
Education Financing: Explaining the Expenditure Concentration Gap between the State and Local Governments in Poland 2008-2019

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Abstract:

Purpose: The aim of this article is to explain the differences between the educational expenses of municipalities and cities in Poland and the educational subvention received by them from the state budget, in particular the scale of the violation of the actual educational expenses of municipalities and cities by their original structure as a result of aggregated decisions of local authorities.

Design/Methodology/Approach: The concentration degree of educational expenditure and subvention streams using the Herfindahl-Hirschman Index (HHI), for 2008-2019 from the database of the Local Data Bank of the Central Statistical Office has been used.

Findings: The educational subvention was universal (nationwide), which is evidenced by the low degree of its concentration for all the studied groups of entities, the highest HHI values for educational expenses were recorded in the cities with county rights in terms of expenses on subsidies, property expenses, expenses on materials and services, as well as total expenses, and the higher degree of concentration of these expenditures as measured by the HHI results from uncoordinated financial decisions of the cities authorities concerning expenditures on education, disturbing the universal character of the nationwide educational subvention in aggregate were observed.

Recommendations: There is a need for systemic actions of central and local authorities to reduce the level of imbalance in financing education by local governments.

Practical Implications: for the empirical identification of determinants of the educational expenditure and subvention level of municipalities as a starting point for a discussion on the actual scale of financial responsibility for education in Poland.

Originality/Value: To estimate the concentration gap between educational expenditure and subvention for groups of entities under study, local governments, municipalities and cities.

Keywords: Education financing, Poland, concentration, Herfindahl-Hirschman Index.

JEL codes: H24, H52, H75, I22, J38.

Paper Type: Research study

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1. Introduction

Education contributes to the development of individuals and society therefore the benefits achieved through education process do not only remain at the individual level. They extend to complete communities on all levels - from the immediate circle of individuals to the local, national and international community. In this context, education becomes a public task, carried out - to varying degrees - by the authorities for the benefit of the inhabitants of individual countries. Contemporary, the responsibility for organising the education process and public spending on education is being transferred on a greater scale and more frequently from the central government to the local and regional level as a result of the decentralisation. This is the situation in Poland and many other countries.

However, diversified income potential does not ensure stable financing of educational tasks in all Polish local government units. In this context, special attention should be paid to the educational subvention, which is divided among local government units based on the scope of their educational tasks measured by the number of pupils and students. The subvention yet is the primary source of education expenditure for local authorities. Local governments, in turn, based on other sources of their income, should ensure the value of educational expenditures at an appropriate level. However, an increase in the scope of educational expenditures on the local scale may disturb the universality of such expenditures previously defined by the universal character of the subvention granted to local governments by central authority.

The topic of the research in this article is the differences between locally incurred expenditures on educational tasks in Poland and subventions from the state budget feeding local budgets divided according to the scope of these tasks. The research is aimed to measure and analyse the degree of concentration of local expenditure and subvention streams, as well as differences between them for municipalities and cities⁴ in Poland in the years 2008-2019. Based on the obtained results, an attempt was made to indicate the nature of expenditures distorting the universal character of the financing of educational tasks, which may provide a basis for discussion about the real responsibility for financing educational tasks in Poland from public funds.

The paper is organised as follows. Section one reviews the literature on education as a service meeting individual and collective needs, as well as the justification of its public financing. The second section presents the scale of financing of education by Polish local governments in the period under study. The third section presents the methodological characteristics of the research conducted, while the fourth one discusses detailed findings resulting from the research. The article closes with conclusions and recommendations.

⁴A city with county rights - a unit of territorial self-government operating in Poland since 1999; it is a urban municipality that additionally performs the tasks assigned to the county.

2. Education as a Publicly Funded Task: A Literature Review

Education can be defined as a long-term process important for the development of individuals and communities. As such, it is essential for economic development and the preservation and enhancement of the cultural heritage of societies (Cebeci, Algan, and Cankaya, 2015). Education is to fulfil four genuine functions over many years: (1) socialisation, (2) the assimilation of attitude, behaviour and habit, (3) the acquisition of knowledge and skills, (4) the propensity to the profession, bringing certain professional opportunities (Schulz, 2008). The functions of education are one of the premises justifying its public financing. This issue is part of a long-running discussion on the role and size of the public sector, conducted within the framework of economic theory. The subject of consideration is, among others, the choice of goods and services provided (financed) by this sector by the public authorities (Buchanan, 1968; Head, 1962; McConnell, 1987), as well as the scale of their provision. There is a consensus among authors on including education in the catalogue of goods and services financed by public funds even though it is not a pure public good. Public financing of goods and services is not the same as their provision by public entities alone. Services that simultaneously satisfy individual and collective needs, such as education, can be provided by both public and private entities.

