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Do Inter-Municipal Cooperation Unions Differ in Their Policies Depending on Their Size? Evidence from Poland

Abstract:

The literature on inter-municipal cooperation (IMC) focusing on the characteristics of its members and factors driving a decision to start cooperating is abundant. Various studies indicate that small municipalities are particularly vulnerable to economies of scale and scope, hence they are more likely to start cooperating than bigger units. On the other hand, small municipalities face incentives to free-ride on bigger local governments due to spillovers. However, it is unclear if there exists a nexus between the size of IMC entities (measured by population) and types of tasks performed jointly by their partners (often of a different number). This paper aims to fill the existing gap by testing whether a share of expenditures on one of the three categories of tasks ('economies of scale and scope tasks,' 'spillover tasks' and 'multi tasks') in total expenditures incurred jointly differs significantly depending on the size of an IMC entity. For that purpose, the Kruskal-Wallis rank test was used. To pinpoint which specific medians are statistically different from the others in each year of analysis, Dunn's multiple comparison test with the Bonferroni adjustment was performed. The research is based on Polish inter-municipal unions (IMC-unions) and their financial statements over the period 2003–2018 and covers 2,541 observations. The results show that the vast majority of statistically significant differences were observed in the share of expenditures on 'economies of scale and scope tasks' in total expenditures, suggesting that very small IMC-unions spent more of their budget on these tasks than medium-sized IMC-unions and small IMC-unions (over several years).

No significant differences were noted in the share of ‘spillover’ expenditures. Significant differences in ‘multi’ expenditures occurred only in 2017 and 2018, indicating that small IMC-unions spent more than very small IMC-unions. These first results add to the existing literature by driving a conclusion that smaller IMC-unions concentrate more on reducing per capita spending.

Keywords: inter-municipal cooperation, local government, economies of scale and scope, spillovers, Poland

JEL: D71, D78, H72, H77, O38, R10

1. Introduction

In the absence of externalities, a decentralised system of providing public goods and services helps tailor policies to local needs, thus is more desirable than a centralised system. In certain tasks, spillovers are inevitable, which forces a need for a trade-off between internalising externalities and uniformity (Tiebout, 1956). Local public goods and services are predominantly produced locally and macroeconomic policies, redistribution policies and goods with spillovers are provided by the upper level of government. However, the theoretical (e.g. Ostrom, Tiebout, Warren, 1961) and empirical literature (e.g. Blaeschke, 2014) on fiscal federalism provides evidence that administrative borders need not coincide with the efficient provision of public goods and services. Horizontal voluntary cooperation between local governments may help to overcome these dilemmas without limiting the political autonomy of members (Blaeschke, 2014) and the benefits of decentralisation.

Though the literature on inter-municipal cooperation (hereafter IMC) is rich, it suffers from a crucial shortcoming: the vast majority of studies focus on members of such an entity (local governments) but pay very little attention to the IMC entities themselves. It remains unclear whether the size of an IMC entity may be linked to performing more tasks that generate spillovers or more capital-intensive tasks. The assessment of satisfaction and potential benefits of collaboration is particularly difficult in the first group of activities concerning environmental protection, sustainable development, circular economy, and those aimed at reducing the bias of digital transformation and diminishing inequalities in the post-COVID-19 societies.¹ Hence, it may discourage local governments from initiating cooperation. Moreover, pursuing these policies may not be of interest to a singular municipality, but they are undoubtedly of great importance to entire societies and mankind. When it comes to capital-intensive tasks concerning the field dominated

¹ The problem of the digital bias in post-COVID societies is studied by e.g. Kuc-Czarnecka, 2020.

by economies of scale and scope, cooperation yields a possibility of enjoying positive scale effects and cost savings when cooperating. Though sewage or waste disposal systems have already been built or established and do not seem to be a current problem of the 21st century, local governments undoubtedly face completely new challenges related to, primarily, numerous e-services and cybersecurity. These tasks should be performed jointly in order to share experiences, solve problems jointly and, given the current complex circumstances, effectively use even more limited public funds.

To the best of our knowledge, the only studies that tried to address similar problems did not focus on the size of the budget spent on particular categories of tasks nor did they differentiate and compare it to different sizes of IMC entities. Moreover, the prevalent approach in this strand of literature is to treat an IMC entity as dealing with a particular task through a dummy variable, which leads to an implicit but incorrect assumption that costs are affected by an IMC entity through a constant percentage or amount. To fill the identified research gap, this paper aims to answer the following questions:

1. Is there any nexus between the size of an IMC entity and types of tasks performed jointly by its members?
2. Do small IMC entities aim at scale effects more intensively than larger ones – just like smaller municipalities do?
3. Or do bigger IMC entities engage more often in joint provision of tasks generating spillovers?

Yet the answer to these questions can provide policy implications and recommendations for providing and tailoring incentives for local governments to start cooperation offered by upper-tier governments or supranational organisations. Considering fiscal imbalances and the COVID-19 pandemic, which has unmistakably become a ‘digital accelerator’ for municipalities on their road of transition to 4.0 and even 5.0 economy standards, it is reasonable to assume a growing need for developing a culture of cooperation.

