital, in all its forms, has a positive impact on the economic growth.

5. Main findings

Education and economic growth

In order to analyze the role of education on the economic growth, we will use the equation 4.1.

Between the tertiary graduates in the population aged 20-24 and the GDP per capita, the partial correlation found is strong and positive(0,789) and between secondary graduates in the population 15-29 and GDP per capita is not so strong (0,488). The results of applying the regression model (Table 1) show that the model of human capital is statistically validated (the significance F is lower that 0,05- the significance level).

Table 1. Results: Education capital and growth in Romania

SUMMARY OUTPUT					
Regression Statistics					
Multiple R	0,798899197				
R Square	0,638239927				
Adjusted R Square	0,590005251				
Standard Error	89748,92656				
Observations	18				
ANOVA	*df*	*SS*	*MS*	*F*	*Significance F*

SUMMARY OUTPUT						
Regression	2	2,13164E+11	1,066E+11	13,23197282	0,000487702	
Residual	15	1,20823E+11	8,055E+09			
Total	17	3,33987E+11				
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-153902,0229	166474,2541	-0,9244794	0,36987083	-508733,4946	200929,45
X Variable 1	32393,74171	7961,705046	4,068694	0,001008296	15423,76919	49363,714
X Variable 2	24766,84216	31649,67829	0,7825306	0,446081384	-42692,84995	92226,534

Source: calculations using Excel Data Analysis

According to the results presented in the table 1, we could explain the evolution of GDP per capita in proportion of 63,82% through the dynamic of the stock of human capital in the economy, considering all other factors as constant. When the human capital will increase with 1 unit, the GDP per capita will increase with 32394, 74 units.

Regarding the composition of human capital, the highly skilled people are more important for growth than the secondary graduates and the model of regression can be statistically validated only for the variable 1(the tertiary graduates), where the P-value is lower than 0,05 (for a significance level of 5%).

Even the regression coefficient of the variable 2 (expressing the secondary graduates) is positive, its variance is not statistically significant for the GDP per capita evolution.

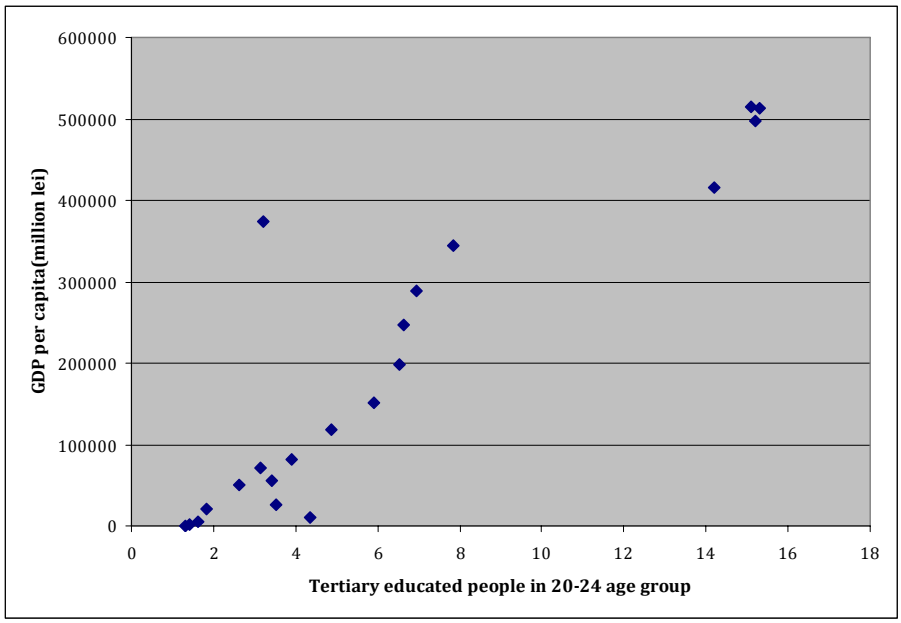

Figure 1. Correlation between tertiary educated people and GDP per capita, 1999-2010

Source: calculations based on NIS data

The conclusion of analysis of the regression model is in line with the correlation found between the tertiary educated people (as % of the 20-24 age population group) and GDP per capita. As we can see in the figure 2, a strong correlation between the highly skilled people and GDP per capita, during 1999-2010, confirming the assumption that education, measured by has a positive impact on economic growth.

