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THE EVALUATION OF ALTERNATIVE FINANCIAL RESOURCES OF SECONDARY EDUCATION IN THE MORAVIAN-SILESIAN REGION

Hodnocení alternativních zdrojů financování v rámci středního vzdělávání v Moravskoslezském kraji

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Annotation
The contribution deals with public and non-public financial resources of secondary education. It focuses on alternative financial resources, such as rental of buildings and sport fields, other complementary activities, donations, grants from other subjects, the programme Excelence, support of gifted students and European programmes (Operational Programme Research, Development and Education and programme Erasmus+). The Moravian-Silesian grammar schools are compared on the basis of average incomes in 2015-2017. The aim is to evaluate gaining of alternative resources by analyzed grammar schools established by the Moravian-Silesian. The research method is cluster analysis. The schools were divided into four clusters by results. The first three clusters are equal in number; the fourth cluster is atypical, containing one school, Gymnázium a SOŠ Rýmařov. This school shows extremely high values in incomes from other complementary activities and the lowest incomes from the programme Excelence. In terms of given criteria, the low numbers are shown with Erasmus+, which is caused by higher number of not involved schools. The research shows that none of the schools reaches extremely high incomes comparing to other schools in the most criteria. This could mean the impossibility for any subject to focus on all forms of gaining alternative resources.

Key words
education, Moravian-Silesian region, financial resources

Anotace
Příspěvek se zabývá veřejnými i neveřejnými zdroji financování středního vzdělávání. Zaměřuje se zejména na alternativní zdroje financování jako je pronájem budov a sportovišť, ostatní doplňková činnost, dary a dotace od jiných subjektů, program Excelence, podpora nadaných žáků a programy Evropské unie (Operační program Výzkum, vývoj a vzdělávání a vzdělávací program Erasmus+). Posuzována jsou gymnázia zřizovaná Moravskoslezským krajem na základě průměrných příjmů za období 2015 - 2017. Cílem příspěvku je zhodnotit získávání alternativních zdrojů u gymnázií zřizovaných Moravskoslezským krajem. Jako metoda pro výzkum je zvolena shluková analýza. Na základě výsledků byly školy rozděleny do čtyř shluků. První tři shluky jsou početně vyrovnané, atypickým shlukem se však jeví 4. shluk, který obsahuje jednu školu, Gymnázium a střední odbornou školu Rýmařov. Ta vykazuje extrémně vysoké hodnoty v příjmech z ostatní doplňkové činnosti a naopak nejnižší z programu Excelence. Z pohledu stanovených kritérií jsou velmi nízké hodnoty vykazovány u Erasmu+, což je způsobeno vyšší četností škol, které se do programu nezapojují. Z průzkumu vyplývá, že ani jedna škola nedosahuje extrémně vysoké příjmy oproti ostatním školám ve většině kritérií. Z toho lze usoudit, že není v možnostech žádného subjektu zaměřit se na všechny formy získávání alternativních zdrojů.

Klíčová slova
vzdělávání, Moravskoslezský kraj, zdroje financování

***JEL classification**: H72, H75, I220*

1. Introduction

The development of the trends of the education politics including its effective spending of the financial resources is the topic of many authors as Glesser (2019), De Witte, López-Torres (2017), Blankeau, Cassou, Ingram (2007) and others. The contemporary education politics of the countries in the European Union (hereinafter referred to as the EU) is discussed in the professional study of the European Commission (2018). However, the overall concept of the development of education policy is defined by the state. Strategic goals and directions of development of education and education system in regions, together with the criteria of development of education system and the efficiency of school network and school facilities, recently determines The long-term intention of education and the development of education system of the Czech Republic for period 2015-2020 (Ministerstvo školství, mládeže a tělovýchovy, 2015). It is a strategic document that is a binding basis for compiled intentions in individual regions. Specifically, in the Moravian-Silesian region (hereinafter referred to as the MSR), the priorities are the strategies of the development of education and school network in the region and also financing of regional education (Moravskoslezský kraj, 2016). The above defined strategic documents emphasize the sufficient and effective spending of financial resources in the educational system. Also, according to the authors Johnes (2017), Wolf and McNally (2011), the expenses on education are an important part of public budgets. At the same time, education is also an essential investment into the development of the long-term potential of countries and investment into related changes in technologies and demography, which are going to start up the labour market again. Also Breton (2013) says the effective use of expense on education has impact on economic growth. Even Maleševic Perovic, Golem and Mihaljevic Kosor (2018) analyze the territorial impact of the government expenses on education on the economic growth in the countries in the EU.

