Data Envelopment Analysis in the Assessment of the Efficiency of Local Government Units: The Case of LAG "Polcentrum"

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Abstract

Purpose: The main aim of this paper is to examine the performance in terms of efficiency of six Polish municipalities associated in Local Action Group (LAG) "Polcentrum" with the use of Data Envelopment Analysis (DEA) method.

Design/methodology/approach: Despite the specific character of their activities, municipalities are subject to the same assessment in terms of effectiveness and efficiency as private for-profit organizations. However, there are some differences between public and private sector entities with this respect. Helpful in such an issue can be DEA, which is a method especially suitable for the assessment of the efficiency of non-profit organizations, including local government units.

Findings: Our analysis allows for concluding that the studied municipalities perform in fact quite uniformly in terms of their efficiency. Therefore, such results are in favor of the statement that due to close cooperation the units may become more homogeneous in terms of performance.

Research limitations/implications: The employed DEA method does not allow for concluding whether this unification is associated with improvement in all the units. What needs to be strongly emphasized is that DEA calculates the "relative" efficiency, so it can show how well a given unit is doing when compared to other peer units, but not compared to a "theoretical maximum".

Originality/value: What distinguishes this study is that the administrative units under investigation are very closely related in terms of geographic location, but also in terms of extensive cooperation in LAG. On

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this basis, we pose a research question of whether such a close relationship translates into a similarity in terms of their performance.

Keywords: DEA, local government unit, efficiency.

JEL: H72, D61

Metoda Data Envelopment Analysis w ocenie efektywności jednostek samorządu terytorialnego: przypadek LGD „Polcentrum"

Streszczenie

Cel: zbadanie efektywności działania sześciu polskich gmin zrzeszonych w Lokalnej Grupie Działania (LGD) „Polcentrum" z wykorzystaniem metody Data Envelopment Analysis (DEA).

Zarys/metodologia/podejście: pomimo specyficznego charakteru swojej działalności gminy podlegają takiej samej ocenie pod względem skuteczności i efektywności, jak organizacje nastawione na zysk. Istnieją jednak pewne różnice między podmiotami sektora publicznego i prywatnego w tym zakresie. Pomocna w takiej kwestii może być DEA, która jest metodą szczególnie przydatną do oceny efektywności organizacji non-profit, w tym jednostek samorządu terytorialnego.

Wnioski: przeprowadzona analiza pozwala stwierdzić, że badane gminy w rzeczywistości są dość podobne pod względem efektywności działania. Takie wyniki przemawiają zatem za stwierdzeniem, że dzięki bliskiej współpracy jednostki mogą stać się bardziej jednorodne pod względem wydajności.

Ograniczenia/implikacje badawcze: zastosowana metoda DEA nie pozwala na stwierdzenie czy ujednolicenie to wiąże się z poprawą wyników we wszystkich jednostkach. To, co należy mocno podkreślić, to fakt, że DEA dostarcza informacji o „względnej" wydajności, więc można wykazać jedynie, jak dobrze dana jednostka wypada na tle innych jednostek równorzędnych, ale nie w porównaniu z „teoretycznym maksimum".

Oryginalność/wartość: przeprowadzone badanie wyróżnia fakt, że analizowane jednostki administracyjne są bardzo blisko powiązane pod względem położenia geograficznego, jak również pod względem szerokiej współpracy w ramach LGD. Na tej podstawie stawiamy badawcze pytanie, czy tak bliska relacja przekłada się na podobieństwo efektywności ich działania.

Słowa kluczowe: DEA, jednostka samorządu terytorialnego, efektywność.

1. Introduction

Municipalities in Poland, being the local government units (LGUs) of the lowest level of self-government, are the most fundamental administrative units aimed at the fulfillment of the most essential needs of community. They are obliged, based on specific legal acts, to manage their spending in accordance with the rule of efficiency. Their financial resources are often limited and the range of activities is extensive. These units can be also characterized by the highest incomes and expenses per capita in comparison to administrative units of higher level, i.e. counties and voivodships. At the same time, their incomes are strictly limited, as the main sources are specific grants and general subsidies. Regardless of the financial

management model adopted by those units, their limited resources must be spent effectively. The execution of social and public tasks and the guarantee of stable and sustainable development are understood as their efficient spending.

