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ANALYSIS OF THE EU STATES EDUCATION EXTERNAL EFFECTS: LESSONS FOR UKRAINE

Abstract. *The author reviews and verifies the hypothesis as regards the possibility of educational sphere externalities assessment for the society by three macroeconomic indicators: economic growth rates, unemployment level and theGini coefficient. In the capacity of influential ones, the author considers four groups of education indices which characterize its scale, organization and educational technologies, financing, level of compliance with the society needs. On the basis of econometric calculations the author has come to the conclusion that for EU States the educational indices did not exert considerable influence upon the growth rates. Nevertheless, the unemployment level is appreciably depended from the number of educated people aged 25-64 and the budgetary education expenses share. The Gini coefficient was estimated by the number of educated young people, average expenses in educational institutions per one person and received education and occupation correspondence. According to the Ukrainian data, the relation between the economic growth rates and unemployment level on the one hand and budgetary education expenses and the number of educated people on the other hand appeared inessential. The last thing testifies indirectly to the expenses inefficiency and the Ukrainian education organization defects.*
Keywords: *education externalities; education externalities indicators; educational sphere indices (characteristics); educational externalities assessment; macroeconomic indices.*
JEL Classification: *D62, I20, I21, O15, O57*

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АНАЛІЗ ЗОВНІШНІХ ЕФЕКТІВ ОСВІТИ КРАЇН ЄС: УРОКИ ДЛЯ УКРАЇНИ
Анотація. У статті зроблено спробу оцінити зовнішні ефекти освіти у країнах – членах Європейського Союзу і асоційованих із ЄС. На основі отриманих результатів автором сформульовано висновки відносно оцінки екстерналій освітньої сфери в Україні.
Ключові слова: екстерналії освіти, індикатори екстерналій освіти, показники (характеристики) освітньої сфери, оцінка освітніх екстерналій, макроекономічні показники.

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АНАЛИЗ ВНЕШНИХ ЭФФЕКТОВ ОБРАЗОВАНИЯ СТРАН ЕС: УРОКИ ДЛЯ УКРАИНЫ
Аннотация. В статье сделана попытка оценить внешние эффекты образования в странах – членах Европейского Союза и ассоциированных с ЕС. На основе полученных результатов автором сформулированы выводы относительно оценки экстерналий образовательной сферы в Украине.
Ключевые слова: экстерналии образования, индикаторы экстерналий образования, показатели (характеристики) образовательной сферы, оценка образовательных экстерналий, макроэкономические показатели.

Introduction. Despite the long-term research the analysis of educational externalities includes at least two problems which require further examination. First one consists in educational externalities indicators specification, i.e. indicators of economic and social life which education can influence and in fact influences. Second one consists in the substantiation and application of definite means of educational sphere influential indices semantic and statistical selection out of a great number of indices which actual education statistics operate.

Brief literature review. The estimation of educational sphere development results by economic growth rate changes is a method of analysis which has been widely applied since 1960s. The works of *R. Barro & J. W. Lee* (1994) [1], *E. Wolff* (1994) [2], *E. Denison* (1962) [3], *N. Gemmell* (1996) [4],

H. Jenkins (1995) [5], *P. Romer* (1989) [6], *D. Wheeler* (1980) [7] and others include such analysis.

The estimation of education externalities by employment (unemployment) rate changes correlates to a certain extent with the estimation by economic growth rate changes in regard to the existence of a direct relation between employment and graduation. But such estimation has definite peculiarities. These peculiarities occur due to the fact that employment (unemployment) rate can reflect not only educational sphere scale but also its structure and quality which becomes apparent in accordance with the employer demand for specialist preparation. The analysis of connection between employment level and education indices has been exercised in the works of *V. P. Antoniuk* (2007) [8], *P. Doerihger & M. Piore* (1971) [9], *O. A. Hrishnova* (2001) [10], *I. S. Kaleniuk* (2002) [11].

The education externalities identification by income distribution inequality indices, for instance, by Gini coefficient change, is considered to be less widespread analysis method. The influence of education upon Gini coefficient change has been studied by *Jose De Gregorio & Jong-Wha Lee* (1999) [12], *G. Becker & B. Chiswick* (1966) [13]. Such approach rests upon the society idea as regards preferences (benefits) being received from income distribution normal inequality (inequality which does not exceed dangerous limits).

