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The Effect of Funding on the Results of the Pre-University Education System

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Abstract: In the context of the new paradigms of the knowledge-based economy, education and the quality of the educational system is becoming one of the strongest factors of influence. Decisions regarding the financing of education have a particular impact on the level of expenditure in the pre-university system and on the organization of the system of study courses. Furthermore, they are closely linked to the economics and accounting of pre-university education institutions. The existence or lack of material resources can greatly influence the teaching activity process and implicitly the results achieved by the system. This paper aims to examine the consequences of certain decisions regarding funding in education, student achievement in pre-university education using data on government spending in the world relative to a single student, the level of salaries in secondary education and the number of students per teacher and the student's test scores. The authors chose the quantitative research methodology using the multiple linear regression model with dependent and independent variables to test the extent to which certain parameters of the funding process can influence the results achieved by students in standardized tests. The research results show that decisions regarding the financing of education in terms of salaries and the level of funding based on the standard cost per student have a direct impact on the achievements of the students and also, on the scores achieved by students.

Keywords: *financing education; teachers' salaries; PISA tests; student-teacher ratio.*

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Introduction

Traditionally, the pre-university education system is part of the public system, which provides social services and in most cases is controlled and owned by the state (Broadbent & Guthrie, 1992). In this context, the educational policy pursued by the owner in terms of funding has a great influence on the organization of the public education system, determining the levels of education, the organization of training and last but not least the level of education expenditures in the revenue budget and costs. The financing of public institutions is carried out through specific instruments, stipulated by law, coming from governmental or local sources, in particular through the budget of revenues and expenditures. Educational policies always aim to increase the quality of services and ensure equal opportunities for each individual in accessing any type and level of education. "Equal educational opportunities exist when the community provides the same resources, the same facilities for all children." (Coleman, 1969). "Policies aimed at improving the quality of teachers should take into account the provision of adequate salaries for teachers and a recognized status in schools and society ..." (Égert, Botev, & Turner, 2020). Ensuring a climate that supports the educational process cannot be achieved without adequate material resources, resources that are found in the budget of revenues and expenditures of educational institutions.(OECD, 2014). The revenue and expenditure budget has different roles in the contemporary economy, namely: allocative, managerial and external responsibility role. (Schick, 2003). Thus, the budget indicates the level of financing, the types and limits of expenditures as well as an informational picture on the activity of the public institution. Budget expenditures can be broken down by budget roles or organizations.(Anessi-Pessina, Barbera, Sicilia, & Steccolini, 2016). Lately, the pressure of international crises, a balanced budget and the reduction of public debt has led to reduced spending across the public sector.(Anessi-Pessina et al., 2016). At the same time, in the context of new visions on management, the so-called New Public Management, promoted the principles of market economies in which the importance of the result obtained comes first along with quantifying performance, value for money and accountability of the management of services.(Bracci, Humphrey, Moll, & Steccolini, 2015). Some researchers say that despite the new functions and roles assigned to the budget document to measure results, there is rarely ever a close and strong link between resource allocation and performance.(Kelly, 2003). In the budgeting process of recent years, we have moved from the

incremental method, based on the history of expenditures to the one based on needs. The best method of financing must cover expenditure and meet the needs of efficiency, effectiveness and accountability.(Agyemang, 2010) The needs-based method aimed to meet all these requirements and provide predictability and simplicity so that it could be easily used.(Agyemang, 2010). Funding and, implicitly, the costs of the education system differ from country to country but in most systems, the costs of human capital have been and continue to be the largest share of these costs.(Edwards, 1989). This research aims to analyse the effect of funding factors on students' test scores, looking for a correlation based on indicators such as education funding as a percentage of GDP per capita, pre-university wage costs and the number of students per teacher, and PISA standardized tests.

Numerous authors believe that investing in the education system does not have a direct effect on the results of the students. (Hanushek, 1997; Hong & Zimmer, 2016; Martorell, Stange, & McFarlin, 2016). Others believe that these components of educational policies such as funding the system, the income of educational staff or the composition of study groups can influence the academic performance of students. (Holmlund, McNally and Viarengo, 2010; Akiba et al., 2012; Hyman, 2017; Belmonte et al., 2020). In this paper, the authors aimed to test whether or not some components of educational funding affect the results of students in pre-university education. For this purpose, hypothesis 0 was formulated:

H0: Decisions regarding the financing of the pre-university education system have no impact on students' test performance.