Despite the character of their specific activities, municipalities are subject to the same assessment in terms of effectiveness and efficiency as private for-profit organizations. However, there are some differences between public and private sector entities with this respect. Whereas inputs in LGUs are easy to measure and present, as they are given in units of currency, formulating efficiency criteria with reference to the outputs becomes more difficult and complex. Some of the outputs cannot be given in units of currency, so the implementation of the classical input-to-output ratio is not possible. Helpful in such an issue can be Data Envelopment Analysis (DEA), which is a method especially suitable for the assessment of the efficiency of non-profit organizations, including local government units. The biggest advantage of this method is its flexibility and possibility to adjust to available data. What is more, DEA not only identifies efficient and inefficient units but also suggests improvements for the latter. The DEA method provides performance measurement in relative terms, i.e. as compared to other units within a set under study. Thus, it embeds the benchmarking concept. As indicated by Ruiz and Sirvent (2019) *"Using DEA for the benchmarking ensures an evaluation in terms of targets that both are attainable and represent best practices."*

As we further elaborate, DEA is widely used in the efficiency assessment in various sectors, both public and private. However, there are only few empirical studies employing this method with reference to the Polish Local Government Units (Sekuła & Julkowski, 2015; Karbownik & Kula, 2009; Kosmaczewska, 2011; Zioło, 2012; Łękawa, 2012). Our study contributes to this strain of literature. The main aim of this paper is to examine the performance in terms of efficiency of six Polish municipalities associated in Local Action Group "Polcentrum". Local Action Group (LAG, in Polish: *Lokalna Grupa Rozwoju*) is a public-private partnerships which acts on a local scale. Its main aim is local development as a result of cooperation of various actors. The legal foundations for LAGs are set in *Regulation no 1303/2013 of the European Parliament and of the Council of 17 December 2013*, which also ensures financial support for LAGs within the European funding programme. In this paper, we employ the DEA method. What distinguishes this study is that the administrative units under investigation are very closely related in terms of geographic location, but also in terms of extensive cooperation in LAG. On this basis, we pose a research question of whether such a close relationship translates into a similarity in terms of their performance.

2. Performance Measurement in the Public Sector

As elaborated in the previous section, even though municipalities are the smallest and the most fundamental units of Polish local government, they are crucial in terms of providing social services and public goods. Due to the public regulations, all activities by local government units need to be performed in accordance with the rule of efficiency and sufficiency of public finances. Therefore, in order to obtain the best results from the given limited inputs, an optimal selection of methods and means must be made. The strong meaning of these concept has been reinforced by the implementation of the obligation to enforce management control. Its main aim is to ensure efficiency of operations and information flow between municipalities and control bodies and it is related to internal audit. The control aims at supporting the authorities in achieving goals and tasks by their systematic evaluation which requires performance measurement.

The most crucial notions associated with performance measurement are *effectiveness* and *efficiency*. As stated by Drucker (1974), *"efficiency is concerned with doing things right. Effectiveness is doing the right things"*. Thus, it can be said that effectiveness is equal to the level of fulfillment of expectations or the extent to which the plan was realized. Efficiency is more complex, as it is a relation between the results achieved (output) and the resources used (input). As argued by Szołno (2016), local government units should be subjected to the evaluation in terms of both effectiveness and efficiency. In this sense, the performance measurement is similar to that in business organizations; however, there are significant differences with reference to the nature of inputs and outputs. On the basis of the existing literature, Filipak (2011) summarizes the key characteristics related to the efficiency measurement in LGUs. First, efficiency, with reference to the implementation of public and local government tasks, can be understood as a set of economic relations in the form of cash flows between participants of activities associated with these tasks. Second, expenditures have the greatest impact on efficiency in LGUs. Therefore, it can be established that efficiency should be understood as shaping expenditures of local government units, which allows for the greatest social utility of allocated public funds. Third, in the public sector, efficiency evaluation is more difficult (or sometimes can be even impossible) as compared to the private sector.