Purpose. The aim of the research consists in hypothesis testing as concerns externalities manifestation in macroeconomic indices changes on the basis of EU States and EU Associated States data. The received results have been used for the Ukrainian data similar analysis.

Results. In course of educational sphere externalities analysis it is expected that society as a whole is considered to be the third party which irrefutably turns to advantages (exercises restraints) related to educational sphere development (lack of development).

We consider that the aggregate of three indices by economic growth rate, employment (unemployment) rate and income distribution inequality arrangements in society is the most applicable educational externalities indicator.

When defining the mentioned indices in the capacity of indicators we assume that under other equal conditions in economies with developed educational sphere the society enjoys positive results like relatively higher economic growth rate, lower unemployment rate and higher level of equality as regards income distribution among different social strata. Externalities assessment relativity implies different countries indices comparison. The externalities analysis made for separate groups of countries possessing common features or similar development characteristics offers comprehensive opportunities.

We consider comparative analysis to be the most acceptable for educational sphere influence assessment in Ukrainian economy. Being approved as a priority strategy of European integration of Ukraine on the national level [14; 15], it gives all reasons for the comparison of the Ukrainian indices with the EU Member-States indices.

The analysis of variables relations for a group of countries provides for panel research method application. In course of educational sphere externalities analysis it is important not only to determine indicators which will participate in the measurement of education development benefits which society enjoys, but also to choose the educational sphere indices which influence the defined indicators: economic growth rate change, unemployment rate, income distribution in society.

The international statistics uses hundreds (approximately 420) of educational sphere indices [16]. Just that very diversity of indices causes a problem regarding the most influential indices selection.

In our opinion, that it is possible to single out the following four groups of indices among the available data on educational sphere condition:

1) educational sphere scale;
2) organization and educational technologies;
3) education financing;
4) education level correspondence with the national economics requirements.

Below there is a list of the European statistics indices applied in course of calculation and their division into groups.

Groups of educational sphere indices

1. Educational sphere scale:
1.1. The number of educated people at the age of 25-34 *(E_1)*
1.2. The number of educated people at the age of 25-49 *(E_2)*
1.3. The number of educated people at the age of 25-64 *(E_3)*
1.4. The number of educated people at the age of 25-74 *(E_4)*
1.5. Share of education in GDP *(E_5)*

2. Organization and educational technologies:
2.1. The number of people receiving higher education in the total amount of all people receiving education *(E_6)*
2.2. The correlation of people with higher education with people with undergraduate education *(E_{13})*
2.3. The correlation of expenses allocated for public and private educational institutions *(E_{14})*
2.4. The number of pupils per one teacher *(E_8)*

3. Education financing:
3.1. Part of expenses allocated for education in the total sum of budgetary public expenses *(E_{10})*
3.2. Expenses per one student *(E_{11})*
3.3. Average expenses allocated for the education of people who study at educational institutions of all levels *(E_7)*

4. Education level correspondence with the national economics requirements:
4.1. Education and occupation incompatibility for people with higher education at the age of 25-34 *(E_9)*
4.2. Unemployment rate among people with higher education at the age of 20-34 *(E_{12})*

The applied approach allowed us to use the available statistics of separate countries to the limit without resorting to observations number reduction and to adjust the available information in accordance with the aim of educational sphere personal parameters (features, characteristics) consequence substantiation.

When constructing models 2007-2011 average indices of GDP rates and unemployment levels fluctuation influenced related to the crisis in 2008-2009 and 2010 Gini coefficient indices were used in the capacity of endogenous indices. All calculations include data of 31 EU Member-States and EU Associated States. Education exogenous indices describe its condition in 2010 for *(E_6, E_8)* and in 2011 for *(E_1, E_2, E_3, E_4)*.

At the initial stage of statistical selection of influential factors which describe educational sphere and influence economic growth rates *(Y),* unemployment level *(U)* and Gini coefficient *(J)* pair correlation matrix was constructed. The results of the first stage statistical selection have shown that all factors which we referred to the group which by our hypothesis reflects organization and educational technologies (regressors E_6, E_8, E_{13}, E_{14}) and one factor from the financing group (regressor E_{11}) proved to be the least influential factors.