The alternative hypothesis formulated is:

H1: Decisions regarding the financing of the pre-university education system have a direct impact on students' test performance.

Literature review

Funding in education is a very broad research topic with different results. Chang researched in 1980 to estimate an education cost index by looking for a relationship between teachers' labour market and education spending in Virginia (USA) and found that federal and state funds affect schools to increase teachers' salaries.(Chang, 1980). Childs and Shakeshaft looking for a correlation between the costs of education and students' performance in 1986 concluded that this correlation is insignificant with a determination ratio between 3% -15%.(Childs & Shakeshaft, 1986). Efficiency in the public sector was investigated by Whittington (1994) where he raised the issue of finding comparable and measurable indicators to

measure inputs and outputs from the system. In his opinion, the system becomes efficient if the marginal value of the outputs is higher than the marginal value of the inputs.(Whittington, 1994). Figlio, in 1997, sought a correlation between the level of teachers' salaries and their level of qualification in the labour market in this sector of activity, concluding that this correlation is strong and significant, inducing an increase in the quality of services provided.(Figlio, 1997). Tooley and Guthrie in their research from 2007 say that increased responsibility for spending resources is induced by increasing funding.(Tooley & Guthrie, 2007). Lin, researching 500 schools in the US in 2010, said that student performance, measured by test scores and enrolment at different levels, is a function that depends on teachers' salaries, teacher quality, community quality, poverty, quality public education, ethnicity and urbanization. He found a strong correlation between student outcomes and teacher pay and the quality of services provided.(Lin, 2010). In these conditions, if the level of teachers' salaries has a great influence on the students' performance, the question arises as to why there are big differences between salaries in different countries? Research "provided substantial evidence in favour of two proposals: teacher quality is an important determinant of student achievement; and the teacher's aptitude has declined substantially in the last generation."(Leigh, 2012) A research carried out by the European Commission on the 2016/2017 school year found that the starting salaries of novice teachers were lower than the salaries indexed to the inflation rate in 2009/2010 immediately after the economic crisis.(European Comision, 2018). According to the 2000 USA census data, teachers' salaries were lower than those of other categories with a similar level of education.(Taylor, 2008). However, neither the salaries nor other expenses in the system can be increased indefinitely because even if the average cost per student in the US doubled between 1970-2000, (Eger & McDonald, 2012) performance did not increase to the same extent, so the expenses are not justified. Hoxby and Leigh (2004) sought the answer to the question of why there was a decline in the quality provided by teachers and found that wage differences are to blame in a 25-80% percentage for this decrease with other factors contributing to a measure of 9% -10%.(Hoxby & Leigh, 2004). In the United States, this decline occurred, although since the 1960s, funding for the education system increased by 6% every decade, growing faster than GDP.(Wilson, Lambright, & Smeeding, 2004). In the opinion of Hanushek and Rivkin (2007), the quality of service delivery by teachers can be influenced more effectively by "reducing barriers to becoming a teacher, such as certification, and more closely connecting compensation and career advancement ..."(Hanushek & Rivkin, 2007).