The educational system in the Czech Republic (hereinafter referred to as the CZ) comprises of schools and school facilities, that are defined in more detail in the law no. 561/2004 Collection of Law, on Pre-school, Basic, Secondary, Tertiary Professional and Other Education, as amended (hereinafter as „the Education Act“). The institution providing the school system in the CZ contains three levels of education, which are primary education, secondary and tertiary professional education and higher education (Dům zahraniční spolupráce, 2018). The founder of schools in the CZ is, according to the legislation, region, municipality and voluntary union of municipalities, and also competent ministries according to their competences (Ministry of Education, Youth and Sports, Ministry of Foreign Affairs, Ministry of Defence etc.), possibly registered churches and religious societies and other legal entities and natural persons by the specific legislation. The supply of schools, their structure and focus vary in the individual regions. Its developmental tendencies are based on a number of statistical data focused on performance indicators (Ministerstvo školství, mládeže a tělovýchovy, 2018), or from professional studies targeting on delimited areas in education (Svaz průmyslu a dopravy České republiky, 2012, Ministerstvo školství, mládeže a tělovýchovy, 2013b). The regional layout of schools is discussed by Kraftová, Lagusová (2014).

The school subjects perform the main and minor activities within their scope of activity. The main activity, education, is mostly financed by the means of the public budget. As a minor activity, the school can carry on the complementary activity whose principle is gaining additional financial resources with the help of the use of material and personal background of the school. The current school policy demands higher school activity in the area of gaining and procuring a sufficient amount of financial resources into their budgets by their own initiative. The complementary activity of schools cannot be in contrast to the main activity of school and show a loss. The most commonly used complementary activity is renting of classrooms and sports facilities after lessons, lecturing activity and organization of courses or seminars and, primarily for vocational schools, productive work of students. The additional financial resources are subsequently used to more effective activities in education. The problems of the efficiency of public financial resources and the way of its usage are also discussed by Afonso, Aubyn (2006), Halásková, Halásková (2016), Kovernuk (2016).

The spreading of activities in the area of education caused the need to finance not only activities, but also specific public projects and the whole expenditure programmes. It cannot be mentioned only the flow of financial resources, but also the realization of exactly defined objectives (Hamerníková, Maaytová, 2010). It means that we come across the financing from public projects and expenditure programmes more and more. Recently, it is possible to gain financial resources from the development programmes of the Ministry of Education, Youth and Sports (hereinafter referred to as MEYS). The applied programme, which can be considered also as an education

quality indicator, is programme Excelence, targeting the support of gifted students (Ministerstvo školství, mládeže a tělovýchovy, 2016). The education institutions can gain finances through the system programmes of the EU directed into the areas of education, specifically from the Operational Programme Research, Development and Education (hereinafter referred to as OP RDE) (Ministerstvo školství, mládeže a tělovýchovy, 2013a) or from the educational programme Erasmus+ that supports cooperation and mobility in all spheres of education (Dům zahraniční spolupráce, 2016), both for period 2014-2020.

Despite the fact that nowadays the economic situation does not allow business subjects to provide donations to school subjects, same schools dispose of such gained finances. Donation can also be purpose-bound; it means that the donator must invest the financial amount in accordance with the content of purpose in the gift contract.

The school subjects must be in accordance with the latest trends to spend considerable financial resources on the complex ensuring of school running. Unfortunately, their resources gained from the state budget and founders' budgets are limited. That is why the schools spend their own effort to provide additional finances from the public and non-public resources. In this case, we speak about alternative resources (Schwarzová, 2018). From the above-mentioned options, the development programme MEYS Excelence and the EU programmes OP RDE and Erasmus+ are classified as public resources. The non-public resources are complementary activities and donations from other subjects. The amount of alternative resources is often a reflection of school management activity. In some regions, e.g. the Moravian-Silesian one, the given activity is one of the main criteria in the evaluation of headmaster work. The question is if it is good to evaluate given indicators considering the different conditions in the individual schools.

1.1 Aim, methods and applied data

The aim of the contribution is to evaluate the gaining of the alternative resources within the grammar schools established by the MSR.

As a research method, it was chosen the cluster analysis which is also used in the area of public administration. The use of this method in regional research is the area of also Měrtlová, Prokop (2015).

