THE USV ANNALS OF ECONOMICS AND PUBLIC ADMINISTRATION | VOLUME 16, ISSUE 1(23), 2016

THE ROLE OF TERTIARY EDUCATION IN THE ARCHITECTURE OF ECONOMIC DEVELOPMENT

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Abstract:

In the current transformation of nations where all economic, social, political and civic pillars, experienced a new dynamic in trying to adapt to present conditions, contribution of higher education is becoming more evident in Romanian society. Universities have often been perceived as the key institutions in the processes of social change and development. The most explicit role universities have been assigned consisted of highly skilled labor productivity and conducting research processes to meet perceived economic needs of society. Higher education not only contributes to the formation of skilled workers, but also creates a workforce eager to acquire new knowledge that contributes to growth and social and economic development. Higher education creates new attitudes, makes vision changes necessary for the socialization of individuals, for modernization and transformation of societies.

The need to draw attention to the importance of the human element brings to the fore the need for human resource development from the perspective of learning and lifelong self-improvement. Establishing the relationship between higher education and economic growth was based on an analysis of the link between them for a longer period of time, over 40 years, in the period 1971-2013 for the countries UK, Poland, Sweden, Korea South and Romania, using participation rates in tertiary education (School Enrollment Ratio, tertiary -% gross) as an indicator for assessing the changes in higher education and the Gross Domestic Product per capita (expressed in dollars per capita) as an indicator of economic growth. Choosing the five countries included in the research is justified by the investments made in education correlated with economic growth related to these countries.

Key words: economic growth, education, GDP, tertiary education

JEL classification: I25, F63, A12, I23, I25

INTRODUCTION

We live in an age where knowledge is increasingly important for the development of contemporary societies and economies in a world of rapidly circulating capital with people and revolutionary communication technologies. In this context knowledge becomes the main engine of economic growth and education has become increasingly more the basis for individual prosperity and social mobility. Research undertaken on studying the link between higher education and the welfare, are not new but are still valid. Several empirical studies in the literature have focused on the effects that different levels of education have on economic growth. From this perspective, the results converge to the fact that higher education has a greater influence on economic growth in developed countries; while for developing countries basic education and secondary education are of priority. Examples are researches: Psacharopoulos and Patrinos (2002), Petrakis and Stamatakis (2002), Papageorgiou (2003), Teles and Andrade (2008), Vandenbussche, Aghion and Meghir (2006) according to which higher education presents a powerful effect on economic growth. Higher education and its products generate significant effects at local, regional and global level, becoming in this context thus a priority for both individuals and society. In this regard have been noted concerns in the studies of romanian authors as Avram, R. (2011), Badea, L. (2013) starting from the belief that without a functional and performance education system it can`t be outlined a favorable climate for the society development, in its complexity, contributing in this way to an absolute/complete economic welfare.

THE EVOLUTION OF TERTIARY EDUCATION PARTICIPATION RATE (%) AND THE EVOLUTION OF GROSS DOMESTIC PRODUCT PER CAPITA DURING 1971-2012 IN CASE OF GREAT BRITAIN, POLAND, SWEDEN, SOUTH KOREA AND ROMANIA

The analysis was conducted based on data available in five countries: Great Britain, South Korea, Poland, Romania and Sweden, according to information provided by the World Bank and (UNCTAD). The variables considered are *gross domestic product per capita* and *the participation rate in tertiary education* for those countries, for a period of 40 years. The data were processed using *SPSS* and for testing hypotheses we use a number of methods such as: graphic method, regression and correlation analysis, specific econometric tests for identifying the existence of the link, establishing the meaning and form of the link and determining the intensity of the link.

Data available on the website of the World Bank for the period 1971-2012 shows an upward trend in the *participation rate of the population in tertiary education*, in the case of the five countries included in the survey. The participation rate in tertiary education represents the total number of students enrolled in higher education, regardless of age, as a ratio of the total population in the corresponding age group in higher education. The purpose of using this indicator is to highlight the overall level of participation in tertiary education within a certain timeframe.