The efficiency of spending public funds should be considered as a process of looking for savings in the sense of applying solutions that will maximize the final effects (Matwiejczuk, 2006). Saving can be described as a process of spending less money at the moment to save part of it for the future; however, in the case of local government units, saving cannot be understood only in this way. Frequently, in several areas, it is not possible to limit expenses. A good example is education or health care, where implementing saving methods is possible, but can result in a failure to achieve goals or their

incomplete achievement. While inputs, which are given mostly in units of currency, are very easy to measure and present, the identification of outputs is more complicated. Thus, it can result in difficulties in formulating criteria for assessing efficiency. What is more, local government units, unlike for-profit organizations, cannot present their outputs only in units of currency. The most important effects are how they perform and to which extend they fulfill local community needs. This can be presented in various units, which makes analysis more difficult to perform. However, difficulties with the identification and measurement of outputs are not a only problem with reference to LGUs' efficiency assessment. As argued by Modzelewski (2009), public administration units are less flexible and autonomous in their financial decisions than for-profit organizations, which can be considered as a limitation in their performance measurement.

There are several methods aimed at efficiency and effectiveness assessment. The following three main categories that reflect different approaches can be distinguished:
– ratio analysis that comprises various indicators referring to the size and structure of debt, financial liquidity, and profitability – also known as classical methods (see Sekuła & Julkowski, 2017),
– parametric methods which employ production function, as well as econometric modeling,
– non-parametric methods that include linear programming.

As compared to the first two categories, non-parametric methods are more flexible and generic and in turn can be used in a situation in which the identification of all effects and inputs cannot be made. The Data Envelopment Analysis, which is employed in this study, belongs to the third aforementioned category. It is briefly described in the subsequent section.

3. Data Envelopment Analysis

Among many methods and techniques from the group of non-parametric methods, the Data Envelopment Analysis (DEA) is the most popular. As summarized by Santos et al. (2013), it is a mathematical programming technique presented in the late 1970s by Charnes, Cooper and Rhodes (1978), but the origins of this analysis can be found in the study developed by Farrell (1957). Although for the first time DEA was conducted in the education field, its applicability is not limited to this thematic area. Moreover, it is equally suitable for the efficiency assessment in enterprises as well as in non-profit units. As indicated by Liu et al. (2013), the most popular fields addressed in the studies that employ DEA are: banking, health care, agriculture and farm, transportation, and education.

DEA is in fact not a single model, but comprises a whole range of models (see e.g. Rostamzadeh et al., 2021, for a review). However, the most popular are: the CCR model (Charnes et al., 1978) with fixed

scale effects, and BCC model (Banker, Charnes, & Cooper, 1984) which distinguishes between technical and scale inefficiencies (Charnes et al., 1994). In DEA, the effectiveness of any organization can be presented as the following ratio:

$$Efficiency = \frac{weighted\ sum\ of\ effects}{weighted\ sum\ of\ inputs}$$

Efficiency reflected by this formula is a relative measurement determined for a defined set of decision-making units (DMUs). It is expressed in percentage points. It ranges from 0 to 100%, and the maximum value is assigned to the most efficient decision-making units, which become a benchmark and a reference point for the rest of the units in the analyzed set. To identify those benchmarks, DEA employs linear programming. Consequently, the remaining decision-making units are considered to be inefficient. In the case of one input and one output (effect) observations, efficiency can be graphed on a scatter plot where the X axis represents inputs and the Y axis represents outputs. On such a plot, the line starting at the (0;0) point and oriented toward the most effective decision-making unit is called the efficiency frontier, and together with the X axis they create a corn labeled "production possibility set", which consists of all empirical measurements. Figure 1 presents such a graph. Decision-making units are marked in the graph as a DMU1, …, DMU5. The efficiency frontier also indicates the direction and magnitude of possible improvements with reference to both inputs and outputs which are feasible for a given DMU.