The processing of the contribution proceeds from the professional literature and researches realized in the area of education. For the processing, there are used statistical data from annual reports and compulsory reports of the individual schools and internal materials acquired on the basis of their own observation of the data in the years 2015-2017. The contribution focuses on secondary education in the CZ, specifically on the comparison of public grammar schools established by the MSR. The selected file comprises of 29 subjects.

The aim was to find, using the method of cluster analysis, in the set of analyzed subjects (the grammar schools) the subsets (clusters) of subjects so that the subjects would be in the given subset as similar as possible in terms of chosen criteria and also they would not be too similar to subjects outside these subsets. To compare the subjects in years it was chosen the average value of incomes of the listed criteria. The criteria are: K1: economic result of the complementary activity - renting (hereinafter referred to as renting); K2: economic result of the other complementary activity (hereinafter referred to as other CoA); K3 donations and grants from other subjects than MSR (hereinafter referred to as donations and grants); K4: grants Excelence, support of gifted students (hereinafter referred to as Excelence); K5: Erasmus+ programme (hereinafter referred to as Erasmus+).

To suppress the influence of school size, the criteria for including into clusters were normalized considering the number of students, i.e. the figures of all criteria were stated after conversion in CZK/student. With respect to a different range (units of CZK vs. thousands of CZK) and variability of the individual criteria, the data were standardized with standardizing z-function, i.e. subtraction of average and standard deviation, before the clustering. All criteria are quantitative, therefore for the measurement of similarity between schools, it was chosen one of the scales of distance, the most commonly used Euclidean distance. In this research, it was, with regard to the small number of subjects, used the hierarchical agglomerative clustering. Two subjects, whose coefficient of dissimilarity is the lowest, were joined together into the first cluster and the new association matrix was calculated, in which the subjects from the first cluster were omitted and this cluster was classified as a new subject. This repeated as long as all subjects created one large cluster. For the clustering, Ward´s method was used. This method has the tendency to eliminate small clusters, i.e. to create the cluster with similar size. The method is based on the loss of information that develops with clustering. For all pairs of deviations of the subject distance, there is given the increment of the sum of deviation squares from the centre of the cluster originated by their merge with every step. The total increment is determined by this relation

$$\triangle C = \sum_{i=1}^{n_G} \sum_{j=1}^{n} \left(x_{Gij} - \bar{x}_{Gi}\right)^2 - \sum_{i=1}^{n_A} \sum_{j=1}^{n} \left(x_{Aij} - \bar{x}_{Ai}\right)^2 - \sum_{i=1}^{n_B} \sum_{j=1}^{n} \left(x_{Bij} - \bar{x}_{Bi}\right)^2,$$

where xGij is the value of the j-th variable of the i-th element (subject) of the cluster G, nG is the number of the elements of this cluster, xGi is the average value of the j-th variable of the cluster G, etc. Subsequently, the clusters to which the minimal value of increment △C is matching will be merged (Meloun, Militký, 2012).

To compare the found clusters of the grammars schools from the point of view of monitored criteria, the standard methods of exploratory analysis were applied - the description of the cluster with the sum of the averages (median, low and upper quartile) and visualization by multiple box graphs. To compare the found clusters of the grammar schools from the point of view of individual criteria by the methods of statistical induction the Kruskal-Wallis test was applied and in the case of the detection of statistically significant differences among the clusters (on the level of importance 5%) the multiple comparing by the Dunn test was performed. The way of evaluation of the education sector is mentioned by e. g. Böhm, Böhmová (2016) in their studies.

2. Results and discussion

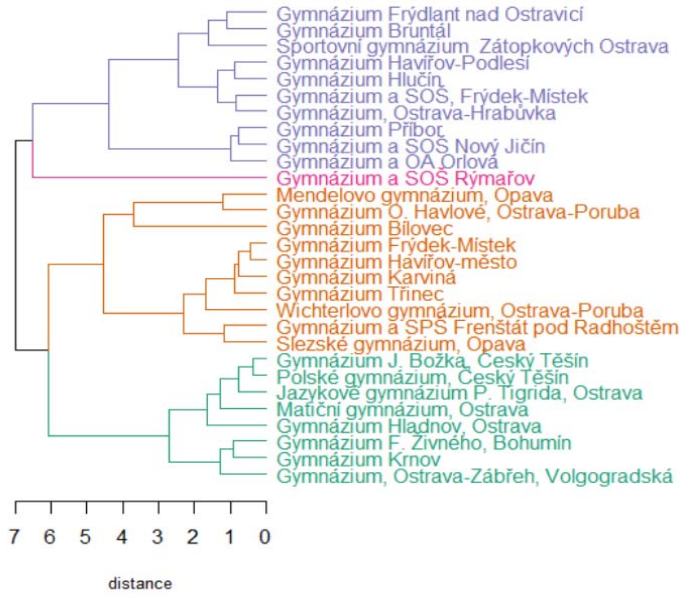
All grammar schools under the study fall among the most numerous group of schools registered in the CZ and are established by MSR. The largest amount of financial resources for a covering of direct costs is gained from MEYS from the chapter of budget 333. Operating and investment costs are provided directly by the founder. The resources from MEYS and resources from the founder should provide running of the school in its main activity. Even so, the founder puts emphasis that the schools subject should take part in this process and gain alternative financial resources from public and non-public resources. These finances can be invested in education development. The financial policy in the area of education has its ground position not only in the CZ but also in the public sector abroad. The influence of financial resources on education in Poland is discussed also by Guziejewska, Majdzinska (2018).

