IS THE UTILIZATION OF THE STATE BUDGET EXPENDITURES IN AREA OF EDUCATION AND HEALTHCARE SUFFICIENT?

Je čerpanie výdavkov štátneho rozpočtu v oblasti školstva a zdravotníctva dostatočné?

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ABSTRAKT

Cieľom príspevku je analyzovať postavenie Slovenskej republiky vo vzťahu výdavkov štátneho rozpočtu k HDP v oblastiach školstva a zdravotníctva a ich jednotlivých subsektorov v porovnaní s ostatnými krajinami OECD, ktoré majú zverejnené alokácie výdavkov na 2021. Údaje potrebné na analýzu pochádzajú z databázy OECD. Z pohľadu SR sme sa zaradili medzi krajiny, s ktorými sme na úrovni štátneho rozpočtu na obyvateľa, HDP a ostatných ekonomických ukazovateľov približne na rovnakej úrovni. Podotýkame, že v oblasti školstva a zdravotníctva sme na úrovni krajín V4 (*Po*ľska, *Českej republiky* a *Maďarska*), pričom náš klaster dopĺňajú krajiny z pobaltských štátov a juhovýchodnej Európy.

Kľúčové slová: Školstvo. Zdravotníctvo. HDP. Slovenská republika. OECD.

ABSTRACT

The aim of the contribution is to analyze the position of the Slovak Republic in the relation of state budget expenditures to GDP in the areas of education and healthcare, and their individual sub-sectors, in comparison with other OECD countries that have published expenditure allocations for the year 2021. The data required for the analysis come from the OECD database. From the point of view of the Slovak Republic, we have become among the countries with which we are at the level of state budget per capita, GDP and other economic indicators at approximately the same level. We note that in the field of education and health we are at the level of the V4 countries (Poland, the Czech Republic and Hungary), while our cluster is completed by countries from the Baltic States and South-Eastern Europe.

Key words: Education. Health. GDP. Slovak Republic. OECD.

INTRODUCTION

Investments in education are investments in the future and can bring many economic and social benefits, both for the individual and for the entire society Gallo (2022). In the same way, a healthy population can create new values, which is why investments in healthcare are no less important. We can state that education as well as healthcare, as elements of the national economy, are connected vessels and inevitably contribute to the growth of the country's economic wealth. Therefore, every country should pay attention to the proper financing and management of these areas.

The area of financing education is the subject of interest of many authors. We can mention for example author Sherman (1979), who provides one of the first multi-country and multi-issue study in the school finance field in 10 OECD countries by the Center for Educational Research and Innovation (CERI). Author Barr (2004) also dealt with the issue of financing higher education. He argues that the expansion of higher education within the OECD (and even outside of it) is necessary and desirable. But it is costly and faces competing public spending imperatives. The authors Provazníková & Chlebounova (2018) try to select appropriate indicators to describe the

quality of European higher education systems and to use cluster analysis to visualize similar higher education systems and discuss their funding. We will use a similar clustering method in our research.

The area of healthcare is not far behind the interest of researching education expenditures. Here, too, there are authors who deal with this issue and examine the effectiveness of spending state financial resources. The authors Dutu & Sicari (2020) conducted a study in which they focus on the effectiveness of public spending on education, healthcare, and general administration in the OECD. These authors found wide variation in efficiency measures within OECD countries and provide possible quantified improvements in both output and input efficiency. Rotenberg et al. (2022) provided really detailed look at the differences between health care organization and costs, as well as health outcomes, in two different countries. They compared situation in Denmark and Israel. Both these countries have highly rated and well-performing healthcare systems with marked differences in funding and organization of primary healthcare. The authors also study the relationship between GDP growth and the growth of healthcare expenditures. For example, Jakovljevic et al. (2020) analyzed the association between the health spending and real GDP growth in the G7 and the EM7 countries. Grigorakis et al. (2022) investigated the assessment of the responsiveness of out-of-pocket healthcare expenditure to macro-fiscal factors and different health financing systems in the conditions of European and OECD countries.

Based on the above, we looked at the situation in this area in the OECD countries. We were primarily interested in what part of expenses from the state budget goes to education and health care and where Slovakia is located among OECD countries. We analyzed the position of the Slovak Republic in the relation of state budget expenditures to GDP in the areas of education and healthcare, and their individual sub-sectors, in comparison with other OECD countries. We performed the analysis based on data for 2021.

1 Financing in education area

According to OECD (2023a) across OECD countries, expenditure per student averages around USD 10.700 at the primary level, USD 11.900 at secondary level and USD 18.100 at tertiary level. These data reflect the fact that higher levels of education often require teachers to have more advanced qualifications and knowledge which are usually accompanied by higher salaries.