Health and economic growth

Measuring the health status of the population raises several problems. First, it is hard to find a statistical indicator to fully reflect the health status of the population and there is no consensus in the literature about this issue. Second, from several european surveys, the indicator of *self-perceived health* (proportion of persons who assess their own health as being very good/ good/ fair/ bad/ very bad) found as a good proxy for the health status of the individuals is available only for 4 years, being not appropriate for statistical analysis.

Even we know that, according to EU Statistics on Income and Living Condition (EU-SILC) survey, in 2004, 74,7% from the active romanian population reported a good and very good health and the health status

improved during 2004-2009 to a level of 88,2% in 2009, we cannot pertinently conclude about the health status of the romanians.

If we assume that a healthy active population contribute to the economic output by working (as employees or self-employed) and worked time is an expression of their health status (or the un-worked time is an expression of their illness or limitations due to health problems), we can use the *worked hours of the employed population* as reflecting her health status. This statistical indicator is used as a measure of employment, as well. For the purpose of this paper we can assume that it is a reflection of the utilization of the active human capital in the economy, determined by the health status of the individuals. Unfortunately, within the national statistical data resources, we can find only data for 9 years (2002-2010), not enough for a relevant statistical analysis. But, it was interesting to conclude on the correlation of this indicator and GDP per capita, in the same period of time. The coefficient is strong negative (-0,656). The calculations with EUROSTAT data, for 2000-2008, have the similar results (-0,622). For 2008-2011(first semester), calculations with NIS quarterly data (14 observations) show a correlation coefficient of -0,147. The possible explanations of this situation resides in low levels of the national productivity and in the large share of GDP coming from the non-productive sectors, non-creating added value, with staff non-contributing to the national work productivity.

Another indicator as a proxy for the health status of the population is *the standardized rate of mortality by all causes of death*, used within the World Health Organization's system. We assume that a low level of this rate reflects, by opposition, a good health and the increasing of this rate is the sign of a worsening health status of the population and inverse. From WHO statistics, for Romania, during 1999 and 2009, *the standardized rate of mortality by causes of death* decreased from 1167,9 in 1999 to 959,4 in 2009. The correlation between GDP per capita and this rate (1999-2009) is strong negative (-0,963), reflecting an inverse dependence, as we expected, between the mortality rate and the economic output.

Table 2. Health investment and life expectancy in Romania

Year	Public health expenditures-total (million lei)	Public health expenditures, per active population (lei)	Life expectancy (years)
1999	1549,2	137,34	69,74
2000	2481,7	219,95	70,53
2001	3662,0	328,4	71,19
2002	4750,3	471,29	71,18
2003	6063,5	611,59	71,01
2004	6894,8	692,45	71,32
2005	9037,8	917,45	71,76
2006	9621,2	958,13	72,22
2007	12015,4	1202,23	72,61
2008	15628,5	1563,68	73,03
2009	12150,7	1224,36	73,33
2010	15104,6	1515,84	-

Source: National Insurance House, NIS, own calculations

The health investment in Romania, expressed by the public expenditures for health, increased almost of 10 times during 1999-2010 and health expenditures per capita (active population) of 11,03 times. The *life expectancy*, as a result of the effectiveness of the health care system, increased with 3,59 years.

Examining the relationship between the public health expenditures per capita and the life expectancy we found a strong and positive correlation (0,941). For 20 years (1990-2009), GDP per capita is strongly and positively correlated with the life expectancy of the population (0,823).

Human capital and economic growth

In order to analyze both effects (of education and of health) on economic growth, we put the statistical variables discussed above in the equation 4.2. : $Y = \alpha + \beta_1 \cdot x_1 + \beta_2 \cdot x_2 + \omega$, where: *Y* is the economic output (the dependent variable), expressed by GDP per capita in millions lei; x_1 and x_2 are the two forms of human capital (independent variables) expressed by educational capital (*tertiary educated people*) and, respectively, health capital, expressed by the *life expectancy*; ε -standard error.