During the comparison of 29 grammar schools established by the MSR, the attention was given to the alternative financial resources that are gained by schools on the basis of their own initiative. These are public and also non-public resources. The public resources are selected as grants from the EU (Erasmus+, OP RDE), development programme MEYS Excelence, support of gifted students, grants from the cities and municipalities and the non-public resources are donations from business and other subjects, resources from complementary activity, from the productive activity of students, from the lecturing and other activities and from the renting of classrooms and sport fields. The observed figures are the average figures for given resources in the period 2015-2017.

2.1 Application of cluster analysis for comparison of financial resources at grammar schools established by the Moravian-Silesian region

Using the method of hierarchical agglomerative clustering we tried to find the clusters of schools among the analyzed schools whose behaviour is similar from the point of view of the above-given criteria. The individual steps are described in the dendrogram (figure 1).

Fig. 1: Dendrogram of the MSR grammar schools according to average income from selected resources (CZK/student) in the years 2015-2017



Source: processed according to compulsory documentation of schools and reports in programme R

The dendrogram above connects the most similar objects as first, in our case the schools Gymnázium J. Božka, Český Těšín, and Polské gymnázium, Český Těšín on the level of dissimilarity approximately 0.4. As the next connection of object, it can be considered the connection of the schools Gymnázium Frýdek-Místek and Gymnázium Havířov-město. This process still repeated until the level of dissimilarity (distance) is approximately 4.5 and the grammar schools are divided into four clusters. The assignment of the grammar schools into the clusters is presented in table 1.

Tab. 1: The division of the grammar schools in the MSR into the clusters according to the selected financial resources in years 2015-2017

cluster 1	cluster 2	cluster 3	cluster 4
Gymnázium, Ostrava-Zábřeh, Volgogradská	Gymnázium a SOŠ NovýJičín	Gymnázium O. Havlové, Ostrava-Poruba	Gymnázium a SOŠ Rýmařov
Gymnázium Hladnov, Ostrava	Sportovní gymnázium Zátopkových Ostrava	Wichterlovo gymnázium, Ostrava-Poruba	
Matičnígymnázium, Ostrava	Gymnázium, Ostrava-Hrabůvka	Slezské gymnázium, Opava	
Gymnázium Krnov	Gymnázium a SOŠ, Frýdek-Místek	Mendelovo gymnázium, Opava	
Jazykové gymnázium P. Tigrida, Ostrava	Gymnázium Hlučín	Gymnázium Havířov-město	
Gymnázium F. Živného, Bohumín	Gymnázium a OA Orlová	Gymnázium Karviná	
Polské gymnázium, ČeskýTěšín	Gymnázium Havířov-Podlesí	GymnáziumTřinec	
Gymnázium J. Božka, Český Těšín	Gymnázium Bruntál	Gymnázium Frýdek-Místek	
	Gymnázium Frýdlant nad Ostravicí	Gymnázium a SPŠ Frenštát pod Radhoštěm	
	Gymnázium Příbor	Gymnázium Bílovec	

Source: processed in programme R

The achieved results clearly show that the most similar are considered to be Gymnázium J. Božka, Český Těšín and Polské gymnázium, Český Těšín. These grammar schools are specific by their border locality. The other very similar grammar schools are Gymnázium Frýdek-Místek and Gymnázium Havířov-město. Both schools are similar in the fact that they have one more competitive grammar school in their area. Gymnázium and SOŠ Rýmařov, which was placed into the separated cluster, can be perceived as an atypical subject in which is not only general

but also vocational education, comparing to other compared schools. This school was established because of the optimization of the schools in MSR.

