

## THE INFLUENCE OF PUBLIC EXPENDITURES ON EDUCATION ON ITS QUALITY - THE CASE OF POLAND

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### **Abstract:**

The improvement of the quality of education is an important element for the functioning of each country. There are many controversies concerning whether the government should interfere with the education system or not, and if should, then to which level. The funding of the education is one of the major areas that the government has the possibility to influence through its decisions. Private education is on a different level of the development in different countries. However, in most countries the public education dominates over its equivalent from the private sector. Poland has to follow the recommendations set out in the 'Strategic framework for European cooperation in education and training - Education and Training 2020', the basis for EU-wide cooperation in education, where have been established long-term strategic objectives and benchmarks for the Member Countries to 2020. The purpose of the article is the analysis of the correlation of the changes of the amount of public expenditures and the results achieved by students up to the age of 16. The results of the Programme of International Student Assessment were taken into consideration, which examine students' skills in three areas: reading literacy, mathematical literacy, and scientific literacy, and the results of examination at the end of lower secondary school education. Conclusions concern the relationship between the amount of public expenditures on education at NUTS5 and its influence on the results achieved by those students. Moreover, the author suggests the applications, which may result in the improvement of the quality of polish education.

*Keywords: knowledge based society, education, public expenditures, international comparison*

## 1. INTRODUCTION

Education and learning outcomes are associated with the concept of human capital. Education increases qualifications and abilities of individuals, which allow them to achieve higher income. Investment in human capital can be treated equally as capital investments. Increase in the size of the investment is related to the increase in productivity of an individual. It is often believed that the government should play a significant role in both financing and providing educational systems.

Education is not a pure public good. The marginal cost of educating another person is significantly higher than zero. Externalities, such as the improvement of functioning of the State, the easier assimilation of new groups of immigrants in multicultural countries or technological progress, are proven to be an explanation for public education. (Stiglitz, 2010, pp. 513 – 517)

One of the most important reasons for financing educational services by government is striving for the equal opportunities to access to education. This is due to inequalities in the society - not all parents are able to provide education for their children at the appropriate level. It is believed that wealth should not affect the access to education at a higher level. Everyone should be given equal access to it, which justifies financing this area by the government. (Stiglitz, 2010, pp. 518 – 531)

The purpose of the article is the analysis of an impact of the amount of public expenditures on education at NUTS5 and its influence on the quality of education. The analysis performed in the article shows if the results achieved by students at the end of lower secondary school education exams, and results of the Programme of International Student Assessment are correlated to the public expenditures on education.

## 2. EUROPEAN STANDARDS FOR IMPROVING THE QUALITY OF EDUCATION

### 2.1. Education and training 2020

Each country in European Union forms its educational strategy alone. European Union supports them in this task by identifying common goals and popularise good practices. One of the documents establishing the objectives in the field of education, which Member Countries are recommended to subordinate to, is 'Strategic framework for European cooperation in education and training - Education and Training 2020', adopted by the European Union's Education, Youth, Culture and Sport Council in May 2009. The document identifies the main aims and challenges in the field of education and training, which form the cooperation of European countries up to 2020. The strategic objectives are as follows (Education and Training 2020):

- making a long life learning and mobility a reality,
- improving the quality and efficiency of education and training,
- promoting equity, social cohesion and active citizenship,
- enhancing creativity and innovation, including entrepreneurship, at all levels of education and training.

Within the implementation of the above-mentioned objectives the Member Countries commit to implement five European benchmarks: adults participating in lifelong learning, 15-year olds with insufficient abilities of reading, mathematics and science, early leavers from education, children between the age of four and the age of the beginning compulsory primary education participating in early childhood education, and tertiary education attainment. Up to 2020 the Member Countries should meet the following conditions:

- an average of at least 15% of adults should participate in lifelong learning,
- the share of 15-year olds with insufficient abilities in reading, mathematics and science should be less than 15%,
- the share of 30-34 year olds with tertiary educational attainment should be at least 40%,
- the share of early leavers from education and training should be less than 10%,
- at least 95% of children between the age of four and the age for starting compulsory primary education should participate in early childhood education.