"Empirical literature research shows that school resources tend to be positively associated with educational gains and achievements, but that the relationship is not always robust to the specific characteristics of the data set or empirical specifications."(Card & Krueger, 1996) Outputs from the education system are difficult to measure if we want to analyse them at their full value because the test results do not reflect the value of the individual and success in life. When measuring them, the time factor is a great difficulty because we have to wait for the end of the years of study and know the relevant data on labour market success.(Card & Krueger, 1996). Variables such as family situation or psycho-social traits can have a great influence in obtaining results, factors that are not easy to measure.(Card & Krueger, 1996). Hanushek (1997), studying 400 researches in this topic divided the input variables into three broad categories. In the first category, he listed the factors in the teaching class such as the level of teacher training, the number of students per teacher and the experience of teachers. The second category includes aggregate material and financial resources such as teacher's salary and expenses per student, while the third category includes school-specific resources such as administrative conditions, extra-curricular offers and others. He found that 15% of research shows that the number of students per teacher has a real positive effect, 9% show that the level of teacher training has a statistically significant positive influence on performance, and 29% say that teacher experience has this effect. 71% of the research studied by Hanushek (1997) indicates a statistically significant decrease in student performance along with decreased experience. In conclusion, he says that "The added resources within the current organization and the incentives of schools are neither necessary nor sufficient to improve student performance."(Hanushek, 1997). How the salaries influence the motivation of the teachers can be said to have an effect on the quality of the services provided and implicitly on the students' achievement. In 2005 Rivkin et al. stated: "Teachers and therefore schools matter a lot to the achievement of students"(Rivkin, Hanushek, & Kain, 2005). Akiba et al. (2012) researching the influence of salary levels in 30 US countries on student performance found that US teachers' starting salaries are higher compared to the OECD (Organization for Economic Co-operation and Development) average, and the salaries of more experienced teachers are lower than the same average. They concluded that investing in starting salaries for teachers has no positive influence on student test scores, but in countries with higher salaries of more experienced teachers, the student's test results were better.(Akiba, Chiu, Shimizu, & Liang, 2012) Leigh in 2012 studied whether the salaries of university professors influence the performance of the university education

system measured by admissions to teacher training courses and found that a 1% increase in salaries has the effect of increasing admissions by 0.6 per cent.(Leigh, 2012). Hyman (2017) found in his paper that a 10% increase in total spending in Michigan schools led to a 3% increase in higher education admissions and a 2.3 percentage point increase in the high school graduation rate. (Hyman, 2017) Lee and Lee (2020) researching the correlation between teacher qualification and student outcomes, found that cumulative qualification indices for math or science teachers had an overall positive relationship with students obtaining higher education degrees.(Lee & Lee, 2020). Belmonte and colleagues (2020) conducted a study in which they wanted to measure whether the environment and the material endowment of a school's influence on student results during a massive investment in the school network in northern Italy after a high-magnitude earthquake. They believed that "High-quality educational infrastructure means that students have an adequate temperature, lighting and functional furniture that can improve the quality of their learning experience." Thus, they found that tripling the material resources of educational institutions leads to a substantial improvement in students' test scores, especially in mathematics and significantly in the case of low-achieving students. (Belmonte, Bove, D'Inverno, & Modica, 2020) Thus, Gjefsen (2020) found that in the case of disadvantaged schools, the 5% increase in teachers' incomes together with vocational training opportunities and the one-hour decrease in workload generated an increase in the achievements of students in these schools.(Gjefsen, 2020). At the same time, there are attempts at educational policy to provide government grants to local authorities to reduce the number of students per teacher to achieve higher performance by example students in Norway in 2015. However, this attempt by the government did not bring the desired result because the local authorities, with high autonomy, did not increase the density of teachers in primary schools despite the funds received for this purpose.(Reiling, Salvanes, Sandsør, & Strøm, 2021) Another attempt to optimize the number of students per teacher is charter schools in the USA. In these schools, the management based on a contract with the financier has total freedom in compiling the study formations, in choosing the taught curriculum, in determining the structure of the school year or schedule to focus on the needs of the children. (www.publiccharters.org) Analysing the results of such schools, it has been found that they have a beneficial influence on the entire education system by increasing the quality of services provided by teachers not only in these institutions but throughout the entire system.(Sorensen & Holt, 2021). Given the above, the authors of this paper aimed to determine whether or

not the funding allocated to education, the level of education salaries or the number of students per teacher influenced the quality of educational services and implicitly the academic performance of students measured during PISA tests.