Figure 1
Efficiency distribution in DEA
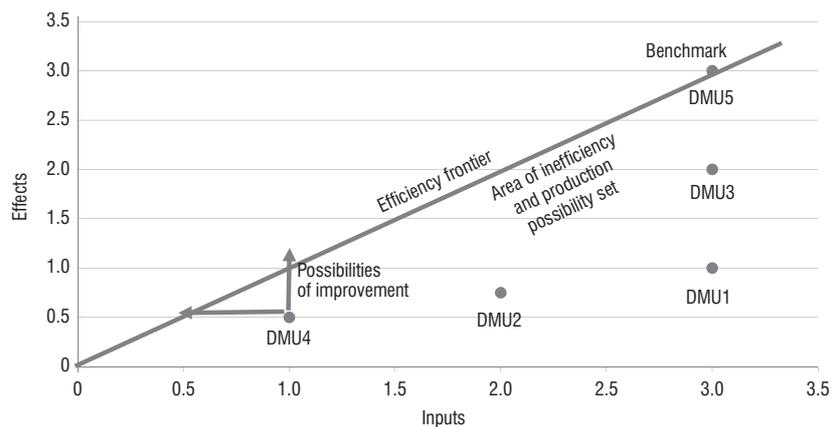
The basic CCR model of DEA can be presented mathematically in the following manner (Charnes et al., 1978):

$$\max h_o = \frac{\sum_{j=1}^{s} W_j y_{jo}}{\sum_{i=1}^{r} V_i x_{io}}$$

subject to:

$$\frac{\sum_{j=1}^{s} W_j y_{jm}}{\sum_{i=1}^{r} V_i x_{im}} \leq 1; \quad m = 1, 2, \ldots, n$$

$$W_j, y_{jm} \geq 0; \quad j = 1, \ldots, s; \quad i = 1, \ldots, r$$

where:
h_o – efficiency indicator of a given decision-making unit
n – number of DMUs,
s – number of inputs,
r – number of outputs,
x_{io} – input i of the DMU o,
y_{jo} – output j of the DMU o,
W_j – weight assigned to the output j,
V_i – weight assigned to the input i,

An important element while using DEA is also the selection of a suitable model orientation. It depends on the aim of the study. If the main aim is to reduce inputs while maintaining at least the current level of results, it is the so-called input-oriented model. When the main aim is focusing on maximizing results while maintaining at most the current level of inputs, it is the so-called output-oriented model.

The Data Envelopment Analysis is a useful tool for efficiency evaluation for several reasons. First, it allows for creating an efficiency ranking. Moreover, for every investigated unit that is below the efficiency frontier, it shows the sources of inefficiency as well as the directions in inputs or outputs which can help to achieve the highest efficiency score. Kozuń-Cieślak (2011) summarizes the advantages of DEA which make this method especially useful in the assessment of public sector entities:
– it does not require an *a priori* assumption with reference to the functional relationship between variables. Consequently, it is suitable when the information about the functional dependence between the resources and effects is often incomplete or ambiguous;
– its practical applicability is quite broad due to the fact that inputs and outputs can be given in different units of measure. It is especially important in the case of local government units aiming at the delivery of

public services. Such services usually cannot be expressed as a monetary value as in the case of commercial goods production;
– the method does not require any knowledge about the weights associated with specific inputs and outputs, as they are estimated in the process of model development;
– DEA is oriented to the maximum values, not the average values, as in the case of many other methods of multivariate analysis which neglect extreme points, also those considered as positive examples that represent best practices and results;
– it allows for combining multiple inputs and outputs in a single model. It also identifies the benchmark to follow in order to improve the efficiency.

However, DEA has also some disadvantages. Namely, due to the relative assessment, the method cannot be applied to a single unit. Additionally, it requires careful consideration and selection of inputs and outputs, because they are not defined *a priori* as compared, for example, to the ratio analysis. On the basis of the literature review, Färe et al. (2011) identify the features of DEA that generate the most criticism. These are:
– non-stochastic nature: such factors as bad weather, external circumstances, bad luck are not considered, and all the results below efficiency frontier are attributed to poor efficiency;
– sensitivity to outliers;
– results of DEA cannot be validated using statistical procedures;
– it does not adequately address the underlying economics.