Cooperation framework determines also the work within the Open Method of Cooperation, which involves setting up medium-term priorities which will be based on four strategic objectives for the

period of three years. Established priorities are the basis for the cooperation in the area of peer learning and the exchange of good practice, including the dissemination of outcomes. At the end of each three-year cycle the Member Countries are obliged to prepare a progress report. The European Commission combines the national reports in a joint report. (Education and Training 2020)

According to the European Commission's report, European countries managed to achieve the following results so far (Education and Training Monitor 2014, p. 2):

- adults participating in lifelong learning – 10,5%,
- 15-year olds with insufficient abilities of reading, mathematics and science – 19,8%,
- early leavers from education – 19,8%,
- the share of 30-34 year olds with tertiary educational attainment – 36,9%,
- children between the age of four and the age for starting compulsory primary education participating in early childhood education – 93,9%.

## **2.2. Evaluation of schools, teachers and local authorities**

A systematic process of teachers', schools', and local authorities' work critical analysis, which leads to forming opinion on education standards and/or giving recommendations that are intended to improve the quality of education, is an important part of the assessment of the quality of education. In most of European countries there is a process of school evaluations that can be either internal or external. In many cases there is also a possibility to evaluate individual teachers. (Kluczowe Dane o Edukacji, p. 39)

Schools' evaluation focuses on activities carried out by school's employees without assigning responsibility to individual workers of the institution. It is an attempt to monitor or improve the schools' and students' achievements and outcomes. Its findings are published in the general report which does not contain the evaluation of individual teachers. The evaluation of individual teachers involves formulating opinions on their work and providing feedback in oral or written form to guide teachers and improve the quality of teaching. This assessment can be carried out during the evaluation of the school or independent. The evaluation of local authorities is performed for administration of schools located in the area under their jurisdiction. (Key Data on Education in Europe 2012, p. 41)

Most of the schools in European countries are externally evaluated, which is carried out by education inspectorate, while internal evaluation is carried out by school's employees and sometimes by other members of school community. The internal evaluation is obligatory or strongly recommended in all countries except Belgium and Ireland. In Italy and Croatia only the internal evaluation is carried out. (Key Data on Education in Europe 2012, p. 39)

In case of Poland, as in Estonia, France, Austria, and Romania, institutions responsible for the external evaluation depend on regional or district education authorities. Schools are also assessed by appropriate local authorities and 'suppliers of educational services'.

European countries aim to standardize the criteria used in the external schools' evaluation at the central level. The criteria of the assessment have two components: the parameter (measurable aspect of assessed areas) and the required standard (benchmark, norm, regulation or standard of proficiency), for which the parameter is evaluated. These elements are basis for quantitative and qualitative analysis. Standardized criteria used to evaluate various aspects of schools' work may vary in form and autonomy, which is left for external institutions to make judgements while evaluating. Moreover, using the standardized criteria does not assume that every school is always assessed in the same frameworks. Standardized criteria can be used, for example, in the first stage of evaluation. In case of schools identified as endangered, there can be the second stage of evaluation, specifically adapted to the situation of this particular institution. Evaluators in Poland have to subordinate standardized criteria from 2009. (Key Data on Education in Europe 2012, p. 41)

Another important aspect of taking care of education is national education monitoring systems. It is the process of gathering and analysing information which aim is to verify the efficiency of education system in relation to set goals and standards, and make the necessary changes. The scope of information which is taken into consideration can cover outcomes of schools' self-evaluation, results of the external exams or other nationwide forms of assessment, especially prepared indexes concerning achievements or results of external evaluation (PIRLS, TIMSS, PISA etc.). The main tools for

monitoring the development of education system in most European countries are results achieved by students in nationwide exams and outcomes of external schools' evaluation. (Key Data on Education in Europe 2012, p.39)