According to the normative approach, public financing of education is most often justified by positive externalities, compensation for market failures, e.g., information asymmetry (Levy, 2005) and affecting economic growth through increasing the productivity of the labour force, reducing income and social inequalities, promoting health, creating better conditions for good governance, increasing the knowledge and innovation capacity of the economy (Awaworyi, Churchill, Ugur, and Yew, 2017). In contrast, the positive approach perceives public spending on education as a redistribution of funds (Levy, 2005).

Education is most often associated with knowledge and the right to acquire it. In developed countries, public funding ensures the realisation of citizens' right to universal and almost free access to education for major age groups (López Rupérez, García García, and Expósito Casas, 2018). On the contrary, in developing countries, the challenge the governments are facing is to shift the focus of public financing from increasing the quantity of education to improving its quality (Sari, 2019). Public funding of education also serves various social policy objectives (Antoninis and Tsa-Kloglou, 2001).

According to human capital theory, spending on education is an investment (Sarid, 2017). Considering education as a real investment thus reinforces the problem of the efficiency of its public financing (López Rupérez, García García, and Expósito Casas 2018). However, each country must decide at what level of government funding will be most efficient.

It is worth noting that several types of efficiency are distinguished. Allocative efficiency refers to the relationship between residents' demand for public services and their supply. Distributive efficiency, on the other hand, refers to how public services are delivered to different groups of residents (Andrews, Entwistle 2013). Thus, spatial distribution should also be a criterion for assessing the efficiency of spending and other activities of public authorities (Carlitz, 2019) at central and local levels.

Samuelson (1954), in a pure theory of public expenditure, pointed out that goods and services that satisfy collective needs can only be financed efficiently at the central level. However, in the 21st century, it is widely accepted that the decentralisation increases efficiency and the influence of social expectations on those in power (Lago, Lago-Peñas, and Martinez-Vazquez, 2020), ensuring better government accountability and realization of the diverse preferences of individual residents (Cahyaningsih and Fitriady, 2019).

Driven by these considerations, in the 20th century, many countries delegated a significant part of the tasks and competencies in education and school system management to regional and local authorities along with the responsibility for their financing as a result of decentralisation. Its degree in education varies over time and between countries, although two levels of school policy can be distinguished. The first level, concerning the educational process and curriculum requirements, increasingly involves the schools themselves. The second involves the spatial organisation of the school system and access to education, which in most developed countries is the responsibility of local and regional authorities. The central government, on the other hand, determines the external framework of the two policies implemented, i.e., the curriculum framework and pedagogical requirements as well as the optimal school size, the form of governance, the rules of school enrolment (Meyer and Kučerová, 2018).

However, the limited, individually determined financial capacities of local authorities do not allow to expect egalitarian outcomes of publicly funded schooling across the country (Andreou, Koutsampelas, and Pashardes, 2014). Financing education at the local level is a difficult decision-making problem. From the local government's point of view, the decision problem consists of choosing the best combination of locally imposed taxes, budget surplus or deficit, and output in public services as a subject to the constraint that local government spending plus budget surplus cannot exceed grants from the central government plus local taxes (Aaberge and Langørgen 2003).

3. Financing Education in Poland at Local Level 2008-2019

The subject literature indicates a high degree of decentralisation of the education system in Poland (Bukowski and Kobus, 2018). In the years 2008-2019, the source of financing of educational tasks of local government units in Poland was the total

income accumulated in their budgets, including the educational part of the general subvention (hereinafter educational subvention). It is a transfer from the state budget to the budgets of local government units. The largest stream is transferred to municipalities and cities with county rights. However, the amount of this subvention was disproportionately small in relation to legitimate needs. A look at public finance from the point of view of the local governments reveals, therefore, a structural gap "in intergovernmental fiscal relations that escape conventional analysis" (Guziejewska and Walerysiak-Grzechowska, 2020).

In the period 2008-2019, the educational subvention did not finance all budgetary expenditure on education at the local level. The data in Table 1 show a growing burden of educational expenses on the local budgets in Poland. Although at that time the income of these units from the educational subvention was growing from PLN 24 to 38 billion, it was not enough to finance education expenses (PLN 37-66 billion). The gap in this respect was continuously growing from PLN 16 billion in 2008 to almost PLN 30 billion in 2019. The significant increase of the gap between educational expenditure and subvention after 2016, as shown in Table 1, coincides with the reform of the school system introduced at that time. Thus, it may result not only from an increase in the costs of school operations, but also from the state passing on the costs of its reforms to the local authorities.