The analyses are based on IMC entities (IMC-unions precisely) operating in Poland in 2003–2018. A nonparametric alternative to ANOVA, the Kruskal-Wallis rank test was chosen to compare the median score of the particular outcome variable across five size groups of IMC entities. To pinpoint which specific medians are statistically different from the others in each year of analysis, Dunn’s multiple comparison test with the Bonferroni adjustment was performed. The independent variable presents the size of an IMC entity. The dependent variable reflects the share of expenditures incurred for a specific category of tasks in total expenditures – tasks which performed jointly enable the exploitation of economies of scale and scope, tasks generating spillovers, and tasks concerning both fields at the same time.

The results show that IMC entities differ in their policies depending on their size. The vast majority of statistically significant differences were observed in the share of expenditures on ‘economies of scale and scope tasks’ in total expenditures, suggesting

that very small IMC entities spent more of their budget on these tasks than medium-sized IMC entities and small IMC entities (over several years). No significant differences were noted in the share of 'spillover' expenditures. Significant differences in 'multi' expenditures occurred only in 2017 and 2018, indicating that small IMC entities spent more than very small IMC entities. These first results add to the existing literature by driving a conclusion that smaller IMC entities concentrate more on reducing per capita spending.

The following sections of the paper provide a literature review of inter-municipal cooperation, research methodology chosen based on the identified research gap, results and their discussion. The paper concludes with a summary of the findings and draws relevant policy implications and recommendations, both for local government in Poland and other countries.

2. Literature review

The literature on inter-municipal cooperation is abundant and presents this issue from various perspectives. One strand, which has been especially well recognised, concerns municipal characteristics and factors driving entities to start the network of horizontal interaction. Most studies² in this area indicate that small, rural or fiscally weak units are particularly vulnerable to economies of scale or scope problems, hence, often for a pragmatic reason, they are more likely to start cooperating than bigger municipalities (e.g. Oates, 1999; Warner, 2011; Bel, Fageda, Mur, 2013; Blaeschke, 2014; Wassenaar, Groot, Gradus, 2016; Bischoff, Wolfschütz, 2020). Bergholz (2018) has suggested that small municipalities that face incentives to free-ride on bigger governments are surprisingly even more prone to jointly deliver public services. His results contradict the previous conclusion of Olson and Zeckhauser (1966) that spillovers are the cause of free-riding on big units, thus limiting the willingness of smaller municipalities to cooperate.

Among other causes that foster or affect IMC emergence, researchers identified socio-demographical determinants (Feiock, Steinacker, Park, 2018; Bischoff, Wolfschütz, 2020), geographical reasons (e.g. Kołsut, 2015), political factors/election cycle (LeRoux, Brandenburger, Pandey, 2010; Baskaran, Lopes da Fonseca, 2016; Bischoff, Wolfschütz, 2020; Schoute, Gradus, Budding, 2020), or willingness to obtain EU funds (Swianiewicz et al., 2016). A rich literature review of IMC emergence can be found, for example, in Bel and Warner (2016).

Another, though even less numerous, group of studies in the literature on IMC investigates its effects and efficiency gains for municipalities being members of an IMC entity (e.g. Allers, van Ommeren, 2016; Allers, de Greef, 2018; Blaeschke, Haug, 2018). These

² The hypothesis that small municipalities are more prone to cooperate was not confirmed by e.g. Swianiewicz et al., 2016.

studies find that smaller municipalities can enjoy positive scale effects and cost savings when cooperating, while they do not confirm higher technical efficiency. A recent study by Arntsen, Torjesen and Karlsen (2021) shows that smaller municipalities cooperating with partners of a different size achieve relatively higher benefits in terms of boosting the quality of joint delivered service than bigger units – even at the cost of losing some part of their political autonomy. However, similarly as in the vast majority of studies, they focus solely on the size of cooperating partners rather than the size of an IMC entity itself.

It remains unclear whether the size of an IMC entity itself may be linked to focusing on tasks that generate spillovers in order to reduce these externalities or those tasks that are performed in collaboration allow these entities to achieve economies of scale or scope. So far, these questions have received little attention in the literature, but there are a few studies that tried to address similar issues. Swianiewicz et al. (2016) empirically tested whether the size (measured by population) of Polish inter-municipal unions, being the most popular form of IMC entities in Poland, is correlated with the probability of long-term cooperation, but they did not find any evidence of such a relation. In his extensive study, Kołsut (2015) analysed the size of various forms of inter-municipal cooperation in Poland demonstrating that usually IMC entities with a smaller number of partners are also smaller in terms of population. This suggests that if small municipalities start cooperating, they do it more often within small groups. However, the study also identifies the cases when big and large IMC entities jointly deal with capital-intensive tasks. Although the author analysed the general groups of IMC entities' tasks (by assigning IMC entities to one or more groups) and their size measured by population or number of members, he did not focus on the size of the budget spent on particular categories of tasks nor did he differentiate and compare it to different sizes of IMC entities. Hence, whether there exist any differences, and if so, of what kind, between smaller or bigger IMC entities cooperating to internalise spillovers or exploit economies of scale remains unclear ex-ante.