Research methodology and research data

Research data

Given its complexity, measuring the efficiency and performance of the pre-university education system has been and continues to be quite difficult. This study uses financial and non-financial indicators related to education policy in OECD countries and the latest results of PISA tests in 2018. The authors of this study chose to collect data on the World Bank and OECD websites. Thus, tables were downloaded regarding:

- government expenditures per student for secondary education, expressed as a percentage of GDP per capita for the years 2013-2017
- the salaries of secondary school teachers in 2017 and 2018
- the number of students per teacher for the years 2014-2018

PISA tests initiated by the OECD have been used since 2000 and are conducted every 3 years at the end of lower secondary education in 15-year-old students. Being standardized tests in the fields of mathematics, science and reading, the last test was performed in 2018 in OECD countries and partner countries. These tests measure students' abilities in the fields shown as well as their ability to use these skills in real life. This type of assessment does not measure the students' ability to reproduce what they have learned, but their skills to use it in life; because of this, they are independent of the curriculum.

Data on teachers' salaries were available on the OECD page only for 2017 and 2018, but the authors consider that these two years are the most relevant in terms of student outcomes in 2018. Teachers' salaries are average gross salaries of teachers according to official pay scales of countries before tax including the employee's contributions to the pension and health system, without the employer's contributions to social and health insurance.(OECD, 2020) Salary data were taken into account for the lower secondary level, at the beginning of the career, at 15 years of age and the top salary, expressed in US dollars. To perform the calculations, the average salaries for the two reference years were calculated and expressed in the US $100.

The averages for government expenditures made by the countries participating in the tests were also calculated and expressed as a percentage of gross domestic product per capita.

Since funding calculated based on the standard cost per student greatly influences the ratio of students per teacher, a higher standard cost allows reducing the number of students in a study. This indicates that the ratio of students per teacher is a pseudo-financial parameter being a consequence of the level of funding. The ratio of the number of students per teaching staff is the total number of full-time equivalent students enrolled at a certain level of education divided by the total number of full-time equivalent teachers at the same level. The term "teacher" refers to the professional staff directly involved in teaching students: class teachers, special education teachers and other teachers who work with students as a whole class in a classroom, in small groups in a resource room or individual teaching inside or outside a regular class. This does not include teacher assistants and other paraprofessionals or support staff. (OECD, 2020).

Table 1 describes the variables used in the research.

Table 1. Variables, symbols, description, variable type

Variable	Symbol	Proxy	Variable Type
PISA mathemtics	math	Avearge PISA score in mathematics in 2018	dependent
PISA science	science	Avearge PISA score inscience in 2018	dependent
PISA reading	read	Avearge PISA score in reading in 2018	dependent
Average salaries	AV_SAL	Average gross salaries of educational personnel per year according to official pay scales in 2017 and 2018 shown in USD covering low secondary education teachers at the beginning of their career, after 15 years, and at the top of the scale.	independent
Student teacher ratio	ST_THC_R	The total number of full-time equivalent students enrolled at a specific level of education divided by the total number of full-time equivalent teachers at the same level	independent

Government expenditures per student in %	AV_SP	Government expenditure per student is the average general government expenditure (current, capital, and transfers) per student in the given level of education, expressed as a percentage of GDP per capita	independent

Source: authors proceeding

Research method

Given that in this paper, the authors intended to see the effect of decisions on funding the pre-university education system on students' test scores and that the data were available in a cross-sectional panel type, the authors decided that the most appropriate method to estimate this influence is the multiple linear regression model, using the least-squares method. Multiple regression tests the correlation between a dependent variable y and several independent variables x_1; x_2; ...; x_p. The multiple regression model in its general form can be expressed using Equation no.1(Andrei, Mirica, Toma, Oancea, & Herțeliu, 2018):

$$y_j=a_0+a_1x_{1j}+...+a_px_{pj}+\varepsilon_j \qquad j=1,n \qquad (1)$$

where:

y_j - dependent variable

$x_{1j}...x_{pj}$ - independent variables

$a_0,a_1,...a_j$ - estimated parameters

ε_j – error

In this research, the effects of independent variables on the three dependent variables were tested separately: MATH; SIENCE; READ

According to the general equation, the three regression equations related to the research can be constructed (2);(3);(4):

$$MATH_{it}= \alpha_0 + \alpha_1*AV_SAL_{it} + \alpha_2*ST_THC_R_{it} + \alpha_3*AV_SP_{it} + \varepsilon_{it} \qquad (2)$$

$$SCIENCEit= \beta_0 + \beta_1*AV_SALit + \beta_2*ST_THC_Rit + \beta_3*AV_SPit + \varepsilon it \qquad (3)$$

$$READ_{it} = \gamma_0 + \gamma_1 *AV_SALit + \gamma_2*ST_THC_Rit + \gamma_3*AV_SPit + \varepsilon it \quad (4)$$