The evolution of participation rates in tertiary education of Romania population during 1971-2012 is under the appropriate values of the other four countries included in the analysis. We can conclude that although South Korea had in 1971 a participation rate in tertiary education of 7.25%, much lower than in Romania (9.29%), it has grown very rapidly since 1979, exceeding after 1982 other 4 countries analyzed. In 2006, the participation rate in South Korea has exceeded 100%, reaching a maximum rate of 101.57% in 2007.

Data on gross domestic product per capita available on the website of **United Nations Conference on Trade and Development (UNCTAD)** for the period 1971 to 2013 were summarized and presented by us through appropriate chronograms corresponding to development of Gross Domestic Product per capita in 5 countries included in the survey shows an upward trend. Based on data we can see that Sweden has the highest gross domestic product per capita, followed by the UK and South Korea, Poland and Romania. In 2013, Romania was the last among the five countries surveyed, with a gross domestic product of $ 8,592.20 / capita. Gross domestic product per capita in Poland experienced a similar evolution to that of Romania, but at a higher level.

EMPIRICAL ANALYSIS OF THE RELATIONSHIP BETWEEN TERTIARY EDUCATION PARTICIPATION RATE (%) AND GROSS DOMESTIC PRODUCT PER CAPITA ($)

Study of the relationship between two variables can be realized by using regression and correlation analysis, which provides the possibility of identifying the existence of the link, of determining the direction and shape of the link and of determining the intensity of the link. An elementary method that allows determining the existence, meaning, form and intensity of the relationship between variables is the graphical method. This method consists of a graphic representation in a system of axes, of the pairs of corresponding values of the two variables considered, the chart or diagram being called correlogram or the diagram of the cloud points. To measure the intensity of the relationship between analyzed variables we used *ratio correlation*, which is calculated as follows:

$$R = \sqrt{1 - \frac{\sum (y_i - y_x)^2}{\sum (y_i - \bar{y})^2}} \quad (1)$$

Choosing the best regression model was based on the *determination coefficient*, which shows in what proportion the dependent variable is explained by the regression model. This

indicator is calculated by squaring the correlation ratio. For the verification of the significance of the correlation ratio we used F test defined by:

$$F = \frac{n-k}{k-1} \cdot \frac{R^2}{1-R^2} \quad (2)$$

Where n is the number of observed values; k number of groups formed in relation to the independent variable; R^2 coefficient of determination. Since the F test value is greater than the spreadsheet and value Sig. is less than 0.05, we can say that linear relationship between two variables considered is significant.

ANALYSIS OF THE LINK BETWEEN THE RATE OF PARTICIPATION IN TERTIARY EDUCATION AND GDP PER CAPITA IN THE UK

Graphic representation in the same system of axes of the link between the 2 variables for 1971-2012 in Great Britain is realized in Figure no. 1

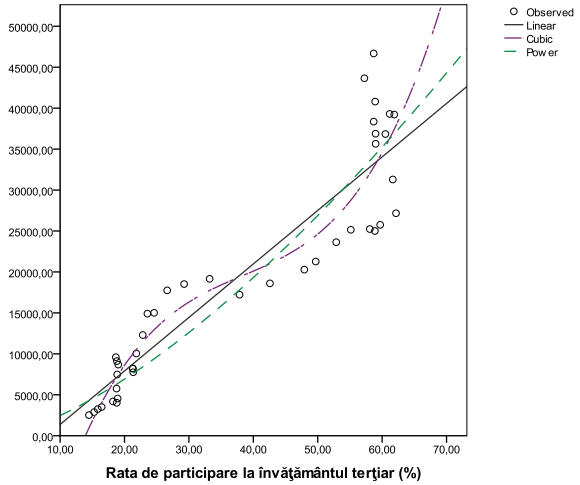

Figure no. 1. The link between *participation rate in tertiary education* and *gross domestic product per capita* in the UK in the period 1971-2012

The graph in *Figure no. 1* shows a direct link between *the rate of participation in tertiary education* and *gross domestic product per capita* in the UK for the period 1971-2012. We appreciate that the connection is non-linear, of cubic shape model:

$$Y = a + bx + cx^2 + dx^3 \quad (3)$$

Table no. 1. Gross Domestic Product model coefficients

	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. Error	Beta		
Participation rate	3786,894	1590,053	5,356	2,382	0,022
Participation rate ** 2	-89,960	44,574	-9,987	-2,018	0,050
Participation rate ** 3	0,781	0,385	5,600	2,029	0,050
(Constant)	-37398,776	16992,678		-2,201	0,034