In their empirical research, Niaounakis and Blank (2017) provide insight into the relation between costs and the size of IMC entities. They find that smaller IMC entities better exploit scale economies. An important aspect to learn is that the decision to treat an IMC entity as dealing with a particular task through a dummy variable is the prevalent approach in the literature. However, they stress that this leads to an implicit assumption that costs are affected by an IMC entity through a constant percentage or amount. Although this paper does not concentrate on the effect side of IMC entities, this remark is kept in mind in the research process. Hence, the analyses in this paper are based on very detailed financial data from official budgetary statements of Polish IMC entities.

3. Research methodology

Based on previous studies on IMC entities and the identified research gap, this paper concentrates on the following questions:

1. Is there any nexus between the size of an IMC entity and types of tasks performed jointly by its members?
2. Do small IMC entities aim at scale effects more intensively than larger ones – just like smaller municipalities do?
3. Or do bigger IMC entities engage more often in joint provision of tasks generating spillovers?

Thus, the formulated hypotheses read:

- H1. IMC entities' expenditures within a particular group of tasks differ depending on the size of an IMC entity.
- H2. Compared to bigger IMC entities, smaller IMC entities spend more of their budget on expenditures on tasks which, when performed jointly, enable the exploitation of economies of scale or scope.
- H3. Larger IMC entities spend more of their budget expenditures on tasks generating spillovers than smaller IMC entities.

To test the hypotheses, the analysis is based on IMC entities operating in Poland. Inter-municipal cooperation in Poland started after the administrative reintroduction of local self-government in 1990. In 1999, the Polish self-government underwent a reform that divided it into three layers – municipalities (basic units responsible for the vast majority of public tasks), counties, and voivodeships (Act of 8 March 1990). Municipalities are allowed to cooperate within various forms, and thus provide their inhabitants with public goods and services jointly (Act of 2 April 1997) without limiting their political power. Inter-municipal unions (hereafter IMC-unions) are the most popular and formalised form of Polish IMC entities. Apart from IMC-unions, municipalities can cooperate via agreements, associations and inter-communal companies (Act of 8 March 1990). Since financial data is not available for the latter, the research is limited to IMC-unions that are obliged to submit budgetary statements.³

Data on IMC-unions was obtained from the official register of IMC-unions run by the Ministry of the Interior and Administration. This register is based on the official statutes of IMC-unions. However, the actual cooperation and tasks proclaimed in IMC-unions statutes may not entirely reflect the reality. This is because some IMC-unions did not submit their financial statement, although they remained active in the official register – there is no legal obligation to dissolve the IMC-union once the real cooperation ended. This problem is known in the literature as the 'empty shells' problem and was studied by

³ For detailed information about inter-municipal cooperation in Poland, please refer to e.g. Kołsut, 2015; 2016; Swianiewicz, Teles, 2018.

Hulst and van Montfort (2007), Kołsut (2015) and Swianiewicz et al. (2016). To overcome this shortcoming, the research is based on the yearly data from detailed IMC-unions financial statements provided by the Ministry of Finance and covers the years 2003–2018. According to official financial statements, the number of IMC-unions that were active in this period and submitted their financial statements amounts to 2,541, which gives an average of 158.8 units per year.

The independent variable is categorical (from 1 to 5) and presents the size of an IMC-union. IMC-unions were divided into five size groups depending on their population,⁴ i.e. depending on the total number of inhabitants of municipalities being members of an IMC-union:

- 1) very small – up to 40,000 inhabitants;
- 2) small – from 40,000 to 80,000 inhabitants;
- 3) medium-sized – from 80,000 to 150,000 inhabitants;
- 4) big – from 150,000 to 300,000 inhabitants;
- 5) large – over 300,000 inhabitants.

The data on populations of IMC-unions members was extracted from the Central Statistical Office Local Data Bank. Detailed information on the number of IMC-unions of different sizes operating in each year of the chosen time-period is presented in Figure 1. On average, small IMC-unions were the most numerous group and accounted for 55.9%. Medium-sized IMC-unions accounted for 40.4%, very small – 27.3%, big – 25.3%, and large – 10%.