Table 3. Human capital and economic growth in Romania

SUMMARY OUTPUT						
Regression Statistics						
Multiple R	0,87264322					
R Square	0,76150619					
Adjusted R Square	0,733448094					
Standard Error	87277,59018					
Observations	20					
ANOVA	*df*	*SS*	*MS*	*F*	*Significance F*	
Regression	2	4,13476E+11	2,067E+11	27,14033797	5,11158E-06	
Residual	17	1,29495E+11	7,617E+09			
Total	19	5,42972E+11				
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-1805810,501	2329242,99	-0,7752779	0,448826238	-6720083,6	3108462,6
X Variable 1	29409,19403	12094,86515	2,4315438	0,026384692	3891,259366	54927,129
X Variable 2	25712,2073	33817,5995	0,7603203	0,457479337	-45636,69028	97061,105

Source: calculations using Excel Data Analysis

Table 3 presents the results of applying the regression model, for GDP per capita and human capital variables, for 1999-2009. There is a strong multiple correlation of 0,87, between GDP per capita and the human capital variables and a proportion of 73,34% of the GDP per capita dynamics can be explained by the variance of the two independent variables. The validity of the model is confirmed by the fact that the Significance F (5,11158E-06) is lower than the significance level of 5%. But not both independent variables have a significant influence on GDP per capita. Due to the fact that the P-value is lower than 0,05(the significance level) only for the *educational capital*, the *life expectancy* is not statistically significant for the growth of GDP per capita.

6. Final conclusions, discussion and further direction of research

The objectives of the paper were to investigate the effect of education and health on economic growth(in a separate analysis for each component of human capital) and to subject the linear regression model of the relation of human capital, in its two forms (education and health) to economic growth to empirical analysis, using statistical data on Romanian's economy.

There three main conclusions arising from the study. First, as expected, we found a powerful effect of educational attainment on economic output. We could explain the evolution of GDP per capita in proportion of 63,82% through the dynamic of the stock of human capital in the economy, considering all other factors as constant. When the human capital will increase with 1 unit, the GDP per capita will increase with 32394, 74 units. The proportion of higher educated people is influencing significantly the economic output. The composition of human capital in the economy is important for growth, meaning that the tertiary education as a measure of the quality of human capital is an determinant of the economic output and its dynamic.

Second, the health capital in Romania, expressed by the life expectancy of the population, is positively correlated with the dynamics of GDP per capita This indicates that investment in factors leading to the raise of life expectancy are beneficial for economic growth. Such factors can be: quality and effectiveness of the health care services, health and safety at work, child bearing, family protection, immunizations, investment in medical equipment, efficient and effectiveness of public spending on health.

Third, the human capital, in its two components, has a strong effect on the economic output: 73,34% of the GDP per capita dynamics can be explained by the human capital variables(education and health). The model is statistically validated as a whole. But, due to the fact that the regression model cannot be validated for the health variable, we have to treat cautiously this result. Possible sources of invalidity that can be investigate are: the (in)consistency of the given statistical indicator with the purpose of the study, the number of observations, the possible auto-correlations between the variables etc. As well, other regression models can be tested (i.e.quadratic or using other variables as logGDP or log GDP per capita.)

The added value of paper consists in offering suggestions and orientation for national educational policies. In order to stimulate the economic growth in Romania it is important to support the development of the tertiary education and to invest in its quality. A stronger connection of tertiary education with research and development is needed to stimulate the component of scientific research of the academic activities, on both

forms (fundamental and applied). As orientation for national policies, the results of the study offers suggestions for three areas: education, employment and health. Regarding the employment and education policies, as it is shown by the results of the study, an increase of the working hours number will not bring an improvement of the economic output as the increase in the share of the highly educated in the educational stock. But the increase in the investment in health care will lead to the raise of life expectancy and of the healthy years of the population. Moreover, policy measures are needed to carefully monitor the efficiency and the effectiveness of the public spending in health.

The study has limitations, of course, related, in a great part, to the measurement of the health capital and the channels through which it influences the economic output. Therefore, is very difficult to explore the relationship between the health capital and the economic growth. The poorness of the relevant statistical data for analyzing the effect of the health status on the economic growth is a great barrier to draw further investigations on this relationship and perhaps to construct specific data sets can be a solution. In this view, further research are needed to identify relevant statistical variables or construct data sets and explore their capacity to reflect the health status of the active population, participating to the creation of the added value in the economy.

The main original contribution of the paper is the inclusion in the same model of both components of human capital in explaining its effect on the economic output.

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