The estimation of the cubic model parameters is given in *Table no 1*. Based on data we can write the estimated equation of the model gross domestic product per capita in the UK for the period 1971-2012, as follows:

$$Pib_{/loc} = +37398,776 + 3786,894 \times R_p - 89,960 \times R_p^2 + 0,781 \times R_p^3 \quad (4)$$

Measurement of the intensity of the relationship between the variables considered was performed using Pearson correlation ratio. The values obtained for the Pearson correlation report, coefficient of determination and the estimated standard error are summarized in *Table no. 2.*

Table no. 2. Pearson correlation report, coefficient of determination and the estimated standard error

Model	Pearson correlation report (R)	Coefficient of determination (R^2)	The adjusted coefficient of determination	Estimated standard error
Cubic	0,932	0,868	0,858	4982,841

Note: The independent variable is the rate of participation in tertiary education in the UK

Pearson correlation report value was calculated with SPSS and points out that between the participation rate in tertiary education and gross domestic product per capita in the UK in the period 1971-2012 there is a very strong bond. Correlation report equals 0,932 for cubic model. The coefficient of determination calculated has a value of 0.868 and shows the proportion of dependent variable explained by the cubic model. The coefficient of determination in the table, expressed as a percentage, shows that the variation of gross domestic product per capita is determined by the in proportion of 86.8% by the variable participation rate in tertiary education, the rest to 100% due to random factors.

In *Table no. 3* there are the estimates of two components of variance, the degrees of freedom corresponding, estimates of variance explained and residual, value of Fisher report and significance of the test.

Table no. 3. ANOVA

	The sum of the deviations	df	Deviation	F Test	Sig.
Regression	6207799378,280	3	2069266459,427	83,342	0,000
Residual	943490603,882	38	24828700,102		
Total	7151289982,161	41			

Note: The independent variable is the rate of participation in tertiary education in the UK

For the verification of the significance of the correlation ratio test F was used. Value Sig. corresponding to the F-test is less than 0.05. In these conditions we can say that the model explains the dependence of the variables constructed through a nonlinear link of cubic type, which is considered significant.

THE LINK BETWEEN PARTICIPATION RATE IN TERTIARY EDUCATION AND GROSS DOMESTIC PRODUCT PER CAPITA IN SOUTH KOREA

Graphical representation of the relationship between two variables for the period 1971-2012, in South Korea is accomplished in *Figure no.2*

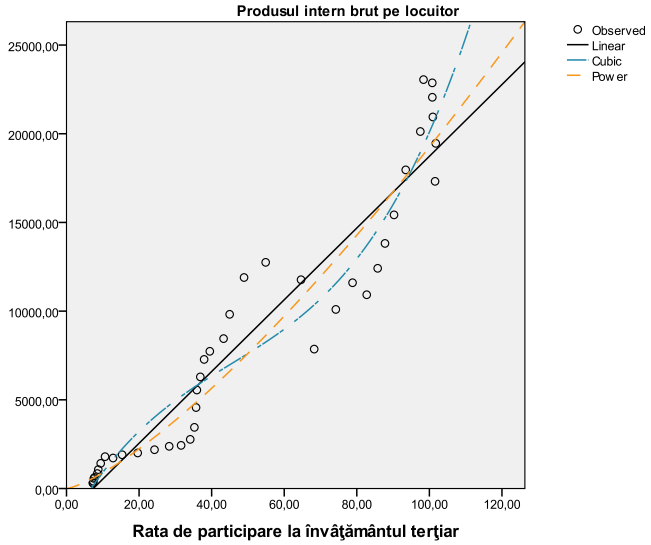

Figure no. 2. The link between participation rate in tertiary education and gross domestic product per capita in South Korea during 1971-2012