The expenditure on education largely comes from public budgets, but it includes funding from individual students, their families, and other private sources as well. According to OECD (2023a) financing from public sources represents, on average, in OECD countries up to 86.5 % of all expenditures on primary to tertiary education institutions. For example, in 2020, on average, in OECD countries, 84 % of funding for primary to tertiary education institutions came directly from government sources, 15 % from private sources and 1 % from non-domestic (international) sources.

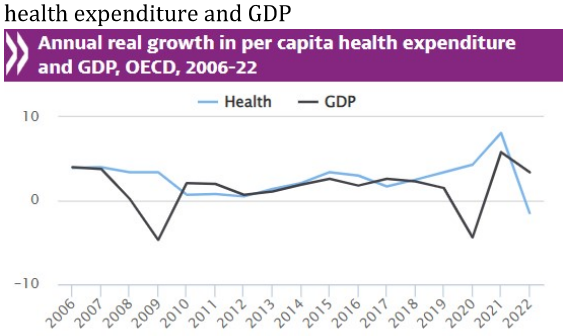
Based on official statistics of OECD (2023a) OECD countries spent an average of 4.4 % of GDP on educational institutions from primary to tertiary education in 2020 (including undistributed programmes by level of education). Six countries with available data (Iceland, Finland, Norway, Belgium, Sweden, and Denmark) spent 5 % or more. We can state that the relative expenditure directed to educational institutions in particular OECD country is influenced by many factors, such as the number of students enrolled, the length of study, the field of study, and the effective allocation of funds.

2 Expenditure in healthcare area

Based on the latest estimates, OECD average of health expenditure to GDP has declined from a peak of 9.7 % in 2021 to 9.2% in 2022. The share of GDP going to health remains above the pre-pandemic level of 8.8 %, even when in 11 OECD countries the ratio is expected to fall in 2022 below pre-pandemic 2019 levels. According to data from the OECD Health Statistics 2023 database (OECD 2023b), the ratio of health expenditure to GDP in 2022 in European

countries remained the highest in Germany at 12.7 % followed by France at 12.1 %. In many Central and Eastern European OECD countries spending on health accounted for between 6.9 % of their GDP.

Figure 1: OECD annual real growth in per capita for health expenditure and GDP



Source: OECD (2023b)

As we can see in Figure 1, because of the financial crisis in 2008 and 2009, the GDP in OECD countries fell sharply from 3.8 % in 2007 to -4.7 % in 2009, while the growth of health care expenditures decreased only slightly during this period (from 4 % in 2007 to 3.4 % in 2009). In the period from 2010 to 2012, it moved close to zero, as several political measures to control public spending were introduced during this period. In the period from 2012, we observe an increase of both real growths in per capita (health expenditure growth as well as GDP growth). In 2020, because of the COVID-19 pandemic, which was associated with large-scale lockdowns and other measures in the field of public health, there is a significant limitation of economic activity and consumer spending, which caused a significant decrease in GDP growth from 1.5 % in 2019 to -4.4 % in 2020. At the same time there was a growth in per capita health expenditure from 3.4 % in 2019 to 4.3 % in 2020.

A recovery in GDP per capita growth occurs in 2021, when GDP growth reached 5.8 %. At the same time, real growth in per capita health expenditure reached 8.1 % in 2021 as countries allocated additional funding to tackle the COVID-19 pandemic. As we can see in the Figure 1, it is assumed that in 2022 due to the fact that the countries got from the acute stage of the COVID-19 pandemic, health spending per capita is likely to decline as well as a decline in GDP growth is also expected.

3 Research objectives and methods

The aim of the contribution is to analyze the position of the Slovak Republic in the relation of state budget expenditures to GDP in the areas of education and healthcare, and their individual sub-sectors, in comparison with other OECD countries that have published expenditure allocations for the year 2021.

The scientific contribution deals with the issue of the perception of individual aspects of education and health in selected OECD countries from the point of view of the share of expenses in the country's GDP. In our analysis, we examined 26 countries from the point of view of several variables representing the mentioned areas.

The procedure of clustering is described by Stankovičová and Vojtková (2007) in the following steps: entering input data, choosing the type of variables, object names, choosing the clustering method, choosing the type of the clustering method - in our case the Ward method, selecting the similarity of objects we transfer based on the Euclidean distance, clusters and cluster interpretation.