Table 1. *Level of income from educational subvention (S), expenditure on education (E) and their differences (E-S) in all local governments in Poland in the years 2008-2019 (billion PLN)*

| Year | all local governments | | | municipalities | | | cities with county rights | | |
|------|-----------------------|----|-----|----------------|----|-----|---------------------------|----|-----|
| | E | S | E-S | E | S | E-S | E | S | E-S |
| 2008 | 37 | 24 | 13 | 23 | 14 | 9 | 14 | 10 | 4 |
| 2009 | 40 | 26 | 14 | 24 | 15 | 9 | 16 | 11 | 5 |
| 2010 | 43 | 27 | 16 | 27 | 16 | 11 | 16 | 11 | 5 |
| 2011 | 45 | 28 | 17 | 28 | 17 | 11 | 17 | 11 | 6 |
| 2012 | 47 | 30 | 17 | 29 | 18 | 11 | 18 | 12 | 6 |
| 2013 | 48 | 31 | 17 | 30 | 18 | 12 | 18 | 13 | 5 |
| 2014 | 50 | 31 | 19 | 30 | 18 | 12 | 20 | 13 | 7 |
| 2015 | 52 | 32 | 20 | 31 | 19 | 12 | 21 | 13 | 8 |
| 2016 | 53 | 33 | 20 | 32 | 20 | 12 | 21 | 13 | 8 |
| 2017 | 57 | 34 | 23 | 34 | 20 | 14 | 23 | 14 | 9 |
| 2018 | 62 | 35 | 27 | 37 | 21 | 16 | 25 | 14 | 11 |
| 2019 | 66 | 38 | 28 | 40 | 22 | 18 | 26 | 16 | 10 |

Source: Own elaboration based on <https://bdl.stat.gov.pl/BDL/>.

4. Quantitative Survey Methodology

The object of the study is the difference (gap) between the amount of educational expenditure and subvention at the local level in Poland. The research was conducted for three groups of entities. The first group included all types of local governments

(2478 units), the second - 2412 municipalities without urban municipalities (cities), and the third one – only 66 cities with county rights.

The research undertaken was focused on determining the difference between expenditure on education and subvention in these groups and identifying the determinants of this gap. For this purpose, processed and aggregated series from the years 2008-2019 were used regarding educational subvention and local expenditures on education (total expenditures, in particular: current expenditures including: salaries, subsidies transferred to private entities running educational institutions and expenditures on materials and services; property expenditures). The aforementioned data was obtained from the Local Data Bank of the Central Statistical Office in Poland (<http://www.bdl.gus.gov.pl>). Confirmation of the observations made was provided by an analysis of the concentration of subvention and expenditure on education, carried out using the Herfindahl-Hirschman Index (HHI).

The rationale for conducting the research into the degree of concentration (or dispersion) of relevant streams of money (expenditure on education, educational subvention) was the need to demonstrate to what extent the aggregated decisions of local authorities can contribute to the stability of the universal system of education financing. The axis of the presented argumentation is the phenomenon of concentration, treated in contrasting terms as the opposite of the phenomenon of dispersion.

The study of this phenomenon is an important part of economic analysis. Such research may concern different areas of economy: agriculture, services, production, as well as issues from the borderline of administration and public finance. Hexter and Snow (1970) indicate that concentration indices can be used for measuring market concentration and aggregate concentration. The first refers to the share of economic resources or activities that constitute a small number of entities in a given industry and is often used as an indicator of the strength of influence of dominant entities in the market. The other one measures the degree of concentration (dispersion) of economic aggregates in relation to the entire set of a relatively small number of entities described by the studied aggregate.

One of the more readily used indicators of concentration is the entropy coefficient, widely used as early as the 1970s (Hart, 1971) to study market concentration. However, in the literature we find numerous applications of concentration analysis in other research areas (Paulson and Garrison 1973; Harmanciouglu, Singh, and Alpaslan 2012; Lenormand *et al.*, 2020). As a concept derived from information theory, entropy is a synthetic, relative measure of the degree of disorder in a given set understood as the dispersion of the probability distribution of the values of a random variable. In concentration analysis, the entropy coefficient (E) will have the form:

$$E = - \sum_i^n s_i \ln s_i \quad (1)$$

assuming the greater values, the smaller the observed diversity of shares of particular (s_i) elements (sectors, entities) in the whole set. The entropy coefficient (E) is an inverse measure of concentration, because as it increases, a more complete dispersion of the aggregate under study is indicated. The coefficient reaches its highest value in the case of a uniform distribution, when the shares of the individual elements are equal. Its value is then equal to the value of the natural logarithm of the number of elements (n) of the examined set.