From *Figure no. 2* we note that between *participation rate in tertiary education* and *gross domestic product per capita* in South Korea for the analyzed period there is a nonlinear connection, which can be approximated by a power model of the form:

$$Y = ax^b \quad (5)$$

Through logarithm we obtain a linear model of the form:

$$\ln Y = \ln a + b \times \ln x \quad (6)$$

Estimation of power model parameters based on statistical data we can write the estimated equation of the power model for gross domestic product per capita, as follows:

$$Pib_{/loc} = 40{,}598 \times R_p^{1{,}338} \quad (7)$$

The values obtained for the ratio Pearson correlation, coefficient of determination and the estimated standard error are summarized in *Table no.4.*

Table no. 4. Pearson correlation report, coefficient of determination and the estimated standard error

Model	Pearson correlation report (R)	Coefficient of determination (R^2)	The adjusted coefficient of determination	Estimated standard error
Power	0,969	0,939	0,937	0,324

Note: The independent variable is the rate of participation in tertiary education in South Korea

The value obtained for the Pearson report of correlation shows that between the rate of participation in tertiary education and gross domestic product per capita in South Korea, for the period analyzed, there is a very strong bond. The coefficient of determination of the table, expressed as a percentage, shows that the variation of gross domestic product per capita is determined in proportion of 93.9% by variable participation rate in tertiary education, the rest to 100% being due to random factors.

In *Table no. 5* there are centralized the estimates of the two components of variation, degrees of freedom corresponding, estimates of variance explained and residual, value of Fisher report and significance of the test.

Table no. 5. ANOVA

	Sum of deviations	df	Deviation	F test	Sig.
Regression	63,990	1	63,990	610,875	0,000
Residual	4,190	40	0,105		
Total	68,180	41			

Note: The independent variable is the rate of participation in tertiary education in South Korea

Sig value corresponding to F test is less than 0.05, which allows us to affirm that the model explains the dependence of the variables built by a nonlinear connection of power type, which is considered significant.

THE LINK BETWEEN PARTICIPATION RATE IN TERTIARY EDUCATION AND GROSS DOMESTIC PRODUCT PER CAPITA IN POLAND

The graphical representation of the relationship between the two variables for the period 1971-2012, in Poland is realized in *Figure no. 3.*

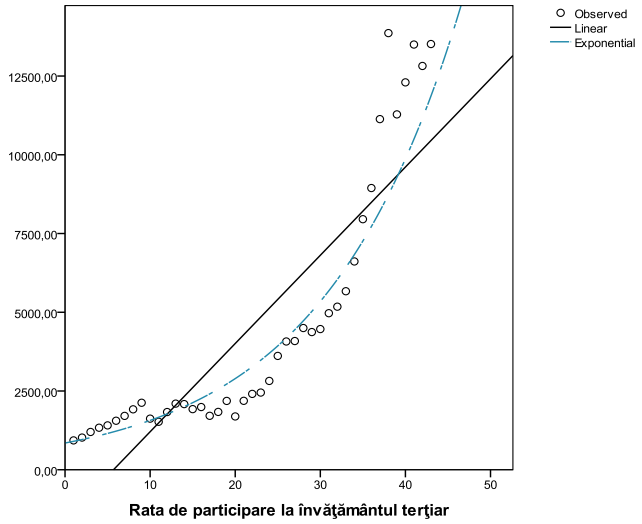

Figure no. 3. The link between *participation rate in tertiary education* and *gross domestic product per capita* in Poland in the period 1971-2012

From *Figure No. 3* we appreciate that between *participation rate in tertiary educatio*n and *gross domestic product per capita* in Poland, there is a nonlinear connection, which can be approximated by an exponential regression model of the form:

$$Y = ax^b \quad (8)$$

Through logarithm we obtain a linear model of the form:

$$\ln Y = \ln a + b \times \ln x \quad (9)$$

Estimation of power model parameters based on statistical data from obtained we can write the estimated equation for exponential model for gross domestic product per capita, as follows:

$$Pib_{/loc} = 942{,}996 \times 0{,}035^{Rc} \quad (10)$$

The values obtained for the Pearson correlation report, coefficient of determination and the estimated standard error are summarized in *Table. no. 6.*

Table no. 6. Pearson correlation report, coefficient of determination and the estimated standard error

Model	Pearson correlation report (R)	Coefficient of determination (R^2)	The adjusted coefficient of determination	Estimated standard error
Exponential	0,972	0,944	0,943	0,187

Note: The independent variable is the rate of participation in tertiary education in Poland

The value obtained for the Pearson correlation report shows a strong link between *the rate of participation in tertiary education* and *gross domestic product per capita* in Poland. The coefficient of determination of the table, expressed as a percentage, shows that the variation of *gross domestic product per capita* variable is determined in proportion of 94.4% by *the participation rate in tertiary education*, the rest to 100% being due to random factors.