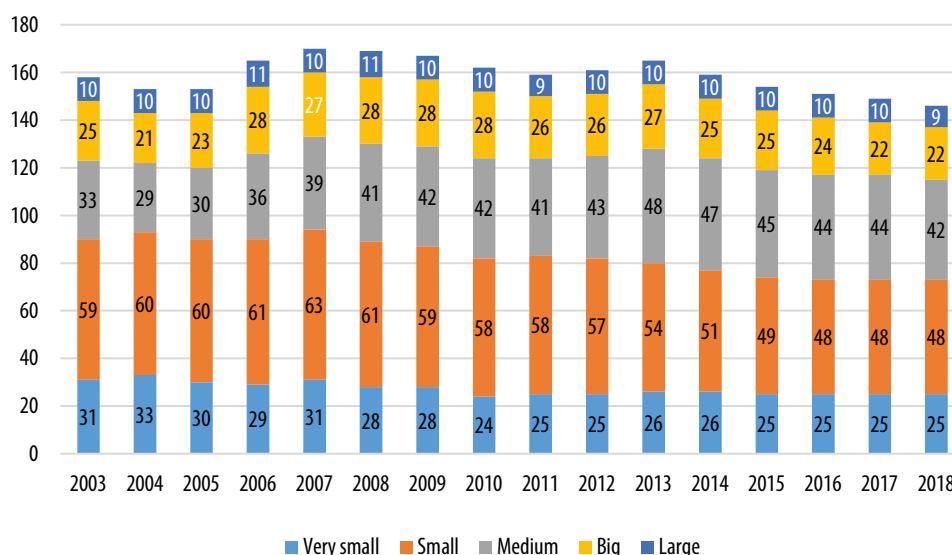


Figure 1. The number of IMC-unions of different size operating in each year in 2003–2018

Source: own calculations

⁴ Population is the most common measure in the empirical studies on IMC and economies of scale (Bel, Warner, 2016).

The number of members within each group of IMC-unions depending on their size is presented in Table 1. The result of grouping IMC-unions into size categories depending on their population, to some extent, coincides with the number of partners within an IMC-union. Spearman's rank-order correlation coefficients for the years 2003–2018 between these two variables vary from 0.7091 to 0.7543 and are statistically significant.

Table 1. The average number of members within each group of IMC-unions depending on their size in 2003–2018

IMC-union size	Min.	1 st Quartile	Median	Mean	3 rd Quartile	Max
Very small	2	2	3	3.66	5	7
Small	2	5	6	6.37	8	12
Medium size	3	7	9	9.06	11	26
Big	2	11	15	15.38	19	30
Large	7	10	22	21.34	29	38

Source: own calculations

The dependent variable reflects the share of expenditures incurred for a specific category of tasks in total expenditures incurred by an IMC-union. Tasks performed by IMC-unions were distinguished based on their financial statements and divided into three categories:⁵

- 1) tasks that performed jointly enable the exploitation of economies of scale and scope (hereafter EoS);
- 2) tasks generating spillovers (hereafter Spill);
- 3) tasks that performed jointly enable the exploitation of economies of scale and scope and generate spillovers at the same time (hereafter Multi).

Each of the three categories represents one outcome variable that is later investigated depending on the independent variable – the size of the IMC-union. The expenditures covered both current and investment expenditures and were adjusted for inflation. The shares reflect IMC-union activity in each type of task.

To test whether each dependent variable significantly differs across the five groups of IMC-unions in each year of analysis, first, a decision on the parametric or non-parametric test of analysis of variance had to be made. Saculinggan and Balase (2013) provide a comprehensive literature review on the comparison of statistical tests for normality. They indicate that the Shapiro-Wilk test has good power properties.

The Shapiro-Wilk test for normality (Shapiro, Wilk, 1965), improved by Royston (1995), was performed within each independent variable. The hypotheses that dependent variables are distributed normally were rejected. Thus, a nonparametric alternative

⁵ For detailed list of tasks classified to each group of expenditures, please see Annex.

to ANOVA, the Kruskal-Wallis rank test (Kruskal, Wallis, 1952), was chosen to compare the median score of the particular outcome variable across the five size groups of IMC-unions. The Kruskal-Wallis rank test verifies the hypothesis that two or more independent samples (of equal or different sizes) originate from the same distribution. Thus, it identifies whether at least one of the groups has a significantly different median (Acock, 2018). However, it does not indicate how the groups differ. Hence, to pinpoint which groups of IMC-unions statistically differ from the others in each year, Dunn's multiple comparison test (Dunn, 1964) with the Bonferroni adjustment (Hochberg, 1988) was performed. This test is commonly used for multiple comparisons and is known as the appropriate method to follow a Kruskal-Wallis test (Dinno, 2015).

By reporting the z-test statistic, Dunn's test shows the results for stochastic dominance across multiple pairwise comparisons. These comparisons correspond to the column mean minus the row mean (StataCorp, 2017). All tests in this study were carried out in Stata Statistical Software (StataCorp LLC, 2017) at the assumed significance level $\alpha = 0.05$.

It could be argued that the methods used in the research are not sophisticated and the analysis is quite descriptive. However, it provides the first insight into the existence of any connection between the size of IMC-unions and the types of tasks they mainly focus on. Hence, the study answers the questions that so far have received little attention in the literature on IMC. The findings will be further used in the strengthened empirical analysis. Moreover, it should be stressed that the financial data obtained from the budgetary statements were highly detailed, which enabled us to avoid a common approach in the literature leading to an implicit, incorrect assumption that costs are affected by an IMC entity through a constant percentage or amount.