Entropy is a useful measure because it has a number of unique properties that make it superior (Luisa and Dillman, 1978) to other indices used to measure relative convergence, such as the Lorenz curve or the Gini coefficient. Its undoubted advantage is that it is a measure with possible unique values for each set of elements studied. It can be stated that in the case of full dispersion, with the appearance of an additional element in the set, its value increases and vice versa. The lower limit of the value of this measure is zero, which corresponds to the situation that we are dealing with a single-element set.

Using the entropy index as a comparison measure, however, is not always possible. If the number of elements within the two compared sets were different, the maximum value of the entropy index would automatically be different. Therefore, for the purposes of this study, it was decided to use a measure known as the Herfindahl-Hirschman Index (HHI). In the case of the HHI, similarly to the entropy index, the share of a single unit (s_i) in the total set is defined as a decimal fraction. The index value then takes values in the closed interval [0;1]. The higher the obtained value of the HHI, the higher (lower) degree of concentration (dispersion) within the whole set becomes. In the case of a one-element set, this coefficient equals 1. The Herfindahl-Hirschman Index is shown by the formula:

$$HHI = \sum_{i=1}^n s_i^2 \quad (2)$$

For a given number of elements (n) having equal share in the set, the minimum value of the coefficient will tend towards zero and will be $\left(\frac{1}{n}\right)$. Thus, the HHI coefficient exhibits the characteristics of a taxonomic measure. It should be noted that according to the properties and shape of the quadratic function, units with larger shares have a more than proportional influence on the value of the coefficient.

The HHI as a statistical measure of concentration is used by the Antitrust Division of the Department of Justice and the Federal Reserve Bank in assessing the competitive effects of mergers or acquisitions (Rhoades, 1995). Nocke and Whinston (2020) report that until 2010, the U.S. Department of Justice considered a market to be dispersed and competitive when $HHI < 0.1$. When the value of this index was within the range: $0.1 < HHI < 0.18$, the examined set was considered moderately concentrated, and when the index exceeded the level of 0.18, it was considered

highly concentrated and inadvisable. A change in 2010 changed the HHI thresholds to [0;0.15], [0.15;0.25], and [0.25;1].

Using the Herfindahl-Hirschmann Index in the present study, it was assumed that since Poland has been divided into 16 voivodeships since 1999, the theoretical minimum value (tmv) of the HHI for Poland is 0.0625. Such a value should therefore be interpreted as indicating low concentration within the examined set of elements.

5. Main Findings and Results of the Quantitative Survey

Table 1 presents the value of gap between educational expenditures and subvention for the studied groups of Polish local governments. In view of the increasing and significant level of the studied phenomenon in 2008-2019, the question arises about the possible stability violation of the public finance system (Neyapti, Bulut-Cevik 2014) by the fact of deepening and varying the size of deficits (gap, difference) generated at the local level.

It is plausible that there is at least one detailed category of expenditure on education, which is decided on a case-by-case basis by the local authority managing educational institutions, but it should be assumed that not all local government units implement this category of expenditure in similar proportions. In this state of affairs, one can see the reasons for the deepening (Guziejewska and Walerysiak-Grzechowska 2020) differentiation and discrepancy between the subvention and necessary funds for educational tasks.

Figure 1A shows the HHI values for the educational subvention in all subject groups. From this data, it can easily be deduced that the subvention is universal in nature, as given evidence by the HHI values remaining admittedly slightly above the theoretical minimum value. However, attention is drawn to the higher value of the index for cities with county rights, particularly in 2018-2019, where the HHI slightly exceeded the value of 0.1, which indicates an increased flow of educational subvention to these very entities.

Figure 1B presents HHI values for educational expenditures. A distinctly higher value of this index for the cities in the entire period under analysis (above 0.1) indicates that their decisions on the need to finance educational tasks from budgetary revenues other than the subvention were most frequent. The figure 1B also implies that these decisions were not coordinated, as the HHI values indicate an increase in variation within the examined set. In individual entities, the situation in this respect may have varied, depending on the characteristics of the network of educational institutions and the technical condition of municipal buildings and premises in which educational services are provided.

Figure 1C illustrates the degree of concentration of differences (gap) between the streams of educational expenditure and subvention for the three groups of entities under study. It should be noted that in this case the theoretical minimum value (tmv) is zero and is not taken into account. It results from the fact that for both subvention and expenditure the tmv is 0.0625. This value takes into account the hypothetical condition of the identity of elements of the set. Thus, if the elements of the set were to be identical, there could not be any difference between them. In this circumstances, if the difference for each pair of elements of the set is zero, then also the square of such a difference is zero, and thus the sum of the squares of such differences would also have to be zero. The reading of Figure 1C indicates clearly that the level of studied gap of a significant and diverse nature is observed for cities with county rights. The HHI is constantly at the level of more than 0.1.