According to the above models, the equations (2), (3), (4) were obtained, where the dependent variable is the average score obtained by students in a country in mathematics (MATH), science (SCIENCE) and reading (READ), and the independent variables are the average gross salaries (AV_SAL), the number of students per teacher (ST_THC_R) and the average government expenditures (AV_SP), i represents each country, t represents the year, $\alpha 0$, $\beta 0$, $\gamma 0$ represents the constant coefficient, α_1, α_2, α_3; β_1 β_2 β_3 and γ_1, γ_2, γ_3 represent the coefficients of the independent variables in each equation and ε represents the errors.

To perform regression models, several countries were eliminated due to unavailability of data, eg Australia, Belgium, Bulgaria, Cyprus, Dominica, Ethiopia, Europe & Central Asia, India, Indonesia, Luxembourg, Malta, Myanmar, Romania, Serbia, Sri Lanka, United Kingdom, Iceland. From the remaining data set with the help of the Grubbs test (Grubbs, 1950) the existence of outliers was verified and thus Luxembourg was eliminated with an average of gross salaries well above the accepted value which could have distorted the results obtained. While the average gross salary in the 33 states was $ 40,708, the average gross salary in Luxembourg in 2017-2017 was $ 112461, 38% above the maximum of $ 81254 in Switzerland. Thus, there were 33 countries where data were available for math and science results, and 32 states for the reading test, because in Spain the test was not performed. Regression model testing was performed with SPSS and EViews Student software.

Results and discussions

To test the correlation between salaries, the number of students per teacher and government expenditures on the PISA test score, the values related to the descriptive statistics that can be seen in Table 2 were determined.

Table 2. Values of descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Science	33	404	530	482.48	33.03
Read	32	412	523	481.56	30.66

Math	33	384	527	481.64	39.50
AV_SAL	32	143.73	812.54	403.26	172.83
ST_THC_R	32	7.55	27.63	13.51	4.92
AV_SP	32	12.02	29.77	22.71	4.22
Valid N (listwise)	32/33				

Source: authors proceeding

From table no.2 it can be seen that the average score obtained in the math test varies between 384 (Brazil) and 527 (Japan), the mean being 481.64. On reading the lowest score is 412 (Colombia) and the highest 523 (Estonia), showing a lower dispersion, the average is 481.56. In the case of media sciences, it is slightly higher 482.48, the lowest score is 404 (Brazil) and the best score being 530 (Estonia). For salaries, there is a large difference of 565% between the minimum value of $ 14,373 (Brazil) and the maximum of $ 81,254 (Switzerland), the mean being $ 40,708 with a high standard deviation of $ 17,152. The average number of students per teacher shows a large dispersion from the minimum value of 7.55 (Lithuania) to 27.63 (Mexico).

In compiling the regression models using the SPSS computer program, the three data were introduced for estimating the model parameters. In the first stage, the validity of the models and parameters represented in Table 3 were tested

Table 3. The values of the regression models and the F test

Domain Statistics PISA	Multiple R	R Square	Adjusted R Square	Standard Error	F Statistic Value	Significance F
MATH	0,785[a]	0.616	0.577	25.701	15.533***	0,000[b]
ȘCIENCE	0,697[a]	0.485	0.432	24.889	9.115***	0,000[b]
READ	0,709[a]	0.503	0.450	22.745	9.442***	0,000[b]

a. Predictors: (Constant), AV_SP, AV_SAL, ST_THC_R
b. Predictors: (Constant), AV_SP, AV_SAL, ST_THC_R
* p< 0.5 ** p<0.01 *** p<0.001
Source: authors proceeding

As can be seen from table no. 3 the values of R are around 70%, which shows that the model is correctly specified, the highest value being in the case of mathematics 78.5%. The values of the determination ratio R^2 are quite high between 48.5-61.6%. All three models have a P-value <0.1%, showing that the models are valid.