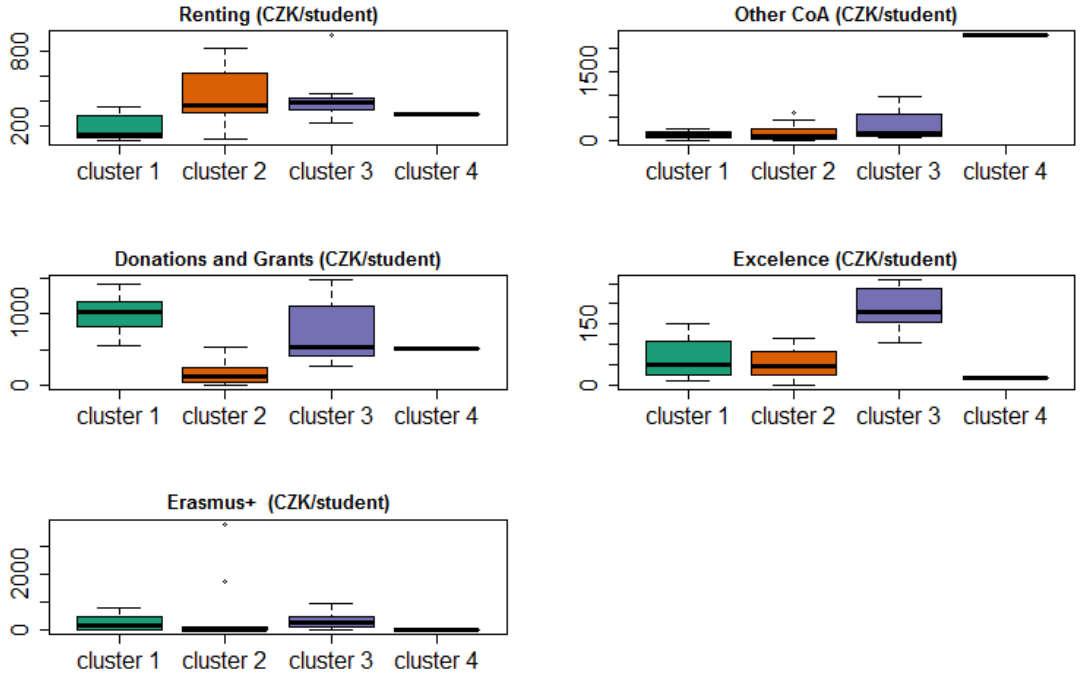
More results of the comparison of financial resources gained beyond the stative normative are listed in following table 2 and box diagram (figure 2). Table 2 comprises of the average incomes for individual clusters of schools in 2015-2017 according to the partial criteria, which is median. Lower and upper quartiles are in the brackets. Cluster four contains only one subject which is why there is only one figure of the average income.

Tab. 2: The average incomes in 2015-2017 for individual clusters of schools according to the partial criteria

	Renting (CZK/student)	Other CoA (CZK/student)	Donations and grants (CZK/student)	Excelence (CZK/student)	Erasmus+ (CZK/student)
Cluster 1	130 (100; 260)	144 (70; 176)	1030 (820; 1160)	52 (28; 105)	140 (0; 430)
Cluster 2	370 (310; 580)	101 (37; 219)	140 (60; 250)	46 (29; 75)	0 (0; 80)
Cluster 3	390 (330; 410)	174 (106; 522)	550 (430; 1010)	180 (161; 225)	240 (130; 440)
Cluster 4	290	2289	510	20	0
Total	320 (220; 410)	139 (80; 262)	510 (260; 990)	90 (37; 156)	100 (0; 400)

Source: processed in programme R

Fig. 2: The division of MSR grammar schools according to the selected public and non-public resources of incomes with the use of box diagram (2015-2017)



Source: processed in programme R

To compare the found clusters of the grammar schools from the point of view of individual criteria by the methods of statistical induction the Kruskal-Wallis test was applied and in the case of the detection of statistically significant differences among the clusters (on the level of importance 5%) the multiple comparing by the Dunn test was performed. Cluster 4 could not be involved in this comparison because it contains only one subject. The relationship between cluster 4 and 1-3 is assessed only on the basis of exploratory analysis.