4. Empirical Research

In this study, we analyze six municipalities associated in Local Action Group "Polcentrum". Those are: Głowno, Ozorków, Dmosin, Piątek, Stryków, and the City of Głowno. Their key characteristics are presented in Table 1. All the units are neighboring municipalities located in the Łódzkie Voivodeship. Four of them are rural municipalities, while one is rural-urban, and one is urban.

Table 1
DMUs's characteristics (as of 2019)

DMU number	Municipality	County	Rural/urban type	Area [m^2]	Population [pers.]	Population density [pers./m^2]
DMU1	Głowno	zgierski	rural	105	4808	46
DMU2	Ozorków	zgierski	rural	96	7021	74
DMU3	Dmosin	brzeziński	rural	100	4463	45
DMU4	Piątek	łęczycki	rural	133	5982	45
DMU5	Stryków	zgierski	rural-urban	158	12711	81
DMU6	City of Głowno	zgierski	urban	20	14119	712

Source: Own elaboration based on Central Statistical Office (Poland) data.

In this study, we implement the CCR model of DEA. One of the most basic assumptions of CCR is the fact that a set of analyzed individuals should constitute a homogeneous group in order not to compare things that are inherently different (Domagała, 2007). The population in all the analyzed municipalities is smaller than 15 000, all of the decision-making units belong to the same Local Action Group, which should consist of similar municipalities, as provided for by law. What is more, the character of their activities as well as the type of tasks they perform are very much alike. They have the same access to resources and are located in a similar area. The units under study also have similarly stable governance – in five out of six municipalities, the mayors have held their positions for at least several years by winning subsequent elections. Moreover, based on preliminary budget analyses, the municipalities in the sample have similar kinds of expenses and incomes, i.e. referring to the same budget sections. Based on this explanation, it can be said that the studied decision-making units are homogeneous.

As already stated in this paper, municipalities have a determined mission – fulfillment of local community needs, but because incomes are strictly limited, LGUs should look for possibilities to reduce the input, and that is why the input-oriented model of DEA is implemented. It is important to highlight that efficiency is calculated based on given inputs and outputs which are common for all decision-making units. The empirical investigation refers to 2019, which represented the most recently published data for the moment of conducting the study. As the main aim of this study is to estimate the efficiency of financial management, the total expenses per capita [PLN] at the end of 2019 are taken as an input. In order to identify indicators which reflect the efficiency of financial management in local government units, the indicators of quality of life are applied. As indicated by Owsiak (2014), they belong to one out of the three most commonly used categories of efficiency measurement with reference to local government units. The indicators of the output selected for this study are presented in Table 2. They represent different areas associated typically with quality of life: living standards, economy, education, culture, sport and leisure, health care, as well as environmental protection. They are also in line with *The Act of 8 March 1990 on the Local Government*, which sets forth the tasks that are mandatory to perform by municipalities. An important restriction with reference to the selection of indicators is the availability of statistical data from the Central Statistical Office and the fact that classical Data Envelopment Analysis (DEA) models can be developed with the assumption that all inputs and outputs are non-negative.

Table 3 presents the values corresponding to each indicator for all analyzed decision-making units. The data were obtained from the database of the Polish Central Statistical Office (for 2019). The indicators are defined in the manner which allows for their direct comparisons, as they are not

Table 2
Output indicators and their descriptions

Symbol	Thematic area	Indicator	Description
O1	Living standards	Access to the water supply system	The ratio of persons using water supply system to total population [%]
O2	Economy	Entities newly registered in the REGON register	The number of all newly registered entities of the national economy recorded in the REGON register
O3	Education	Children covered by preschool education	Share of children aged 3–6 years covered by preschool education [%]
O4	Culture	Public library borrowers	Total number of public library borrowers per 1000 pers.
O5	Sport and leisure	Number of sports clubs per 1000 inhabitants	Total number of officially registered sports clubs (including religious and UKS clubs) in the territory of a given municipality per 1000 pers.
O6	Health care	Number of doctors' consultations performed per capita	Total number of all doctors' consultations performed in all health care centers in the territory of a given LGU per capita
O7	Environmental protection	Waste collected separately from households in relation to the total waste	Share of waste collected separately from households in relation to the total waste [%]

Source: Own elaboration based on Central Statistical Office (Poland).

biased by the differences in population size. Generally, on the basis of this preliminary picture, one can conclude that Stryków and the City of Głowno municipalities perform better in most of the areas under consideration. What distinguishes them is the type: rural-urban and urban, as opposed to the rest of the DMUs, which are rural municipalities. In the case of indicator O3, a single value exceeds 100%. It means that more children are covered by preschool education than the total number of children living in the territory of DMU6. It can be caused by the fact that children from other municipalities can attend a preschool establishment in the territory of other.