The values of the coefficients, the probability that they are equal to 0 and their confidence intervals are presented in Table no.4

Table 4. Coefficient values

PISA	Variable	Unstandardized Coefficients		t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error			Lower Bound	Upper Bound
Math	(Constant)	474.478	37.701	12.585***	0.000	397.370	551.587
	AV_SAL	0.072	0.028	2.605*	0.014	0.016	0.129
	ST_THC_R	-4.646	1.085	-4.281***	0.000	-6.866	-2.426
	AV_SP	1.780	1.298	1.371	0.181	-0.875	4.436
Science	(Constant)	478.793	36.511	13.114***	0.000	404.119	553.466
	AV_SAL	0.060	0.027	2.218*	0.035	0.005	0.114
	ST_THC_R	-3.447	1.051	-3.280**	0.003	-5.597	-1.298
	AV_SP	1.142	1.257	0.908	0.371	-1.430	3.714
Read	(Constant)	488.296	34.714	14.066***	0.000	417.187	559.405
	AV_SAL	0.057	0.025	2.290*	0.030	0.006	0.109
	ST_THC_R	-3.420	0.985	-3.472**	0.002	-5.437	-1.402
	AV_SP	0.717	1.204	0.595	0.556	-1.749	3.182

* $p<0.05$ ** $p<0.01$ *** $p<0.001$

Source: authors proceeding

As can be seen from Table no.4 in all three models the probability that the value of the constant-coefficient, the average salary variables (AV_SAL) and the rate of the number of students per teacher (ST_THC_R) to be equal to 0 is below the significance threshold $p < 0.05$, in some cases below 0.01, but in the case of the variable average expenditure in the education system (AV_SP) the probability that the value of the coefficient of this variable is 0 is above the significance threshold of $p > 0.05$, which is also evident from the confidence intervals for each model, where these intervals contain the value of 0. Consequently, this variable had to be removed from all three models. In search of the cause, the authors proceeded to draw up the correlation table between the three variables which is presented in Table no.5

Table 5. Correlations

		AV_SAL	ST_THC_R	AV_SP
AV_SAL	Pearson Correlation	1	-0.043	0.275
	Sig. (2-tailed)		0.811	0.121
	N	33	33	33
ST_THC_R	Pearson Correlation	-0.043	1	-,497**
	Sig. (2-tailed)	0.811		0.003
	N	33	33	33
AV_SP	Pearson Correlation	0.275	-,497**	1
	Sig. (2-tailed)	0.121	0.003	
	N	33	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Source: authors proceeding

From table no.5 it can be seen that the variable AV_SP correlates significantly with the variable AV_SAL where $p < 0.05$, which distorts the results obtained. Akiba and colleagues in 2012 found that in those countries where teachers' salaries are higher the percentage allocated to education in GDP per capita is higher. (Akiba et al., 2012). This correlation is an additional reason for the decision to eliminate the variable average expenditure on education (AV_SP).

The next step was to test the models with two variables AV_SAL and ST_THC_R. The equations of the regression models are modified as follows:

$$MATH_{it} = \alpha_0 + \alpha_1 * AV_SAL_{it} + \alpha_2 * ST_THC_R_{it} + \varepsilon_{it} \quad (5)$$

$$SCIENCEit = \beta_0 + \beta_1 * AV_SALit + \beta_2 * ST_THC_Rit + \varepsilon it \quad (6)$$

$$READ_{it} = \gamma_0 + \gamma_1 * AV_SALit + \gamma_2 * ST_THC_Rit + \varepsilon it \quad (7)$$

The values of the regression models and the F test can be seen in table no. 6

Table 6. The values of the regression models and the F test

PISA	Multiple R	R Square	Adjusted R Square	Standard Error	Durbin Watson	F Statistic Value	Significance F
Math	0,769[c]	0.592	0.564	26.075	1.674	21.722***	0,000[d]
Science	0,686[c]	0.471	0.435	24.817	1.742	13.337***	0,000[d]
Read	0,705[c]	0.497	0.462	22.491	1.612	14.304***	0,000[d]

c. Predictors: (Constant), AV_SAL, ST_THC_R

d. Predictors: (Constant), AV_SAL, ST_THC_R
p<0.05 ** p<0.01 *** p<0.001

Source: authors proceeding

Analysing the data from Table no.6, it can be seen that in all three models Significance F <0.05, meaning that the three regression models were correctly specified so H0 is rejected and the alternative hypothesis is accepted. H1: Educational policy decisions have a direct impact on students' test performance. (Andrei et al., 2018)