The analysis of the data in Figures 1A-1C calls for a specific examination of the expenditure categories separated within the total expenditure allocated to education. The results of detailed research presented in Figures 2A-2C confirms previous observations concerning the reasons for the increase in differentiation and thus the increase in the HHI for the expenditure of cities with county rights. However, the picture of the concentration of individual educational expenditures incurred in cities shows two different qualitative features. The first is a noticeable difference in the amount of subsidies paid from their budgets to private entities providing educational services. This phenomenon is more common in the case of cities than municipalities (the HHI has lower values in Figure 2B).

The other qualitative difference for cities is the level of their property expenditure on education, for which the HHI values remain above 0.1 and periodically increase even above 0.15. The degree of variation in this category of expenditure is also significantly higher for cities than for municipalities, where an increase in variation can be observed between 2010 and 2016, although the HHI only once exceeds 0.1. It is also worth noting that the degree of variation in cities' expenditure on materials and services related to the provision of educational services is higher (Figure 2C) than for municipalities.

6. Conclusions and Recommendations

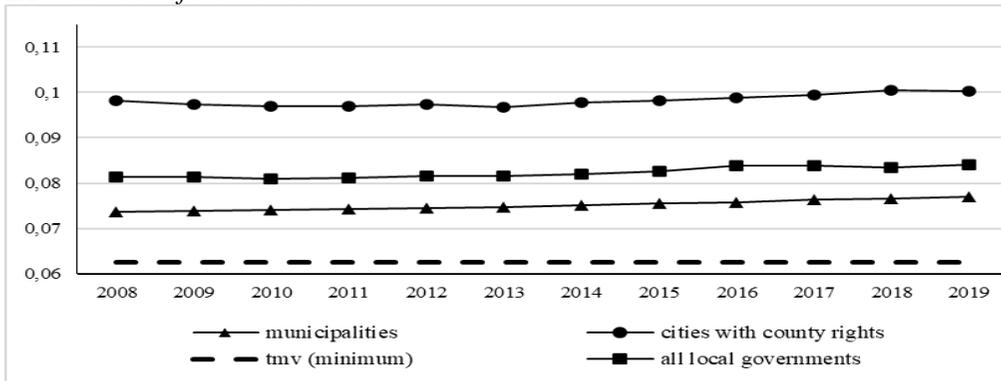
When decentralising education in Poland, municipalities were provided with funds for the expenditure necessary to carry out the tasks entrusted to them as part of their total budget revenue, including the educational subvention. Despite the formal guarantee, such a system of financing means that the responsibility of central (providing the subvention) and local (deciding on its allocation, but at the same time obliged to incur higher budgetary expenditure on education) authorities is not clearly defined (Nucińska, 2018).

The analyses carried out indicate a significant gap between the level of educational expenditure of the surveyed local government units and the subvention they received

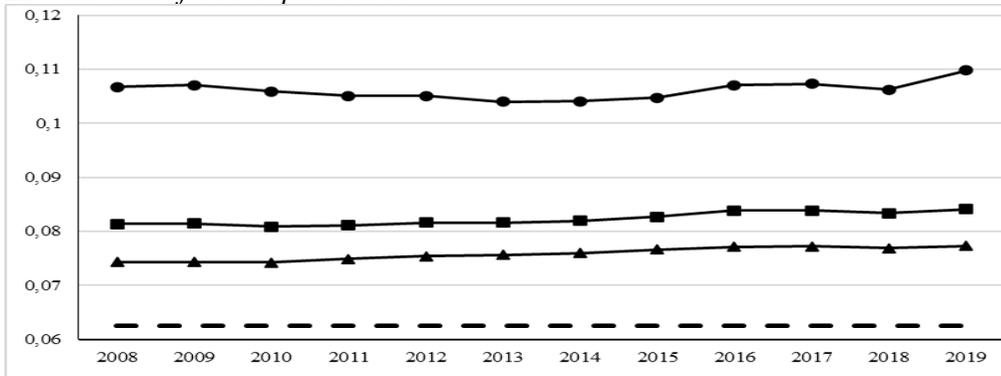
in 2008-2019 (Table 1). The applied HHI approach makes it possible to identify those determinants of this gap that depend on aggregate decisions of local authorities. Their determinant was the variation in the concentration' degree of the examined cash streams.