Table 3
Values of the output indicators

Symbol of indicator	Decision-making unit					
	DMU1	DMU2	DMU3	DMU4	DMU5	DMU6
O1	88.40	100.00	98.00	99.90	98.20	88.00
O2	33.00	48.00	35.00	40.00	103.00	104.00
O3	54.00	49.20	52.20	83.50	89.50	106.60
O4	43.00	63.00	64.00	115.00	147.00	100.00
O5	0.42	0.43	0.22	0.50	0.79	0.64
O6	2.75	3.56	4.92	4.64	7.83	9.48
O7	34.70	48.80	39.40	26.90	45.20	14.90

Source: Own elaboration based on Central Statistical Office (Poland) data.

As stated previously, per capita municipal expenditures registered on municipal accounts for the year 2019 are selected as a measure of the municipal resources used to provide local services. Inputs of all decision-making units are reported in Table 4. The data are taken from the Annual Reports which, in accordance with the law, are published by each municipality and made publicly available.

Table 4
Values of input indicators [PLN]

Symbol of input	Decision-making unit					
--	DMU1	DMU2	DMU3	DMU4	DMU5	DMU6
I1	4384.63	4 892.89	5 542.06	4747.76	7480.51	4024.17

Source: Own elaboration based on Annual Reports published by municipalities.

The results of Data Envelopment Analysis were obtained using DEAFrontier™ software. Table 5 presents final efficiency indicators reported for each unit under investigation. Those results can be interpreted as follows: DMU2, DMU4 and DMU6 are determined to be best-practices units, which means that their relative efficiency is equal to 100%. The other three units are considered to be inefficient. Their efficiency indicator varies from 84.99% to 96.72%. Based on the efficiency scores, the following ranking of municipalities in terms of their efficiency can be compiled: Ozorków (place no. 1), Piątek (no. 1), City of Głowno (no. 1), Głowno (no. 4), Stryków (no. 5), and Dmosin (no. 6). Such results also demonstrate that although (as shown in Table 3) output indicators for Stryków considered separately are quite high, this municipality takes a low place in the ranking. The reason can be output weighting as well as the inclusion of inputs.

Table 5

Results of Data Envelopment Analysis

DMU	Name of the municipality	Efficiency indicator
DMU1	Głowno	0.96717
DMU2	Ozorków	1.00000
DMU3	Dmosin	0.84995
DMU4	Piątek	1.00000
DMU5	Stryków	0.94450
DMU6	City of Głowno	1.00000

Source: Own elaboration.

Apart from the efficiency ranking, the method employed allows for identifying the scope of possible improvements for inefficient DMUs as compared to the efficient ones. They are presented in Table 6. The results imply that for Głowno municipality, the following combination for setting input ensuring full relative efficiency can be used: 61.9% of DMU2's input and 30.1% of DMU6's input. This means that a 3.29% reduction of expenditures per capita will not affect outputs. For Dmosin municipality, characterized by the smallest efficiency, the following combination to determine an efficient input target can be applied: 71.6% of DMU2's input + 30% of DMU6's input. In this case, a 15.01% decrease in expenditures per capita will not affect the outcomes. For Stryków municipality, characterized by the highest incomes and expenses, to gain full relative efficiency, the following mathematical equation can be formulated: 46.1% of DMU2's input + 52.5% of DMU4's inputs + 57.6% of DMU6's input. This means that expenditures per capita can be decreased by 5.55% without affecting outcomes.