The value of the determination ratio R^2 has the highest value in the field of mathematics 59.20%, which means that the variations of the score in the case of mathematics in PISA tests are due in a percentage of 59.20% to the variations of the two independent variables, namely average gross salary and number of students per teacher. The value of 0.769 for Multiple R shows a strong correlation between the independent variables and the dependent variable. In the case of science and reading, the value of the determination ratio is lower, which means that the variations of the dependent variables are due to the variations of the independent variables in 47.1% in science and 49.7% in reading. The value of Multiple R shows a fairly strong correlation around 70% for the two subjects. The stronger correlation and higher determination ratio in mathematics are probably because this field has a closer connection with the school requiring a very strong presence of a teacher in the learning process, while for other subjects the alternative sources of information are more strongly present.

In the next step, we proceeded to estimate the regression parameters presented in Table 7:

Table 7. Coefficient values

PISA	Variable	Unstandardized Coefficients		t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error			Lower Bound	Upper Bound
Math	(Constant)	520.250	17.772	29.274***	0.000	483.955	556.544
	AV_SAL	0.083	0.027	3.098**	0.004	0.028	0.138
	ST_THC_R	-5.397	0.951	-5.678***	0.000	-7.339	-3.456
Science	(Constant)	508.155	16.914	30.044***	0.000	473.613	542.698
	AV_SAL	0.067	0.026	2.604*	0.014	0.014	0.119
	ST_THC_R	-3.929	0.905	-4.343***	0.000	-5.777	-2.082
Read	(Constant)	506.787	15.332	33.053***	0.000	475.428	538.145
	AV_SAL	0.063	0.023	2.673*	0.012	0.015	0.110
	ST_THC_R	-3.734	0.822	-4.541***	0.000	-5.415	-2.052

$p<0.05$ ** $p<0.01$ *** $p<0.001$
Source: authors proceeding

In table no.7 it can be seen that all the coefficients of the three regression models are valid because the probability of the *t* test is less than 5%. Each model contains a constant with $p <0.001$, the probability of the *t* test for the variable AV_SAL is between 1-5% and for the variable ST_THC_R below 1%. Thus equations (5); (6) and (7) are as follows:

$$MATH_{it} = 520{,}25 + 0{,}083 * AV_SAL_{it} + (-5{,}39) * ST_THC_R_{it} + \varepsilon_{it} \quad (5)$$

$$SCIENCEit = 508{,}15 + 0{,}067 * AV_SALit + (-3{,}92) * ST_THC_Rit + \varepsilon it \quad (6)$$

$$READ_{it} = 506{,}78 + 0{,}063 * AV_SALit + (-3{,}73) * ST_THC_Rit + \varepsilon it \quad (7)$$

In the case of mathematics, from equation (5), it can be seen that there is a strong positive correlation with the variable AV_SAL, in other words increasing the salary of a teacher by $100 per year has the consequence of increasing the score obtained in mathematics by 0.083 points. In science, equation (6) this increase is 0.067 points, and in reading (7) 0.063 points. The relation of the score in mathematics with the variable number of students per teacher is strong but negative, resulting in that the increase with one student of this rate leads to the decrease by 5.39 points on average of the score obtained in mathematics, by 3.92 points in science and

by 3.73 reading points. For a more assured certainty of the validity of the models, the autocorrelation of the errors, the homoscedasticity, the normality of the errors and the lack of multicollinearity of the independent variables were further tested. These tests were performed using the EViews Student program testing the following hypotheses:

- Testing the lack of autocorrelation of errors using the Breusch-Godfrey Serial Correlation LM Test, where:
  - H0: errors do not auto-correlate, Chi-Square> 5%
  - H1: errors auto-correlate, Chi-Square <5%
- Homoscedasticity testing using the White test, as this test can detect heteroscedasticity of unknown shape:
  - H0: error variance is constant, homoscedasticity is present: Chi-Square (2)> 5%
  - o H1: error variance is not constant, heteroscedasticity is present: Chi-Square (2) <5%
- Error normality testing using the Jarque-Bera test:
  - H0: errors are normally distributed: Probability> 5%
  - H1: errors are not normally distributed: Probability <5%
- Testing the lack of multicollinearity of variables using the Variance Inflation Factors test:
  - H0: there is no Centered VIF multicollinearity < 10
  - H1: there is multicollinearity Centered VIF> 10

The results of the tests of these hypotheses are presented in Table 8:

Table nr. 8 Diagnosis of residual values and multicollinearity

Regression/Test	Prob. Chi-Square (Test White)	Prob. Chi-Square (Test Breusch-Godfrey)	Prob. (Test Jarque-Bera)	Centred VIF
MATH	0.65	0.63	0.38	1
SCIENCE	0.58	0.74	0.91	1
READ	0.78	0.2	0.98	1

Source: authors proceeding

From table no.8, it can be seen that all values correspond, thus accepting all null hypotheses H0 for each test.

Following the testing of the regression models presented, it can be said that this research falls within the range of those researches (Akiba et al., 2012; Belmonte et al., 2020; Gjefsen, 2020; Holmlund, McNally, &

Viarengo, 2010; Hoxby & Leigh, 2004; Hyman, 2017; Leigh, 2012) that state that various educational policy decisions, especially in the financial field, influence the quality of services provided in pre-university education systems and on performance students in the various tests. At the same time, it cannot be denied that there is a multitude of factors that influence students' performance, factors that were not taken into account in this research.

Conclusions

This research sought to observe whether educational policy decisions in the financial field and the organization of the education system influence the quality of services provided by educational institutions to final beneficiaries. One way to measure the quality of educational institutions is how students achieve their goals, and the road to these goals leads through exams or tests. Thus, the academic performance achieved by students in tests can be considered barometers of the quality of services provided. Because many researchers say that funding affects students' test scores, the authors considered measuring how the level of average annual gross salaries and the number of students per teacher influence the score on the standardized PISA test in OECD countries. Carrying out three regression models to analyse the effect on the score in mathematics, science and reading, the authors found that the variations of the average gross salaries in lower secondary education in 2017 and 2018 and the average number of students per teacher in the years 2014-2018 affect the average score obtained in each field, the most accentuated in the mathematics score, at the same time the financing per student expressed as a percentage of GDP per capita not having a significant influence on the results. Thus, the authors' hypothesis that there is a correlation between financial policy decisions on education and the results of the system is accepted. The ratio of determining the independent variables to the dependent ones has the highest value in mathematics around 60% this fact shows that these two explanatory variables play a very important role in the score obtained in mathematics. In the other areas, this determination ratio is much lower, around 47-49% which means that the influence of the variables is lower, but it is not negligible. At the same time, from the descriptive statistics of the variables, it can be seen that there is a very big difference between the minimum and maximum values of the average salary levels in different countries, but the scores obtained in the tests do not show the same high amplitude, it will be justified in terms of student performance. Although increasing the number of students per teacher by 1 student has consequences for reducing the

scores obtained, especially in mathematics (5.39 points), but also in other areas, this does not mean that reducing the rate excessively can solve the problem, having financial implications in terms of current material and investment costs.

Such an approach places a great responsibility on the political decision-makers in each country, because, in the context of the pressure of austerity budgets in conditions of financial crisis or pandemic, they must find optimal financing formulas that provide equal opportunities to access and complete all levels of studies of each individual. In the context in which the reduction of budgetary expenditures is present in the objectives of any country, the reduction of funds for salary expenditures can lead to the increase of the number of students in the study formations and implicitly to the drastic decrease of the academic performances obtained by the students. This research has many limitations because a thorough study of the influences on student performance would involve the introduction of many more economic, social and psychological factors, however, the authors believe that it presents a slice of this reality, which cannot be neglected by policymakers and professionals in the field.

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