Different groups of object similarity measures can measure similarity between country results. The choice of the degree of similarity also depends on the monitored characters whose values characterize the survey results for the given countries. The most well-known are distance measures, association coefficient, correlation coefficient and likelihood similarities. In our work, we will use the distance measure called the Euclidean distance. By using this distance, the authors Sinwar and Kaushik (2014) also deals with the research.

$$d_{ij} = \sqrt{\sum_{k=1}^{n} \left(X_{ik} - X_{jk}\right)^2} \qquad (1)$$

where:

X_{ik} is the value of the k-th variable for the i-th country,

X_{jk} is the value of the k-th variable for the j-th country.

In the clustering method, we will use Ward's method, which is the most used in practice. This method does not calculate the distance between the clusters, but the clusters are formulated based on the

maximization of inside aggregate sum of squares. The homogeneity measure represents the subsonic sum of squares of deviations from the aggregate diameter we call ESS - error sums of squares, and we use the following formula for its calculation:

$$ESS = \sum_{i=1}^{n_h} \sum_{h=1}^{q} \left(X_{hi} - \overline{X}_{C_h} \right)^2 \quad (2)$$

where:
n_h is the number of objects in the cluster,
X_{Ch} is the vector of the values of the character values in the cluster,
X_{hi} is the value vector of the i-th object's character in the cluster.

The statistical analysis was performed using the programming language ClustVist, which is suitable for the creation of statistical models and data analysis and is suitable for graphing and graphic analysis of data.

4 Results

The data required for the analysis come from the OECD database and the variables used are in Table 1. These data are publicly accessible on the OECD website. The analysis itself is addressed to the following countries participating in the assessment of expenditure on health and education to GDP. All data for individual countries are for the year 2021 (Table 1).

Among the basic conditions of cluster analysis is the analysis of dependencies between variables through statistical testing. The starting point for us was the correlation analysis, which consisted of Pearson's correlation coefficients. In cluster analysis, however, it is necessary to exclude statistically significant but weaker dependencies, because they could distort the result of cluster analysis. It is therefore necessary to test the statistical significance of Pearson's correlation coefficients. The analysis shows that, in the case of several variables, several coefficients are statistically insignificant. However, their correlations are statistically significant for the other variables. This means that there may be a clustering problem in cluster analysis. Therefore, it is necessary to use principal component analysis, which works with the original variables, but in their standardized form, i.e. j. it eliminates correlations between variables. We also refer to the original variables as PC1, PC2, ... PCx.

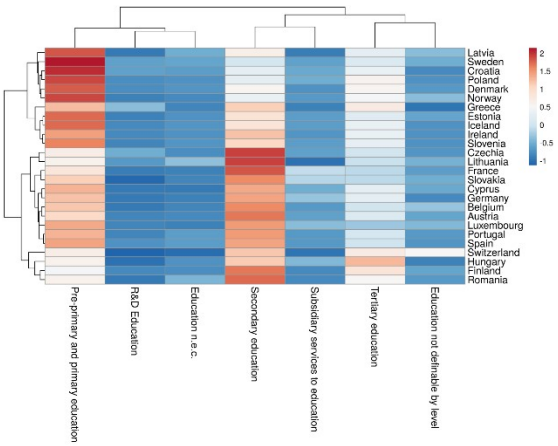
Based on a number of assumptions to determine the required number of main components, we will select 3 main components for the field of education, which will use the aggregation method. These components explain more than 90 % of the variability of the original data. In the area of health, 2 main components explaining more than 95 % of the variability of the original data were chosen based on statistical testing. Subsequently, we proceeded to the implementation of the clustering itself through a hierarchical tree, where the clusters are marked. We can see that multiple clusters have been created that are heterogeneous but homogeneous within their cluster. This means that countries in one cluster have similar characteristics in area of education or health and at the same time have a different share of spending on GDP with countries in other agglomerations. When analyzing education and spending on education to GDP (Figure 2), the Slovak Republic as a country was included in a cluster together with the Czech Republic, Lithuania, France, and Germany. It is necessary to emphasize that once again the expenses of the state in the field of education were limited and affected by the ongoing pandemic, which was associated with increased costs, e.g. for testing, disinfection of premises, but also expenses related to distance education. Surprisingly, the isolated noise of countries that, from our point of view, cannot be put together in area of takeover. These are Hungary, Romania, and Finland. It is clear from several surveys, studies, and other literature that the standard of living in Finland is significantly different than in the two mentioned countries. Education in Finland has just been rated as one of the best in the OECD in 2023 and is considered a leader. A prerequisite for a high level of education in Finland during the corona crisis for the organization of effective distance teaching and learning during the spring semester 2020 were investments in the digi-competence of teachers and students and digi infrastructure and the availability of digi-tools.