4. Results and discussion

Descriptive statistics⁶ of expenditure shares for EoS/Spill/Multi-type tasks incurred by very small (1), small (2), medium-sized (3), big (4), and large (5) IMC-unions in each year from 2003 to 2018 give the first insight into the distribution of the three dependent variables.⁷ The means are presented in Figures 2, 3 and 4, whereas the medians are presented in Figures 5, 6 and 7. In almost all years and IMC-union types, the means of expenditure shares for EoS-type tasks are smaller than the medians, which suggests that their distribution is negatively skewed. This indicates that most IMC-unions allocated a larger part of their budget to this type of task than the average would suggest.

⁶ Because of the large amount of data, descriptive statistics are not included in the text but can be provided by the author upon request.

⁷ The distribution was also checked on the histograms reported for all kinds of expenditure shares incurred by all IMC-unions groups in each year from 2003 to 2018. The histograms can be provided by the author upon request.

The opposite is identified regarding expenditure shares for Spill- and Multi-type tasks – the distribution is positively skewed because the means in most cases are greater than medians. The overwhelming majority of all kinds of IMC-unions did not spend any money on Spill-type tasks. This finding is in line with the results based on surveys of Swianiewicz et al. (2016), who showed that cooperation in non-capital-intensive tasks is harder to evaluate. Thus, it is difficult to assess satisfaction and potential benefits of collaboration, which in turn may discourage potential partners from initiating cooperation.

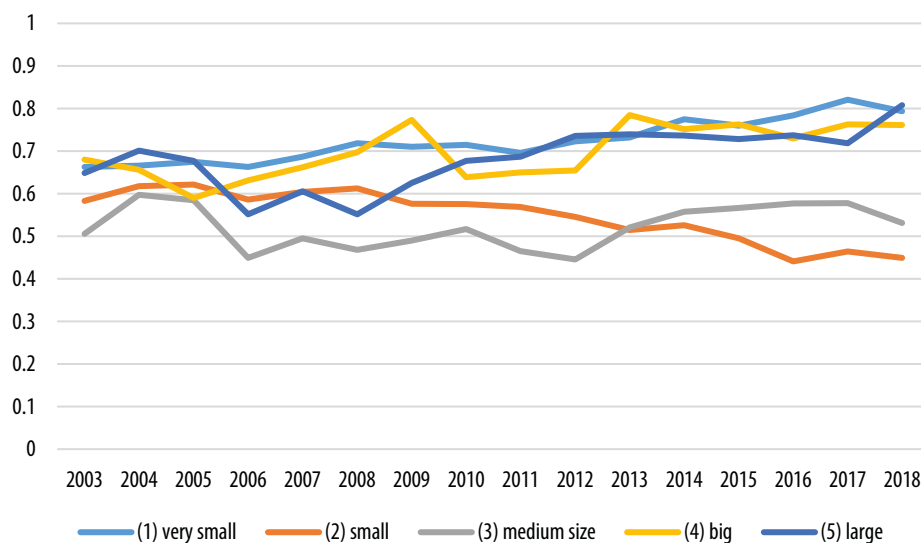


Figure 2. Means of shares of EoS expenditures by IMC-union size in 2003–2018
Source: own calculations

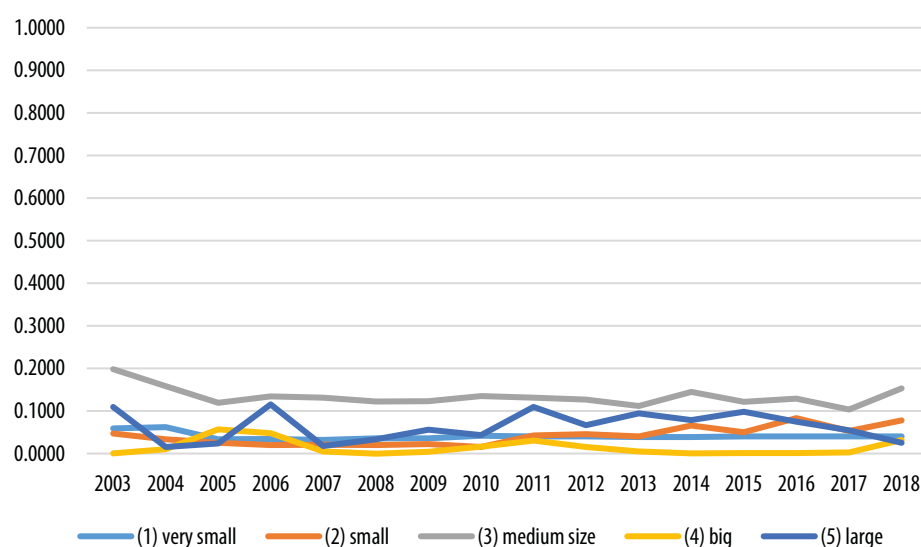


Figure 3. Means of shares of Spill expenditures by IMC-union size in 2003–2018
Source: own calculations