Figure 1. HHI for three types of local governments

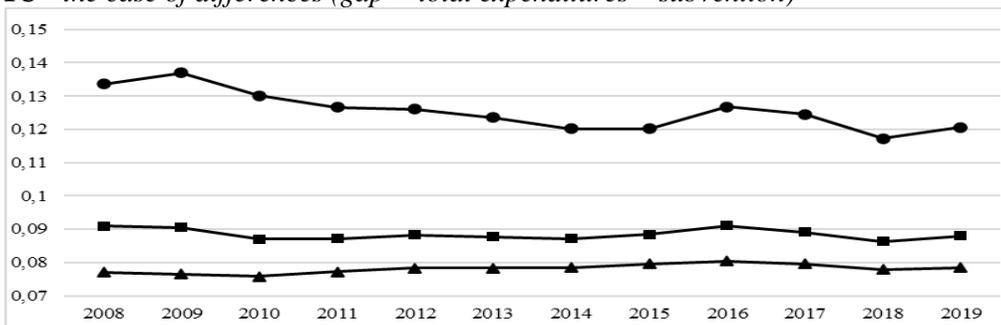
IA - the case of subvention



IB - the case of total expenditures

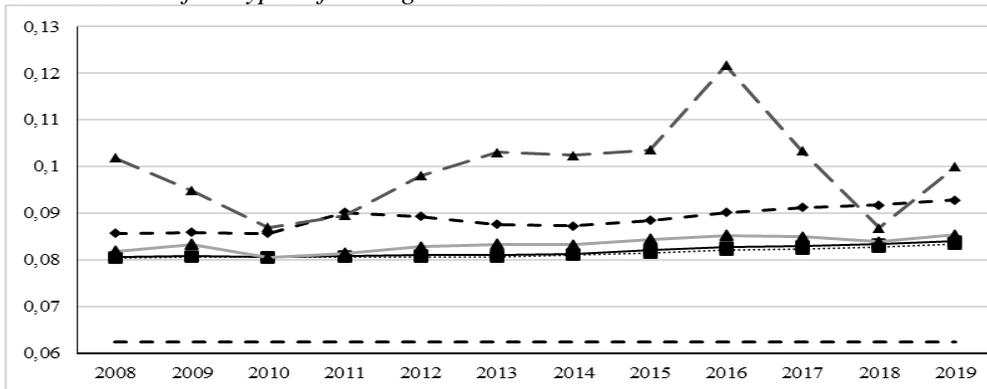


IC - the case of differences (gap = total expenditures – subvention)

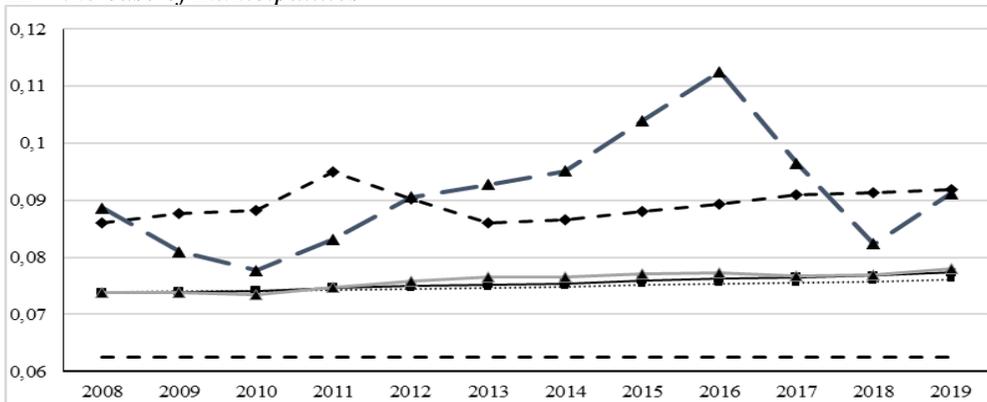


Source: As for Table 1.

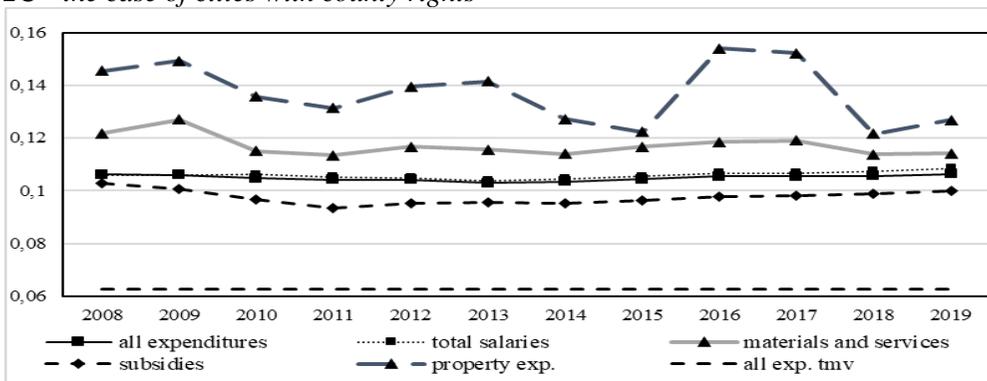
Figure 2. Expenditures Concentration
2A – the case of all types of local governments



2B - the case of municipalities



2C - the case of cities with county rights



Source: As for Table 1.