In Table no. 7 we centralized the estimates of the two components of variance, the degrees of freedom corresponding, the estimates of variance explained and residual, the value of Fisher report and significance of the test.

Table no. 7. ANOVA

	Sum of deviations	df	Deviation	F test	Sig.
Regression	23,630	1	23,630	678,627	, 000
Residual	1,393	40	, 035		
Total	25,023	41			

Note: The independent variable is the rate of participation in tertiary education in Poland

Sig value corresponding to F test is less than 0.05, which allows us to affirm that the model explains the dependence of the variables built by a non-linear exponential link, which is considered significant.

THE LINK BETWEEN PARTICIPATION RATE IN TERTIARY EDUCATION AND GROSS DOMESTIC PRODUCT PER CAPITA IN ROMANIA

Graphical representation of the relationship between two variables in Romania is shown in *Figure no. 4.*

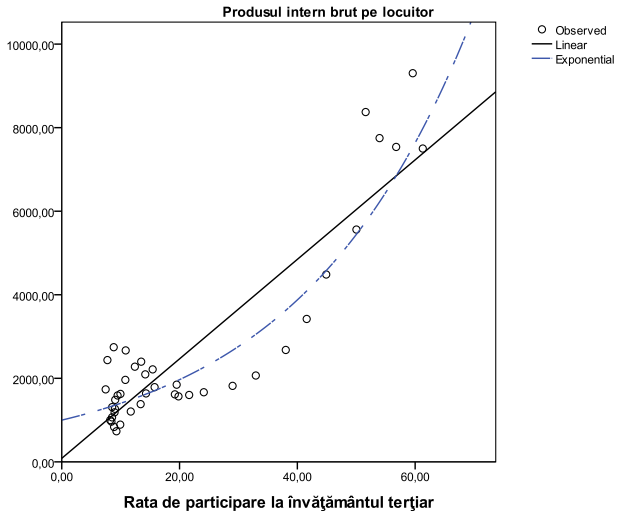

Figure no. 4. The link between *participation rate in tertiary education* and *gross domestic product per capita* in Romania

In the graph of *Figure no. 4* we estimate that between *participation rate in tertiary education* and *gross domestic product per capita* in Romania, there is a nonlinear connection, which can be approximated by an exponential regression model, of the form:

$$Y = ax^b \quad (11)$$

Through logarithm we obtain a linear model of the form:

$$\ln Y = \ln a + b \times \ln x \quad (12)$$

Estimation of power model parameters based on the statistical coefficients we can write the estimated equation for exponential model for per capita gross domestic product per capita model, as follows:

$$Pib_{/loc} = 998{,}882 \times 0{,}034^{Rc} \quad (13)$$

The values obtained for the Pearson correlation report, coefficient of determination and the estimated standard error are summarized in *Table. no. 8.*

Table no. 8. Report Pearson correlation report, coefficient of determination and the estimated standard error

Model	Pearson correlation report (R)	Coefficient of determination (R^2)	The adjusted coefficient of determination	Estimated standard error
Exponential	0,876	0,767	0,761	0,322

Note: The independent variable is the rate of participation in tertiary education in Romania

The value obtained for the Pearson correlation report shows a strong link between *the rate of participation in tertiary education* and *gross domestic product per capita* in Poland. The coefficient of determination of the table, expressed as a percentage, shows that the variation of the variable gross domestic product per capita is determined in proportion of 87.6% by variable rate of participation in tertiary education, the rest to 100% being due to random factors.