### **3. EXTERNAL EVALUATION OF EDUCATION**

#### **3.1. The programme of international student assessment**

The Programme of International Student Assessment (PISA) firstly appeared in 1997. It examines the abilities and knowledge important from the perspective of challenges that fifteen-year olds will face in adult life. The PISA research tools are focused on examining the abilities of practical thinking and the use of the knowledge and abilities from various areas. This assumption is accompanied by a reference to the idea of "lifelong learning" – motivations and attitudes incentive to self-reliance in acquiring further knowledge. Therefore, the content of tasks is rooted as much as possible in everyday situations, and it is not associated with any education programme.

The PISA examines students' skills in basic three areas of knowledge: reading literacy, mathematical literacy and scientific literacy. It is performed regularly every three years starting since 2000. The quantity of students taking part in the examination is systematically growing from 265 thousand from 32 countries in 2000 to 510 thousand from 65 countries in 2012.

Every country involved in organisation of the PISA has a possibility to formulate aims and the methodology of the study. It is coordinated by eight-member team in OECD office. Priorities of the study are set by the Governing Board which consists of one representative from each country. The methodology of the study is also formulated by appointed by the OECD groups of experts. The study is organised and supervised by international consortium which is responsible to the OECD for the whole research process. National research managers are responsible for the national implementation of the study.

#### **3.2. The progress in international reading literacy study and the trends in international mathematics and science study**

The Progress in International Reading Literacy Study (PIRLS) and the Trends in International Mathematics and Science Study (TIMSS) are studies concerning students at the age of ten carried out by Association for the Evaluation of Educational Achievement (IEA).

The PIRLS examines reading and writing abilities at the first stage of school education. Since 2001 the study takes place every five years. The purpose for creating the study was a desire to create an innovative measure, enabling international comparison of reading skills. On the other hand the TIMSS examines competencies in the area of mathematics and science. It takes place every four years since 1995. Poland took part in it for the first time in 2011. Continued participation in the study aims to assess the change in students skills.

IEA, for over 50 years, thanks to the commitment of outstanding experts and leading research centers, formed its position as a recognized organizer and coordinator of international comparative educational researches. The Association unites about 70 countries from all over the world, most of them are developed ones. Researches carried out by the IEA are an important benchmark for planning and implementing an educational reforms. The results of the IEA studies are presented in a form complex, multifaceted information, which consists of:

- average results, distribution of results, results in chosen types of tasks,
- trends (measuring tools provide the ability to make reliable comparisons of the results from subsequent editions),
- contextual information: school working conditions, preparation and attitude of teachers, students' household (environmental) conditions.

#### **3.3. The global index of cognitive skills and educational attainment**

The Global Index of Cognitive Skills and Educational Attainment was published for the first time in 2012 by Pearson publishing and actualized in January 2014 (it was elaborated with the usage of the same methodology and includes the same countries as first edition). The Index examines performance

of 39 countries in two categories: Cognitive Skills (based on the results achieved in international studies PISA, TIMSS, and PIRLS) and Educational Attainment (literacy and graduation rates). The overall index is the weighted sum of these two category scores.

## 4. THE ANALYSIS OF THE CORRELATION BETWEEN THE PUBLIC EXPENDITURES ON EDUCATION AND RESULTS OF THE EXAMS

### 4.1. The methodology of the analysis

The purpose of the analysis is to verify if there is a relation between the amount of expenditures on education and the quality of education measured by results achieved by students at the age of 16 at examinations. Financing education to the level of lower secondary school is the responsibility of NUTS5. The analysis takes into consideration NUTS5 expenditures on education (presented in the paper as a division for particular voivodships' expenditures), and the results of examination at the end of lower secondary school education from years 2006 - 2013. Moreover, the results of PISA from years 2006, 2009, and 2012 were analysed to give a clearer overall view.