The first conclusion showed the universal character of the educational subvention for all municipalities and cities in the country confirmed by a slight variation in the degree of its concentration for the three analysed local government groups (Figure 1A). Thus, the amount of the subvention received depends mainly on the decisions of central authorities, and local governments can influence its level only slightly.

The second observation concerned the cities, where there was a significant variation in the degree of concentration of educational expenditure and the level of the gap between expenditure and subvention (Figures 1B-1C). This indicates a greater influence of the local conditions for the realisation of educational tasks, including the decisions of the cities' authorities, on the level of expenditures and gaps. They are influenced, among others, by the attractiveness, diversity of the offer and standard of educational services of institutions run by the cities with county rights.

Analysis of Figures 2B-2C confirms the dependence of some educational expenditure categories on aggregate decisions of local authorities. Property expenditures depend on them. These are mainly due to the technical condition of local government property in which educational services are provided. It often requires large expenditures on capital repairs, modernisation, or supplementation through investments in new buildings.

Moreover, higher HHIs were recorded for grant (subsidies) expenditure. Local authorities are obliged to provide funds to educational institutions run by other entities in the form of grant (i.e. subsidies), the amount of which depends mainly on the number of pupils, their health status, and educational needs. The decrease in the number of pupils in local authority establishments (due to the demographic decline and the choice of third-party establishments) resulted in an increase in the average fixed costs of their maintenance per pupil. When calculating the educational subvention per pupil, this therefore increasingly perpetuates the growing level of gap between educational expenditure and subvention. Additionally, especially in cities, local authorities distort the stability of expenditure on materials and services for their educational institutions (Figure 2C).

However, it is worth noting that there are also systemic factors determining the gap between expenditure and subvention, which are decided by the central government. First of all, they legally regulate the rules of employment and remuneration of teachers and other employees in educational institutions, and decide on their minimal salary increases. However, expenditure on salaries did not show a differentiated degree of concentration for the surveyed units (Figures 2A-2C), which confirms its uniform character on the national scale. However, this does not exclude their influence on the overall level of the gap between expenditure and subvention. This largest category of expenditure treated separately was not fully covered by the educational subvention. It allowed to finance in municipalities 95.9% of the salaries of education employees in 2008 and only 81.5% of their salaries in 2019, and in cities - respectively - 99.4% and 92.3%.

Furthermore, the level of differences between educational expenditures and subvention for all local governments in Poland is due to the implementation of successive school reforms (1999, 2017) resulting in increased costs: adjustment of teachers' employment, necessary investments in new school buildings (property expenses) and their further maintenance (expenditures on material and services).

Taking into account the financial situation of local government units in Poland (Kotlińska 2018), caused by the construction of their revenue system, as well as the constantly increasing scope of their tasks, it is possible to predict in the coming years a deterioration in the standard of services provided in public educational institutions in Poland, including the technical condition of buildings and premises where these activities are carried out. Having examined the gap between state subventions and local authorities' educational expenditures, a number of measures shall be taken into consideration:

- 1) linking the amount of educational subvention to the differentiated local expenditures on education, determined mainly by national legal regulations (decisions of central authorities), as well as local conditions of providing educational services;
- 2) rationalisation the network of municipal educational institutions and expenditures on their operation by local authorities in Poland;
- 3) performing a detailed analysis of the costs of running local government educational institutions in Poland in order to determine what standard of quality of their services is ensured by financing at the level of the received educational subvention.

The resulting and widening gap may jeopardise the financial stability of local authorities in the future. Therefore, it seems justified to carry out additional research addressing the issue of the probably changes in expenditure' structure of local government budgets in the face of the simultaneously growing gap between their expenditure on education and the subvention received from the state budget.

References:

- Aaberge, R., Langørgen, A. 2003. Fiscal and Spending Behavior of Local Governments: Identification of Price Effects when Prices are not Observed. *Public Choice*, 117, 125-161.
- Andreou, S.N., Koutsampelas, C., Pashardes, P. 2014. Estimating the value and distributional effects of free state schooling. *Economics Letters*, 125(2), 303-305.
- Andrews, J., Entwistle, T. 2013. Four faces of public service efficiency. *Public Management Review*, 15(2), 246-264.
- Antoninis, M., Tsakloglou, P. 2001. Who Benefits from Public Education in Greece? Evidence and Policy Implications. *Education Economics*, 9(2), 197-222.
- Awaworyi Churchill, S., Ugur, M., Yew, S.L. 2017. Government education expenditures and economic growth: a meta-analysis. *Journal of Macroeconomics*, 17(2), 20160109.
- Buchanan, J. M. 1968. *The Demand and Supply of Public Goods*. Rand, McNally &