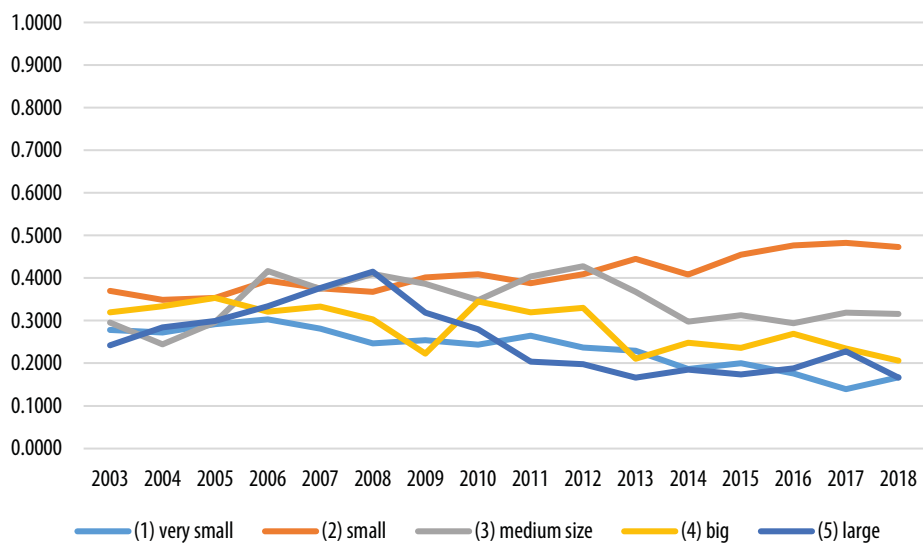


Figure 4. Means of shares of Multi expenditures by IMC-union size in 2003–2018

Source: own calculations

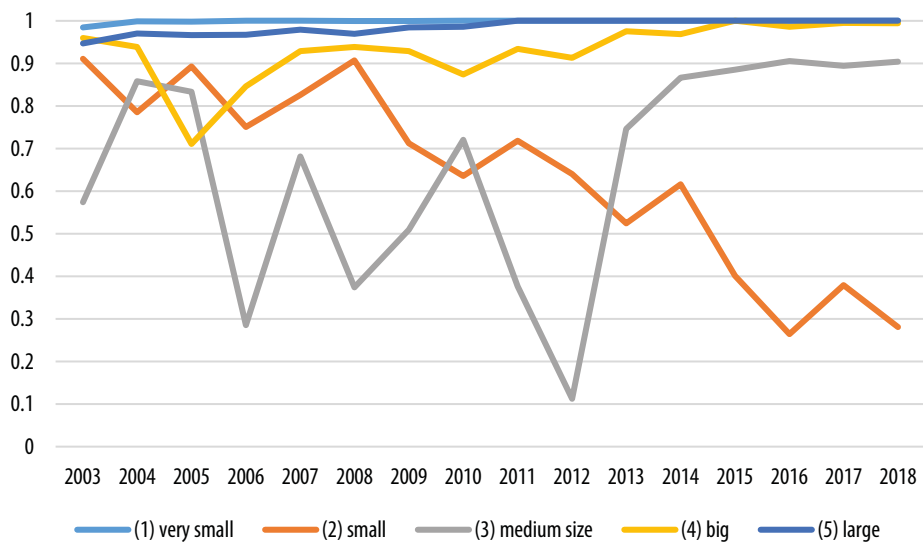


Figure 5. Medians of shares on EoS expenditures by IMC-union size in 2003–2018

Source: own calculations

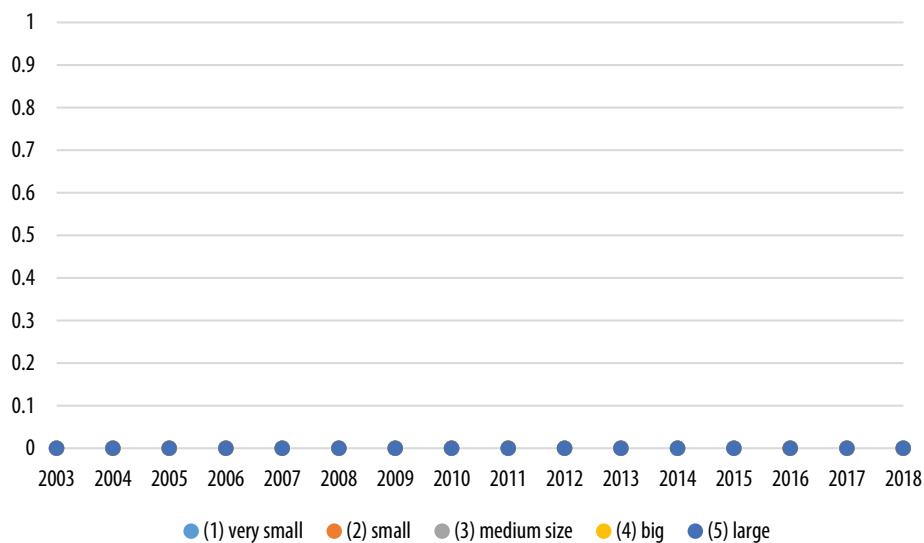


Figure 6. Medians of shares of Spill expenditures by IMC-union size in 2003–2018*

* All medians are equal to zero.