The analysis was carried out using Pearson's correlation coefficient. In the analysis of correlation, the dependent and independent variable are treated equally. The correlation between variables is a measure of linearity and relation between them. It presents how both of variables change in linear at the same time. The correlation between random variables  $X$  and  $Y$  is the measure of strength (degree) of linear relationship between these variables. The degree of the correlation is measured by the correlation coefficient. The correlation coefficient ( $\rho$ ) assumes the value between the range of  $(-1, 1)$ . The possible values of the coefficient are interpreted in the following way (Aczel, 2006, pp. 479-480):

- if  $\rho = 0$ , there is no correlation, which means that there is no linear relationship between random variables,
- if  $\rho = 1$ , there is a close positive relationship between two variables; it means, that when one of the variables adopts a larger value, the other adopts a larger value too, and when the value of one variable decreases, the value of the second one also decreases,
- if  $\rho = -1$ , there is a close negative relationship between two variables; it means, that when one of the variables adopts a larger value, the other adopts a smaller value, and when the value of one variable decreases, the value of the second one increases,
- if the absolute value of  $\rho$  is in the range  $(0, 1)$ , it measures the strength of the linear relationship between variables.

Assuming that both variables  $X$  and  $Y$  are normally distributed with means  $\mu_x$  and  $\mu_y$  and standard deviations  $\sigma_x$  and  $\sigma_y$  the covariance forms as follows:

$$\text{cov}(X, Y) = E(X - \mu_x)(Y - \mu_y)$$

The covariance is the expected value of the product of variables  $X$  and  $Y$  values from their means. The covariance takes a positive value when both variables 'move in the same direction', and a negative value when variables 'move in the opposite directions'. The covariance takes a zero value when there is no linear relationship between variables. The covariance can not be interpreted as the indicator of the linear relationship, as its value depends from the value of standard deviations of the variables  $X$  and  $Y$ . But when the covariance is divided by standard deviations of both variables, the correlation coefficient is created and it forms as follows (Aczel, 2006, pp. 481-482):

$$\rho = \frac{\text{cov}(X, Y)}{\sigma_x \sigma_y}$$

Like other values of the population are not known, the  $\rho$  is not known and it needs to be based on the knowledge of random attempt of observations of two variables  $X$  and  $Y$ . It turns out that the assessment of the covariance from the attempt is the quotient  $\frac{SS_{XY}}{(n-1)}$ . Assessments for standard

deviations  $\sigma_x$  and  $\sigma_y$  are accordingly  $\sqrt{\frac{SS_X}{(n-1)}}$ , and  $\sqrt{\frac{SS_Y}{(n-1)}}$ . The correlation coefficient from the attempt, called Pearson's correlation coefficient is formulated as follows:

$$r = \frac{SS_{XY}}{\sqrt{SS_X SS_Y}} = \frac{\sum_{i=1}^n (X - \mu_x)(Y - \mu_y)}{\sqrt{\sum_{i=1}^n (X - \mu_x)^2} \sqrt{\sum_{i=1}^n (Y - \mu_y)^2}}$$

## 4.2. The analysis

Table one presents the dynamics of NUTS5 expenditures on education in the division for particular voivodships' expenditures in years 2007 – 2013. The amount of expenditures is mainly dependent on the number of students in schools. From year to year public expenditures on education systematically increase. In 2013 they were over 50% higher than in 2006.