ANALYSIS OF THE LINK BETWEEN THE RATE OF PARTICIPATION IN TERTIARY EDUCATION AND GDP PER CAPITA IN SWEDEN

Graphical representation of the link between two variables for the period 1971-2012 in Sweden is realized in *Figure No. 5.*

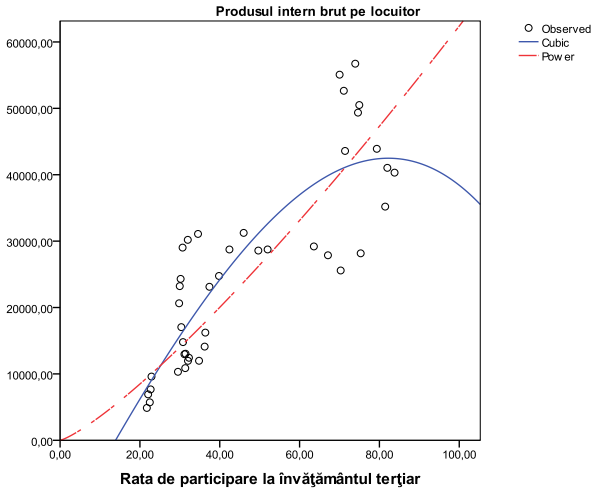

Figure no. 5. The link between participation rate in tertiary education and gross domestic product per capita in Sweden

From *Figure No. 5* is observed that between *the participation rate in tertiary education* and *gross domestic product per capita* in South Korea for the analyzed period there is a nonlinear connection, which can be approximated by a power model of the form:

$$Y = ax^b \quad (14)$$

Estimation of power model parameters based on the values obtained for the coefficients we can write the estimated equation of the power model for gross domestic product per capita t, as follows:

$$Pib_{/loc} = 206{,}339 \times R_p^{1,24} \quad (15)$$

The values obtained for the Pearson correlation report, coefficient of determination and the estimated standard error are summarized *in Table. no. 9.*

Table no. 9. Pearson correlation report, coefficient of determination and the estimated standard error

Model	Pearson correlation report (R)	Coefficient of determination (R^2)	The adjusted coefficient of determination	Estimated standard error
Power	0,850	0,722	0,715	0,344

Note: The independent variable is the rate of participation in tertiary education in Sweden

The Pearson correlation report indicates that between *the rate of participation in tertiary education* and *gross domestic product per capita* in Sweden for the period analyzed, there is a strong connection. The coefficient of determination from the table, expressed as a percentage, shows that the variation of gross domestic product per capita is determined in proportion of 72.2% by variable participation rate in tertiary education, the rest to 100% being due to random factors.

Sig value corresponding to F test is less than 0.05, which allows us to affirm that the model explains the dependence of the variables built by a nonlinear link of type power, which is considered significant.

CONCLUSIONS

The analysis based on the data available showed that there is a strong link between the rate of participation in tertiary education and GDP per capita, for all 5 countries included in the survey. The relationship between the two analyzed variables is of nonlinear form, and can be approximated by a cubic regression model type (UK), power (South Korea and Sweden), exponential (Poland and Romania).

Measuring the intensity of the relationship between the variables analyzed was performed using the correlation report. The highest value is 0.969 and was obtained in the case of South Korea. The lowest value for the correlation ratio was obtained by Sweden, the coefficient of determination indicating that the variation of ***gross domestic product per capita*** is explained in proportion of 85% by a nonlinear regression model of type power. For Romania, the Pearson correlation ratio is R = 0.876 indicating a very strong link between ***the participation rate in tertiary education*** and ***gross domestic product per capita*** for the period 1971-2012.

In the literature, the results converge towards accepting that higher education has a great influence on economic growth in more developed countries. In our case, for South Korea it was obtained the highest value of correlation ratio. Selection of states for which we conducted this analysis was based on eligibility criteria, given the specificity of each of them, such as geographic location and culture and rankings. However, they are also enjoying successful educational systems, and outstanding performance in education.

In our opinion, at the moment, Romania needs a public education system that is folded on its real needs; there is no ideal system, and we do not opt for the idea of encouraging copy-paste-type patterns for the entire public education system because it is not natural; Each school system must meet the needs of each society that it develops. Beyond the comments that can be achieved in connection with the examples given, they communicate "education has the difficult job to transmit culture accumulated for centuries, but also a preparation for the future, largely unpredictable."

Accepting that research conducted has not exhausted all perspectives of analysis, we envision new directions for action and possible openings:

· longitudinal analysis of the level of education and economic growth to include other indicators representative;

· discover all factors that influence the level of education.

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