Source: own calculations

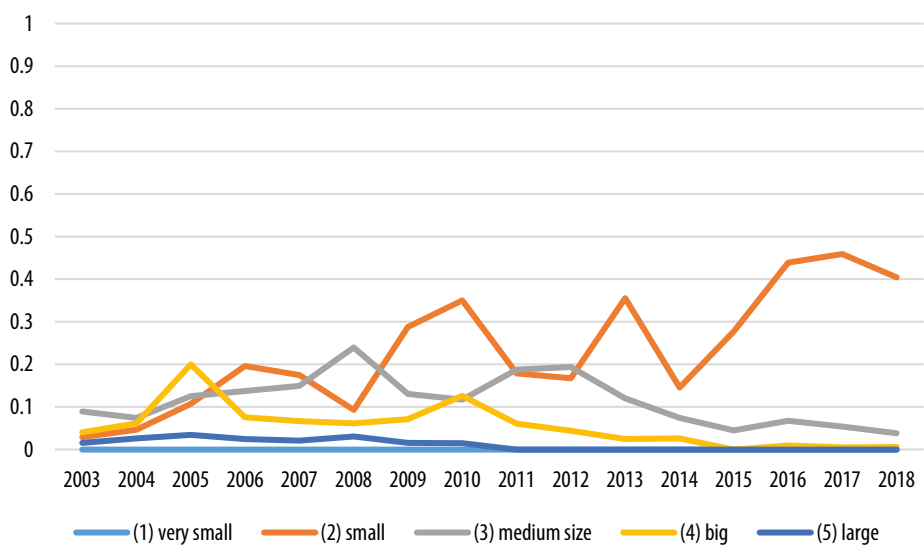


Figure 7. Medians of shares of Multi expenditures by IMC-union size in 2003–2018

Source: own calculations

Concerning expenditure shares for Multi-type tasks, more IMC-unions spent less of their budget than the average unit. It is important to note that this paper does not aim to identify the reasons of such differences, but it only focuses on determining whether the observed differences were statistically significant between the groups of IMC-unions in the period of observation.

The analysed descriptive statistics suggested the lack of normality in sample distributions, which was further tested using the Shapiro-Wilk test. The test was applied:

- 1) for three separate dependent variables (expenditure shares for EoS-type tasks, expenditure shares for Spill-type tasks and expenditure shares for Multi-type tasks),
- 2) within each of the five independent variables (very small, small, medium size, big, large), and
- 3) for each year of the period of 2003–2018 (16 years).

The Shapiro-Wilk test showed a statistical lack of normality in sample distributions in 233 out of 240 cases.⁸ Even though the probability that sample distribution is normal was bigger than 0.05 in seven cases,⁹ their insufficient size suggests applying nonparametric methods in further analyses and examining medians rather than means.

Hypothesis H1 postulates that IMC-unions expenditures within a particular group of tasks differ depending on the size of an IMC-union. This hypothesis is examined with the Kruskal-Wallis test. The null hypothesis of this test – that median scores of expenditure shares for EoS/Spill/Multi-type tasks are the same for each of the five size groups of IMC-unions – was based on the comparison to (alpha = 0.05) critical values for the Kruskal-Wallis H distribution (chi-squared) which is $\chi^2_{0.05,4} = 9.45$. Hence, when $H > 9.45$, the null hypothesis was rejected showing that the distributions of expenditure shares for EoS/Spill/Multi-type tasks are not equal across the size groups of IMC-unions. The Kruskal-Wallis H statistics are reported in Table 2. Statistically significant differences in medians were reported for expenditure shares for EoS-type tasks in nine analysed years (2008–2009, 2012–2018) and for Multi-type tasks in three analysed years (2013, 2017–2018). Regarding Spill-type tasks, the null hypothesis was not rejected even once. Thus, hypothesis H3 is not confirmed, which can provide valuable policy implications.

⁸ Because of the large amount of data, tables with detailed results of the Shapiro-Wilk test are not included in the text but can be provided by the author upon request.

⁹ These concerned: EoS-type tasks – four times, Spill-type tasks – twice, Multi-type tasks – once.