Table 6
Improvement proposal for inefficient DMUs

Inefficient DMUs/Efficient DMUs	DMU2	DMU4	DMU6
DMU1	0.619	0.000	0.301
DMU3	0.716	0.000	0.300
DMU5	0.461	0.525	0.576

Source: Own elaboration based on own sources.

In order to give these figures a more practical dimension, Table 7 presents the expenses suggested by the model. They are compared to the actual expenses. The results imply that three municipalities could have spent less and still maintained the effects. The potential savings indicated by DEA amount to PLN 0.69 million for Głowno, PLN 3.54 million for Dmosin, and PLN 5.28 million for Stryków. Given that they had budget deficits covered by loans in 2019, the implementation of the practices set by the efficient municipalities could have resulted in lower debt.

Table 7
Suggested expenses ensuring full relative efficiency

	DMU1	DMU2	DMU3	DMU4	DMU5	DMU6
Expenses per capita made	4384.63	4 892.89	5 542.06	4747.76	7480.51	4024.17
Suggested decrease [%]	3.29	0.00	15.01	0.00	5.55	0.00
Suggested expenses	4240.58	4 892.89	4747.76	4747.76	7065.37	4024.17
Suggested decrease in PLN per capita	144.05	0.00	794.3	0.00	415.14	0.00
Suggested decrease in total expenses in PLN	692 592.40	0.00	3 544 960.90	0.00	5 276 855.54	0.00

Source: Own elaboration based on own sources.

5. Conclusions

There is little evidence in the previous literature on the existing regularities with reference to the efficiency of local government units. As summarized by Sekula and Julkowski (2017) on the basis of the literature review, LGUs with a greater population size tend to be more efficient. Also LGUs which have a more attractive location (e.g. near big cities) more often perform better. Additionally, income per capita is negatively associated with efficiency; however, LGUs reporting the smallest income per capita are not the most efficient ones. This study aims to explore how close cooperation between administrative units affects efficiency.

We have evaluated the relative efficiency of local government units associated in Local Action Group "Polcentrum" through the input-oriented CCR model of the Data Envelopment Analysis. According to the results obtained, out of the six municipalities under investigation, three can be assessed as efficient ones, i.e. Ozorków, Piątek, the City of Głowno. The first two are of the rural type, whereas the third one is an urban municipality. They have also different population sizes – 7 thous., 6 thous. and 14 thous citizens, respectively. However, the inefficient municipalities are near to the target value, which suggests that there is not much potential for improvements for the less efficient units, and the studied municipalities perform in fact quite uniformly in terms of their efficiency. Nevertheless, in line with the approach adopted (input-oriented), the study allows for indicating the potential cost reduction in absolute value that would enable the less efficient units to achieve greater efficiency. Since the input is defined as the total spending per capita, some further detailed qualitative analysis is required to recognize the specific areas where the costs can be reduced in those units (while maintaining the outputs).

The results of our study allow for answering our research question positively. Namely, they confirm the statement that due to close cooperation, the units may become more homogeneous in terms of performance. This is also a premise for exploring this phenomena in further studies to discover the underling patterns.

However, the employed DEA method does not allow for concluding whether this unification is associated with improvement in all the units. What needs to be strongly emphasized is that DEA calculates the "relative" efficiency, so it can show how well a given unit is doing when compared to other peer units, but not compared to a "theoretical maximum". On the other hand, it can be difficult to estimate the "theoretical maximum" efficiency of financial management of local government units. The implementation of proposed improvements, calculated as a part of the Data Envelopment Analysis, does not guarantee that a municipality achieves the highest possible efficiency, but it determines a possible way to match the efficiency of other decision-making units in the studied sample.

When interpreting these results, one must bear in mind that the DEA method has its limitations. The results are influenced by the number of variables introduced to the model and their type. By changing inputs or outputs, or by adding new inputs or outputs, efficient and inefficient municipalities may change as well. The results can be also sensitive to the method of selection of inputs and outputs. However, that should not discourage a search of methods helping to monitor efficiency in the public sector. Effective usage of financial resources by a municipality is an important issue from a social point of view. Moreover, the issue of indebted local government units is often raised in public debate. This study shows that in some cases, this problem can be mitigated or even avoided if appropriate control tools are implemented.

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