**Table 1:** The growth rate of the NUTS5 expenditures on education (according particular voivodships' expenditures)

VOIVODESHIP	2007	2008	2009	2010	2011	2012	2013
Polska	106,63%	111,16%	107,93%	107,09%	104,87%	105,37%	101,75%
Lodzkie	107,68%	111,63%	108,39%	108,88%	104,05%	105,74%	101,17%
Mazowieckie	107,03%	113,27%	107,55%	104,79%	104,51%	106,65%	102,26%
Malopolskie	108,21%	109,87%	108,09%	108,25%	106,00%	103,54%	101,57%
Slaskie	105,12%	109,83%	109,11%	107,32%	105,57%	105,75%	100,57%
Lubelskie	109,20%	107,90%	108,62%	107,56%	106,55%	104,36%	101,24%
Podkarpackie	105,62%	110,79%	108,06%	109,83%	103,57%	103,47%	101,03%
Podlaskie	106,34%	112,08%	106,07%	107,71%	107,23%	106,51%	99,88%
Swietokrzyskie	103,41%	109,95%	110,47%	109,97%	101,39%	102,87%	99,92%
Lubuskie	104,72%	114,08%	107,92%	107,59%	100,59%	104,95%	103,42%
Wielkopolskie	105,26%	109,96%	108,45%	106,95%	106,23%	106,02%	102,31%
Zachodniopomorskie	105,91%	112,22%	108,14%	106,87%	103,51%	103,89%	102,08%
Dolnoslaskie	107,93%	114,58%	106,67%	103,73%	104,93%	107,15%	103,26%
Opolskie	105,03%	109,44%	106,77%	105,73%	105,39%	103,46%	101,13%
Kujawsko-Pomorskie	107,10%	108,56%	108,61%	105,50%	105,78%	105,40%	102,37%
Pomorskie	107,67%	113,33%	105,87%	110,35%	104,08%	107,12%	103,28%
Warminsko-Mazurskie	107,17%	110,28%	107,03%	106,91%	103,88%	104,00%	101,17%

Source: Own calculations based on data derived from public statistics..

When the improvement of the quality of education is considered, it is important how the number of students changes in particular years. Very useful measure is the net enrolment rate, which is the relation of students enrolled in a particular level of education to the total of population of the official age for this level of education. The net enrolment rate for the primary schools and lower secondary schools is presented in table 2. The table shows that each year the share of students attending primary schools and lower secondary schools is insignificantly decreasing.

**Table 2:** The net enrolment rate for the primary schools and lower secondary school

VOIVODESHIP	2006	2007	2008	2009	2010	2011	2012	2013
Polska	96,33%	95,75%	95,32%	95,07%	94,09%	93,70%	93,24%	92,79%
Lodzkie	97,25%	96,66%	96,47%	96,07%	95,52%	95,30%	95,00%	94,66%
Mazowieckie	97,38%	97,28%	96,97%	97,33%	97,46%	97,26%	97,18%	96,96%
Malopolskie	96,73%	96,04%	96,26%	96,11%	95,40%	95,12%	94,76%	94,42%
Slaskie	95,88%	95,32%	94,70%	94,40%	94,39%	94,09%	93,72%	93,49%
Lubelskie	97,47%	97,20%	96,86%	96,66%	95,03%	94,74%	94,26%	93,84%
Podkarpackie	96,03%	95,84%	94,82%	95,50%	93,82%	93,40%	93,02%	92,62%
Podlaskie	95,21%	94,58%	94,33%	93,97%	92,45%	92,05%	91,43%	91,08%
Swietokrzyskie	97,65%	97,35%	97,18%	96,74%	94,98%	94,57%	94,24%	93,67%
Lubuskie	96,01%	95,40%	94,93%	94,25%	93,19%	92,79%	92,12%	91,51%
Wielkopolskie	97,97%	97,56%	97,37%	97,15%	96,36%	96,09%	95,83%	95,52%
Zachodniopomorskie	95,93%	94,81%	94,11%	93,25%	91,58%	90,90%	90,05%	89,19%
Dolnoslaskie	95,93%	94,64%	94,02%	94,39%	93,20%	92,60%	92,20%	91,71%
Opolskie	92,19%	91,63%	91,01%	90,88%	92,22%	91,65%	91,14%	90,90%
Kujawsko-Pomorskie	97,00%	96,02%	95,71%	95,04%	93,66%	93,38%	92,76%	92,12%
Pomorskie	96,76%	96,15%	95,74%	95,33%	94,08%	93,62%	93,31%	92,74%
Warminsko-Mazurskie	95,95%	95,47%	94,65%	94,11%	92,21%	91,65%	90,83%	90,30%

Source: Own calculations based on data derived from public statistics.