Table 1: Analyzed variables

	Pre-primary and primary education	Secondary education	Tertiary education	Education not definable by level	Subsidiary services to education	R&D Education	Education n.e.c.	Medical products, appliances, and equipment	Outpatient services	Hospital services	Public health services	R&D Health	Health n.e.c.
Belgium	2,0333	2,389055	0,911048	0,602136	0,238219	0,001553	0,1039	0,80038	3,017151	4,166677	0,371283	0,04981	0,213991
Austria	1,51661	2,031512	0,801236	0,256746	0,221596	0,037996	0,074714	1,227388	1,636733	5,083609	1,328363	0,478608	0,32269
Croatia	2,544346	0,973305	1,033576	0,027484	0,260298	0,201637	0,162211	1,245209	1,3033	4,635256	0,699726	0,060542	0,307986
Cyprus	1,839805	1,882271	1,000048	0,340149	0,3822	0,045877	0,037887	1,024195	1,602908	3,568863	0,167369	0,027062	0,026212
Czechia	1,286408	2,320045	0,727616	0,11554	0,209488	0,291632	0,075826	0,92535	1,943174	4,514909	2,138551	0,070358	0,237579
Denmark	2,787702	1,468107	1,476812	0,115687	0,058023	0,039015	0,094362	0,53283	1,196161	6,417875	0,351812	0,226781	0,514939
Estonia	2,358092	1,616478	1,008112	0,330737	0,270314	0,076642	0,179361	0,709813	0,600733	4,651627	0,282717	0,155828	0,091589
Finland	1,279421	2,445929	1,658715	0,227815	0,015506	0,007554	0,056854	0,699746	3,392176	3,275684	0,197201	0,096613	0,042541
France	1,409669	2,237701	0,639937	0,223922	0,672926	0,00016	0,026991	1,49508	3,209123	3,730662	0,522818	0,094967	0,163463
Germany	1,463372	1,596446	0,817075	0,092511	0,420879	0,010439	0,058971	1,859263	2,356632	2,896897	0,704602	0,089512	0,735504
Greece	1,313888	1,242881	1,002892	0,009357	0,06385	0,361085	0,087519	1,551125	0,666576	3,897628	0,363287	0,141462	0,045686
Hungary	1,152618	1,516304	1,607314	0,103378	0,423079	0,018155	0,191198	0,741057	1,411868	2,226242	0,744029	0,074234	0,437568
Iceland	3,431086	2,256011	1,540222	0,108168	0,222445	0,000642	0,128756	0,637011	2,056821	5,921085	0,033616	0,985475	0,28943
Ireland	1,159861	1,050043	0,59769	0,045087	0,066483	0,001431	0,036463	0,624277	1,836674	2,082433	0,377162	0,006485	0,335998
Latvia	2,219546	1,295707	0,989194	0,494579	0,104182	0,063174	0,394039	0,612635	1,840043	3,108443	0,53356	0,000003	0,15317
Lithuania	1,035054	1,8728	0,621182	0,353278	0,023526	0,212455	0,429392	0,885802	1,89297	2,733854	0,184918	0,003254	0,180816
Luxembourg	1,687386	1,743507	0,443878	0,346414	0,377938	0,030622	0,012617	1,674162	1,09114	2,166638	0,245158	0,156546	0,088341
Norway	2,194151	0,97275	1,067464	0,405487	0,177645	0,037273	0,084689	0,576461	1,106526	3,731522	0,93055	0,000365	0,30796
Poland	2,301895	0,93028	1,205499	0,083806	0,271372	0,064785	0,07665	0,055671	1,713315	3,543642	0,222135	0,098243	0,137641
Portugal	1,668751	1,790839	0,684922	0,145876	0,139141	0,028529	0,161706	0,672172	1,898461	4,253931	0,12509	0,240005	0,431458
Romania	0,760787	1,301421	0,713339	0,126806	0,076554	0,001684	0,235219	0,855228	0,140601	3,067738	0,21483	0,015622	1,177848
Slovakia	1,241011	1,494675	0,557552	0,334744	0,53042	0,029298	0,14627	0,929769	1,562843	3,517814	0,622054	0,024714	0,362261
Slovenia	2,323912	1,824913	1,100022	0,086602	0,203314	0,01123	0,119592	1,00361	2,290054	3,804469	0,605427	0,088745	0,34803
Spain	1,783663	1,773969	0,640929	0,089407	0,124457	0,063306	0,134069	1,095752	2,72082	3,079193	0,120148	0,293576	0,034056
Sweden	4,172504	1,022822	1,151053	0,193044	0,018313	0,006955	0,100321	0,741238	3,301879	2,629895	0,454644	0,170895	0,204751
Switzerland	1,291124	1,646943	1,312782	1,189631	0,127431	0,034413	0,09665	0,989854	0,220175	1,809029	0,660197	0,089281	0,046116