The pair correlation matrix has shown an interesting result and namely the absence of more or less essential relation between GDP growth rates and all educational sphere indices. Such situation can relate to the peculiarities of labor market functioning and EU States employment formation in 2000s. The researches *D. Vassiliu* (2009) [17], *N. Didenko* (2010) [18], *A. Nikonenko* (2010) [19], *M. Hazans* (2011) [20] admit the essential influence of migration processes upon this market. As a result one may suggest that labor migration flows could influence economic growth rates more considerably than educational system of separate countries. Manpower had been taught and prepared for work in other countries that is why the internal state educational system influence upon the graduation changes could get weakened. From our point of view the mentioned fact cannot be considered a strong reason for the refusal from further analysis of relation existing between GDP changes rates on the one hand and educational sphere indices on the other hand for education externalities identification.

At the last stage of statistical analysis two groups of regression equations were built and namely the regression equations of:

1) unemployment level *(U)* dependence on the number of educated people at the age of 25-64 *(E_3),* state budget educa-

tion expenses (E_{10}) and unemployment level among people aged 20-25 (E_{12});

2) Gini coefficient (*J*) dependence on the number of educated people at the age of 25-34 (E_1), educational institutions average expenses per one studying person (E_7), and education and occupation incompatibility (E_9).

The best results by statistical criteria have been reached for the equations with two exogenous variables and namely:

– for the equation of U dependence on E_3 and E_{10}

$U = 16{,}86 - 0{,}14E_3 - 0{,}61E_{10}$ (1)

$R^2 = 0{,}43$; DW = 1,76; Prob.(E_3) = 0,059; Prob.(E_{10}) = 0,039.

– for the equation of *U* dependence on E_3 and E_{12}

$U = 7{,}26 - 0{,}16E_3 - 0{,}21E_{12}$ (2)

$R^2 = 0{,}48$; DW = 1,58; Prob.(E_3) = 0,016; Prob.(E_{12}) = 0,009.

– for the equation of J dependence on E_1 and E_9

$J = 29{,}36 - 0{,}14E_1 + 0{,}23E_9$ (3)

$R^2 = 0{,}37$; DW = 1,67; Prob.(E_1) = 0,021; Prob.(E_9) = 0,024.

– for the equation of J dependence on E_7 and E_9

$J = 31{,}37 - 0{,}0008E_7 + 0{,}28E_9$ (4)

$R^2 = 0{,}46$; DW = 1,82; Prob.(E_7) = 0,002; Prob.(E_9) = 0,002.

The main semantic results of the analysis of the study groups of countries which emerge from the equations are as follows:

1. The overall unemployment rate is inversely related with the number of educated people at the age of 25-64, with state budget education expenses and with unemployment level among young people aged 20-34. It has been statistically proven that due to the increase of the number of educated people aged 25-64 and the state budget education expenses increase the unemployment rate decreases. Meanwhile the influence of state budget education expenses increase in coefficients by E_3 and E_{10} regressors is more considerable.

2. Gini coefficient is inversely related with the number of educated people aged 25-34, with educational institutions average expenses and is directly related with education and occupation incompatibility index. It has been statistically proven that income distribution inequality decreases when people get educated at a young age (E_1) and grows when incompatibility between received education and employment place grows (E_9).

It is significant that the conclusion which emerges from the received regression equations fully conforms to economic processes interconnection logic. It is evident that lifelong learning from 25 to 64 (variable E_3) creates prerequisites for better adaptation to labor market demand. And the increase of education budget expenses (variable E_{10}) can contribute to population effective employment. The same logic can be traced as concerns statistically proven connection between income distribution inequality reduction when bigger amount of young people get educated (variable E_1), what creates more equal starting conditions for the youth. At the same time education and occupation incompatibility (variable E_9) levels the possibility of the acquisition of income which conforms to the level of education and that is why can increase distribution inequality.

We use the determined for EU States dependences between variables (macroeconomic indices) which can discover educational externalities, on the one hand, and educational sphere indices, on the other hand, for education externalities assessment in Ukraine.

In the capacity of endogenous indices we examine GDP changes rate (*Y*) and unemployment rate (*U*). The choice of these two indices and Gini coefficient exclusion can be explained by two reasons. The first reason is connected with the peculiarities of the Ukrainian economy which has one of the biggest in Europe shadow sectors. Almost 50% of economy is in the shadow and therefore the acquisition of the same part of incomes in shadow sector depreciates Gini coefficient as an index able to reflect spillovers. Gini coefficient has been calculated on the basis of real incomes and does not reflect actual redistribution and cannot act as equality (inequality) indicator. The second reason consists in the fact that insufficiently long dynamic sequences of annual data for the Ukrainian economy imply settlements by quarterly data which are not present by Gini coefficient.