- Company, Chicago.
- Bukowski, P., Kobus, M. 2018. The threat of competition and public school performance: Evidence from Poland. *Economics of Education Review*, 68, 14-24.
- Cahyaningsih, A., Fitriady, A. 2019. The impact of asymmetric fiscal decentralization on education and health outcomes: Evidence from Papua Province, Indonesia. *Economics and Sociology*, 12(2), 48-63.
- Carlitz, R.D. 2019. Who gets what – and how efficiently? Assessing the spatial allocation of public goods. *Research & Politics*, 6(3), 1-6.
- Cebeci, E., Algan, N., Cankaya, S. 2015. The Returns of the Education in the Context of Micro-macro Analysis. *Procedia - Social and Behavioral Sciences*, 174, 916-925.
- Guziejewska, B., Walerysiak-Grzechowska, K. 2020. A Local Government Revenue System under Macroeconomic Pressure - The Case of Poland. *Prague Economic Papers*, 29(1), 29-52.
- Harmancioglu, N.B., Singh, V.P., Alpaslan, N. 2012. Versatile uses of the entropy Concept in Water resources. In: V.P. Singh, M. Fiorentino (ed.), *Entropy and Energy Dissipation in Water Resources*, 91-117.
- Hart, P.E. 1971. Entropy and Other Measures of Concentration. *Journal of the Royal Statistical Society, Series A (General)*, 134(1), 73-85.
- Head, J.G. 1962. Public Goods and Public Policy. *Public Finance*, 17(3), 197-219.
- Hexter, J.L., Snow, W.J. 1970. An Entropy Measure of Relative Aggregate Concentration. *Southern Economic Journal*, 36(3), 239-243.
- Kotlińska, J. 2018. The result of the LGU budget in the context of the mission of local governments. *Studia Regionalne i Lokalne*, 71(1), 26-47.
- Lago, I., Lago-Peñas, S., Martínez-Vázquez, J. 2020. Decentralization after the Great Recession: fine-tuning or paradigm change? *Regional Studies*, 54(7), 877-880.
- Lenormand, M., Samaniego, H., Chaves, J.C., da Fonseca Vieira, V., da Silva, M.A.H.B., Evsukoff, G.A. 2020. Entropy as a Measure of Attractiveness and Socioeconomic Complexity in Rio de Janeiro Metropolitan Area. *Entropy*, 22(3), 368.
- Levy, G. 2005. The politics of public provision of education. *The Quarterly Journal of Economics*, 120(4), 1507-1534.
- López Rupérez, F., García García, I., Expósito Casas, E. 2018. Educational Effectiveness, Efficiency, and Equity in Spanish Regions: What Does PISA 2015 Reveal? *Orbis Scholae*, 12(2), 9-36.
- Luisa, P., Dillman, B. 1978. An Entropy Analysis of Areal Concentration for Manufacturing Plants. *The Review of Regional Studies*, 8(3), 1-9.
- McConnell, C.R. 1987. *Economics: Principles, Problems, and Policies*. McGraw-Hill, New York.
- Meyer, P., Kučerová, R.S. 2018. Do pupils attend the nearest elementary school to their homes? Factors in school choice in the urban environment of Liberec, Czechia. *AUC Geographica*, 53(1), 70-82.
- Neyapti, B., Bulut-Cevik, B.Z. 2014. Fiscal efficiency, redistribution and welfare. *Economic Modelling*, 41, 375-382.
- Nocke, V., Whinston, M. 2020. Concentration Screens for Horizontal Mergers. Working Paper No 27533. Cambridge, National Bureau of Economic Research.
- Nucińska, J. 2018. Fiscal imbalance in education in Poland – selected problems. *Torun Business Review*, 17(3), 17-31.
- Paulson, A.S., Garrison, B.C. 1973. Entropy as a measure of the areal concentration of water-oriented industry. *Water Resources Research*, 9(2), 263-269.
- Rhoades, S. 1995. Market share inequality, the HHI, and other measures of the firm-

- composition of a market. *Review of Industrial Organization*, 10(6), 657-674.
- Samuelson, P.A. 1954. The Pure Theory of Public Expenditure. *Review of Economics and Statistics*, 36(4), 387-389.
- Sari, V.A. 2019. Educational Assistance and Education Quality in Indonesia: The Role of Decentralization. *Population and Development Review*, 45, 123-154.
- Sarid, A. 2017. Public investment in a hierarchical educational system with capital-skill complementarity. *Macroeconomic Dynamics*, 21(3), 757-784.
- Schulz, B. 2008. The importance of soft skills: Education beyond academic knowledge. *Journal of Language and Communication*, 6, 146-154.