Source: Data analyzed according to OECD (2021)

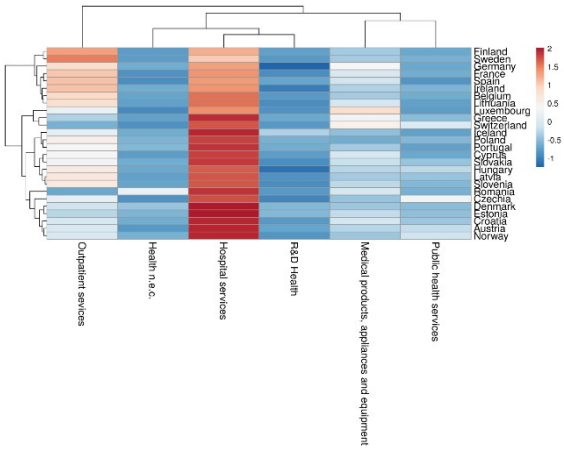
Figure 2: Dendrogram of education area



Source: Data analyzed according to OECD database (2021)

A prerequisite for a high level of education in Finland during the corona crisis for the organization of effective distance teaching and learning during the spring semester 2020 were investments in the digi-competence of teachers and students and digi-infrastructure and the availability of digi-tools. During the pandemic, they provided financial support for teachers' digi-pedagogy and students' digi-competencies. In addition, several innovations were created in the field of digital pedagogy and joint teaching (Lavonen and Salmela-Aro 2022). Based on statistical analysis in the case of health and expenditure on individual sub-areas (Figure 3), we can conclude that the Slovak Republic is included in a group of countries with Slovenia, Latvia, Hungary, Cyprus, Portugal, and Poland. We can therefore say that a similar structure of state budget expenditures for individual sub-areas of healthcare financing in relation to GDP is confirmed.

Figure 3: Dendrogram of health area



Source: Data analyzed according to OECD database (2021)

The field of healthcare was closely monitored by the public and the government during the 2021 budget year. The spread of the COVID-19 disease brought about several measures, based on which more financial resources were transferred to the health sector than to other areas.

CONCLUSION

Each country has the right to dispose of the funds entrusted to it. This power is exercised either by parliament, the government or in another form regulated by local legislation. The specifics of the year 2021, which brought with it constant measures due to the spread of the COVID-19 pandemic, were reflected primarily in expenditures in the field of health and education, which is also reflected in this scientific contribution. Based on statistical analysis - clustering, we managed to characterize the basic clusters that were created by comparing countries in individual sub-areas of state budget expenditures to the GDP of individual countries.

What are the results of our analysis important? From the point of view of the Slovak Republic, we have become among the countries with which we are at the level of state budget per capita, GDP and other economic indicators at approximately the same level. We note that in the field of education and health we are at the level of the V4 countries (Poland, the Czech Republic and Hungary), while our cluster is completed by countries from the Baltic States and South-Eastern Europe.

Expenditures in education are aimed at rationalizing the network of regional education, abolishing credit surcharges, increasing the share of students who do not continue in the second level of study, even with the help of professional practice. We are monitoring increased spending on teacher positions, including greater emphasis on practical training of future teachers directly in school. We are constantly following the trends of increasing tariff wages for teachers, ending the system of credit supplements and more significant remuneration for demonstrable quality (e. g. in universities for projects and professional contributions). In order to achieve better results in education, according to the Ministry of Education, Science, Research and Sport of the Slovak Republic, it is necessary to improve the quality and availability of data on the results of schools, pupils and graduates, as well as to reform the accreditation process of higher education institutions (*Ministry of Finance of the Slovak Republic*, 2022).

On the contrary, in area of health spending by the state, Slovakia has focused on finding measures to increase value in the health sector, while at the same time it will continue to reduce inefficient spending. Expenditures were feasible for financing based on the determination of the total necessary expenditures in the health sector, will improve the monitoring of results and data collection. In addition, the financial resources spent on indebtedness of hospitals, changes to the salary machine for health workers, prescription limits and eHealth were also significant expenses. The main goal in the field of health is to reduce the mortality avoidable by the health care system to the level of the average of the V4 countries and the OECD, with health expenditure increasing at the rate of inflation.

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