In the capacity of exogenous indices two educational sphere indices were analyzed: the share of education expenses in the consolidated Ukrainian budget (*O*) and the share of educated Ukrainians in the general population of the country (*E*). The selection of these very educational sphere indices can be explained by the fact that, firstly, they are similar to those which appeared influential for EU States. Secondly, there is a sufficient array of information on these indices.

Pair correlations matrix (calculations have been made on the basis of the Ukrainian statistics [21; 22]) has showed insufficiently high but appreciable relations between the rates of GDP changes (*Y*), on the one hand, and education expenses and the number of educated Ukrainians on the other hand. However, the statistics verified an unnatural relation considering the theory of educational externalities and namely when the budget education expenses rose, the economic growth rates abated. It can be considered as an evidence of the inefficiency of the application of budgetary funds allocated for education.

According to the pair correlations matrix data the part of expenses allocated for education in the budget influenced unemployment level (*U*) meanwhile the level of education of Ukrainians exerted no influence upon the unemployment rate. The influence of budget education expenses share upon the unemployment level appeared to be unnatural: the increase of education expenses share is related to the unemployment rate growth.

The detailed analysis of relations in course of regression equations definition and their verification by means of statistical criteria suggest the following conclusions:

– the influence of budgetary education expenses and the number of educated Ukrainians upon the economic growth rate appeared to be very weak (R^2 on the level of 0,17 and 0,14, respectively) under low influence assumptions inaccuracy probability indices and under autocorrelation;

– the influence of budgetary education expenses upon the unemployment level appeared to be also very weak (R^2 on the level 0,03) under low influence assumptions inaccuracy probability indices and under autocorrelation.

Certain model improvement has been achieved under regression equation definition for *Y* simultaneously with two educational sphere indices (*O* and *E*) and four quarters lag application as concerns education expenses index. It means that the change of education expenses share influenced the economic growth with a delay for one year. The calculations results are reflected by the equation (5).

$Y = -145{,}8255165 + 3{,}169802566 \times O(-4) + 4{,}9469596 \times E$ (5)

$R^2 = 0{,}32$; DW = 0,48; Prob.($O(-4)$) = 0,008; Prob.(E) = 0,0003.

Model improvement has been achieved under unemployment level explanation as well simultaneously by two educational indices and namely budgetary education expenses share and the number of educated Ukrainians. Both exogenous indices appeared to be in direct relation with the unemployment level. The calculations results are reflected by the equation (6).

$U = -16{,}33236798 + 0{,}6753162363 \times O + 0{,}6339894211 \times E$ (6)

$R^2 = 0{,}35$; DW = 1,13; Prob.(O) = 0,00; Prob.(E) = 0,001.

Conclusions. Summarizing the stated above it is possible to draw the following conclusions:

1. By hypothesis verification results on dependence existence between three education externalities indicators and educational sphere indices assisted by EU States statistics the following results have been achieved:

- educational indices did not exert considerable influence upon economic growth rate changes but some of them exerted appreciable influence upon unemployment rate indices and income distribution inequality;

- such educational sphere indices as the number of educated people in course of the most active life (at the age of 25-64) and the share of state budget education expenses exerted the most significant influence upon unemployment level change;
- the number of educated young people (aged 25-34) and education and occupation conformity exerted the most substantial influence upon Gini coefficient.

2. The verification of influence of influential for EU States educational indices upon the economic growth rates and unemployment level according to the Ukrainian data offers grounds to draw the following conclusions:

- in the Ukrainian economy the educational indices exert much weaker than in EU States influence upon the indices which can be regarded as educational externalities indicators – GDP changes rates and unemployment level;
- the educational indices influence upon the GDP changes rates and unemployment level in models with more satisfactory statistical criteria appeared unnatural and testified to growth limitation and unemployment level rise under budgetary education expenses share increase.

3. The ascertained for the Ukrainian economy regularities can serve as an occasion for conclusions as regards positive external education effects shortage and the necessity of educational sphere management system change aimed at budgetary funds effective allocation provision directed at educational sphere organization and structure formation and improvement.

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