At the end of an education in lower secondary school, students write an exam, which consists of two parts: Reading Literacy, and Mathematics and Science. Table 3. Presents the correlation between the expenditures on education and the results achieved by students in particular parts.

**Table 3:** The correlation between the expenditures on education and results achieved by students at the exam

VOIVODESHIP	Reading Literacy	Mathematics and Science
Polska	-0,69	-0,23
Lodzkie	-0,70	-0,31
Mazowieckie	-0,65	-0,23
Malopolskie	-0,73	-0,14
Slaskie	-0,69	-0,31
Lubelskie	-0,75	-0,21
Podkarpackie	-0,66	-0,02
Podlaskie	-0,79	-0,20
Swietokrzyskie	-0,63	-0,39
Lubuskie	-0,59	0,02
Wielkopolskie	-0,78	-0,23
Zachodniopomorskie	-0,72	-0,32
Dolnoslaskie	-0,58	-0,23
Opolskie	-0,62	-0,28
Kujawsko-Pomorskie	-0,63	-0,32
Pomorskie	-0,65	-0,41
Warminsko-Mazurskie	-0,70	-0,12

Source: Own calculations based on data derived from public statistics.

The table shows, that the relation between the NUTS5 expenditures on education and the results achieved by students at the exam at the end of lower secondary school education is negative. It means that with the increase of expenditures, the results achieved by students are decreasing. In case

of Reading Literacy the relation between the expenditures and the results is moderate, whereas in Mathematics and Science is weak. It follows that the results achieved by students at the end of lower secondary education are not strictly dependent from the amount of expenditures on education. The correlation coefficient in particular voivodships differ from each other, but they show the same trend.

The analysis was also based on the analysis of the Programme of International Student Assessment. The choice of the study is based on the age of students taking part – students from the last class of the lower secondary school. It means that the study is conducted at the same level of education as the exam at the end of the lower secondary education. The results of the test, in comparison to OECD average is presented in table 4.

**Table 4:** Results of the Programme of International Student Assessment

AREA	2006		2009		2012	
	Poland	OECD average	Poland	OECD average	Poland	OECD average
Mathematical Literacy	495	493	508	496	518	494
Reading Literacy	508	492	500	493	518	496
Science Literacy	498	500	495	501	526	501

Source: Own elaboration based on data derived from public statistics..

The Programme of International Student Assessment is conducted systematically every three years. Polish students, in each subsequent edition, achieved better results. The dynamics of the results achieved by them is much higher than the dynamics of OECD average. It means that polish students made a bigger progress than students that took part in the study in average.

The correlation between the particular parts of the study and the NUTS5 expenditures on education is presented in table 5.

**Table 5:** Correlation between expenditures on education and the PISA's results

AREA	R
Reading literacy	0,5121
Mathematical literacy	0,9997
Scientific literacy	0,7891

Source: Own calculations based on data derived from public statistics..

In case of the PISA the correlation between expenditures on education and the results achieved by students is positive. It means that with the increase of expenditures on education, results of the study improved. In case of Reading Literacy the correlation is moderate, which means that the amount of expenditure does not have a big impact on the improvement of students' results. In case of other parts there is a strong correlation between the increase of expenditures and students' results.

## 5. CONCLUSIONS

The analysis in the article presents the impact of the amount of expenditures on the results achieved by students from the lower secondary school on the exam at the end of this level of education, and at the Programme of International Student Association. The Correlation coefficient received for each of exams is significantly different. For the end of lower secondary education exams the correlation is negative, whereas for the PISA the value is positive. It means that the relation between the expenditures on education and results of exams cannot be clearly defined.

It should be remembered that the quality of education consists of many factors and the results of the exams is only one of its many measurable reflections. Not all of the components submitted to the quality of education can be expressed in a quantitative form. There are more and more studies and indicators, which strive for unification and normalisation of studies on the quality of education internationally. They measure the changes in the quality of education in a complex way in particular countries, and create rankings of countries based on it.



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