If we compare clusters 1-3, we can state that in terms of the incomes from the other CoA and the incomes from Erasmus+ the statistically significant differences among clusters 1-3 were not found ($p\text{-value}_{\text{Other CoA}}=0.295$, $p\text{-value}_{\text{Erasmus+}}=0.162$). It worth the mention that cluster 2 is in terms of incomes from the Erasmus+ significantly misbalanced. Only 3 out of 10 grammar schools in this cluster show non-zero incomes from this programme, at the same time Gymnázium Bruntál has average incomes from this programme in 2015-2017 100 CZK/student, Gymnázium a OA Orlová 1738 CZK/student and Gymnázium Frýdlant nad Ostravicí 3820 CZK/student. The grammar schools with average incomes from Erasmus+ amounting into thousands CZK/student are, in relation to the cluster two, assessed as remote of observation (see figure 2). In terms of average incomes from the other CoA,

Sportovní gymnasium Zátopkových, Ostrava is assessed as remote of observation. Its average income in this criterion is 612 CZK/student (see figure 2).

Concerning average incomes from renting, the clusters of the grammar schools significantly differ (p-value=0.016). The grammar schools from cluster one has statistically significantly lower average income than the grammar schools from cluster 2 (median=370 CZK/student) and the grammar schools from the cluster to (see figure 2). In cluster three Gymnázium Bílovec with average income from the renting 930 CZK/student is identified as a remote observation. According to the average income from donations and grants, the clusters of the grammar schools significantly differ (p-value<0.001). The grammar schools from cluster two have statistically significantly lower average income than the grammar schools from the cluster one and three. From the perspective of average income from Excelence, the cluster of the grammar schools significantly differ (p-value<0.001). The grammar schools in the cluster three have statistically significantly higher average income than the grammar schools from the cluster one a grammar schools from cluster two.

The multiple box graph (see figure 2) shows that the cluster four (Gymnázium a SOŠ Rýmařov) differs from the rest of the clusters mostly in the criterion the other CoA (2289 CZK/student), when the income of this school exceeds more than thirteen times income medians of the grammar schools in other clusters. The school has, unlike the „clean" grammar schools, a larger possibility to gain resources from the productive activity of students as a part of the other complementary activity.

The clustering of schools clearly shows the position of Gymnázium a SOŠ Rýmařov (cluster four) that is completely different in the criteria of the other CoA (median is several times higher than the other clusters) and Excelence (median is the lowest of all clustering).The school has, unlike the „clean" grammar schools, a larger possibility to gain resources from the productive activity of students as a part of the other complementary activity. At the same time, the results of the educational activity are distorted by the combination of two types of schools that has a varied quality of students.

The first cluster of schools achieves statistically significantly the lowest value of the median of the average income comparing to other clusters in the area of renting. Moreover, these are the grammar schools that possess larger property and quality material equipment. What is more, they are located in larger localities (namely Ostrava), where is surely concern about a given form of financing. The second cluster deviates from the average income median point of view only at the criterion donations and grants. It shows statistically significantly the lowest value of the average income median probably because of the location of the schools (Orlová, Bruntál, Frýdlant nad Ostravicí, Hlučín). These are remote localities or areas with high unemployment, which means that the possibility of gaining financial support from business subjects is almost zero. The third cluster is special, in a positive way, with the criterion Excelence where is its income median statistically significantly higher than other clusters. The grammar schools of this cluster can be, on the basis of this criterion, evaluated as schools with gifted students, who achieve excellent results in national and international competitions. Because of the fact that the time period for research is short and the analysis of general education prerequisites of the school students is missing, it cannot be told if this is a momentary input of gifted students or the great work of teachers.

3. Conclusion

On the basis of the executed research, the specifics and differences in the attitude to gaining public and non-public financial resources for the grammar schools established by MSR have been confirmed. The comparison of selected public and non-public financial resources of all (29) grammar schools established by MSR for the period of three years showed that the biggest differences are in the area of the other CoA between the first three clusters and the fourth cluster that has only one school (Gymnázium a SOŠ Rýmařov). This cluster performs extremely high values here. Further, very low values are performed in Erasmus+, which is caused by the higher number of schools that are not involved in this programme.

The result of the research is that none of the schools protrudes above the others in most of the criteria. This could conclude that itis not in power of any subject to focus on all possible forms of gaining alternative resources. The question is if all grammar schools fully use their potential and focus on the most profitable areas for them. The way of evaluation with the cluster analysis and gaining of the characteristics of individual schools with the definition of their weak and strong sides in the area of gaining alternative resources could be the foundation for the founders, not only how to assess individual schools, but also how to show them the way of possible development, as the evaluations of the level of schools and schools facilities with their economic activity are implemented within the public control executed by not only by the Czech School Inspectorate, but also by the founder, e.g. relevant region.

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