Table 2. The Kruskal-Wallis H statistics for three types of expenditures in 2003–2018

Year	EoS-type tasks		Spill-type tasks		Multi-type tasks	
	H statistics (chi-squared)	p-value	H statistics (chi-squared)	p-value	H statistics (chi-squared)	p-value
2003	3.441	0.487	2.630	0.622	1.115	0.892
2004	1.526	0.822	2.506	0.644	1.478	0.831
2005	3.442	0.487	3.363	0.499	1.547	0.818
2006	6.480	0.166	2.255	0.689	3.876	0.423
2007	5.955	0.203	3.443	0.487	2.835	0.586
2008	10.062	0.039*	3.676	0.452	5.315	0.257
2009	9.821	0.044*	3.617	0.460	5.181	0.269
2010	6.169	0.187	4.247	0.374	4.070	0.397
2011	8.544	0.074	3.009	0.556	5.925	0.205
2012	10.690	0.030*	2.365	0.669	7.670	0.105
2013	13.065	0.011*	2.389	0.665	9.913	0.042*
2014	16.644	0.002*	2.368	0.669	9.217	0.056
2015	12.198	0.016*	1.632	0.803	9.269	0.055
2016	14.615	0.006*	2.753	0.600	9.309	0.054
2017	12.074	0.017*	1.693	0.792	11.045	0.026*
2018	13.578	0.009*	2.260	0.688	13.232	0.010*

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: own calculations

The results indicate that the distributions of expenditure shares for EoS-type and Multi-type tasks over several years are not equal across the size groups of IMU, hence hypothesis H1 receives substantial support. This requires a further investigation on which groups are statistically different from each other.

Hypothesis H2 implies that, compared to bigger IMC-unions, smaller IMC-unions spend more of their budget on expenditures on tasks which, when performed jointly, enable the exploitation of economies of scale or scope.

This hypothesis is verified using Dunn's multiple comparison test with the Bonferroni adjustment.¹⁰ The results are reported in Tables 3 and 4.

¹⁰ The Dunn's multiple comparison tests were also performed using five other adjustments: 1) the Sidak adjustment, which yielded the same results in terms of statistical significance; 2) the Holm adjustment, which yielded the same results in terms of statistical significance; 3) the Holm-Sidak adjustment, which yielded the same results in terms of statistical significance with one additional statistically significant z-test statistic for EoS-type tasks; 4) the Hochberg adjustment, which yielded the same results in terms of statistical significance; 5) the Benjamini-Hochberg, which yielded the same results in terms of statistical significance with 18 additional statistically significant z-test statistics for EoS-type tasks and two additional statistically significant Z-test for Multi-type

Table 3. Z-test statistics reported from Dunn's multiple comparison test with the Bonferroni adjustment in 2003–2018 for EoS-type tasks

2008	1	2	3	4	2015	1	2	3	4
2	0.958				2	2.339			
3	2.882*	2.416			3	2.681*	0.456		
4	0.483	-0.393	-2.356		4	0.316	-1.975	-2.323	
5	0.602	-0.014	-1.450	0.240	5	-0.128	-1.795	-2.050	-0.367
2009	1	2	3	4	2016	1	2	3	4
2	1.225				2	2.976*			
3	2.544	1.681			3	2.732*	-0.239		
4	-0.114	-1.358	-2.669*		4	0.602	-2.248	-2.018	
5	0.111	-0.703	-1.648	0.193	5	-0.114	-2.234	-2.075	-0.571
2012	1	2	3	4	2017	1	2	3	4
2	1.603				2	2.918*			
3	2.831*	1.621			3	2.430	-0.533		
4	0.747	-0.741	-2.024		4	0.492	-2.237	-1.780	
5	-0.269	-1.415	-2.315	-0.833	5	0.272	-1.778	-1.447	-0.111
2013	1	2	3	4	2018	1	2	3	4
2	2.291				2	2.962*			
3	2.852*	0.744			3	2.637*	-0.305		
4	0.394	-1.861	-2.437		4	0.764	-1.971	-1.683	
5	-0.101	-1.698	-2.106	-0.394	5	-0.206	-2.232	-2.032	-0.767
2014	1	2	3	4					
2	2.398								
3	3.095**	0.883							
4	0.378	-1.933	-2.628*						
5	-0.509	-2.218	-2.716*	-0.789					

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: own calculations

pe tasks. Because of the large amount of data, the results of the additional tests can be provided by the author upon request. Out of the presented adjustments for multiple comparisons, the Bonferroni adjustment is most commonly used. It is a conservative adjustment that is appropriate for a relatively small number of comparisons, which is true for the research in this paper (ten comparisons). It must be stressed that less conservative adjustments (Sidak, Holm, Holm-Sidak, Hochberg) (Chen, Feng, Yi, 2017) yielded the same results, with only one exception. The Benjamini-Hochberg adjustment allowed us to report more statistically significant z-test statistics. However, this adjustment should be used in cases where a large number of hypotheses are simultaneously tested (Chen, Feng, Yi, 2017). Therefore, the author decided to present the results with the Bonferroni adjustment, which is appropriate for the number of comparisons tested in the paper and is the most popular and conservative approach that allows researchers to avoid false positive results.

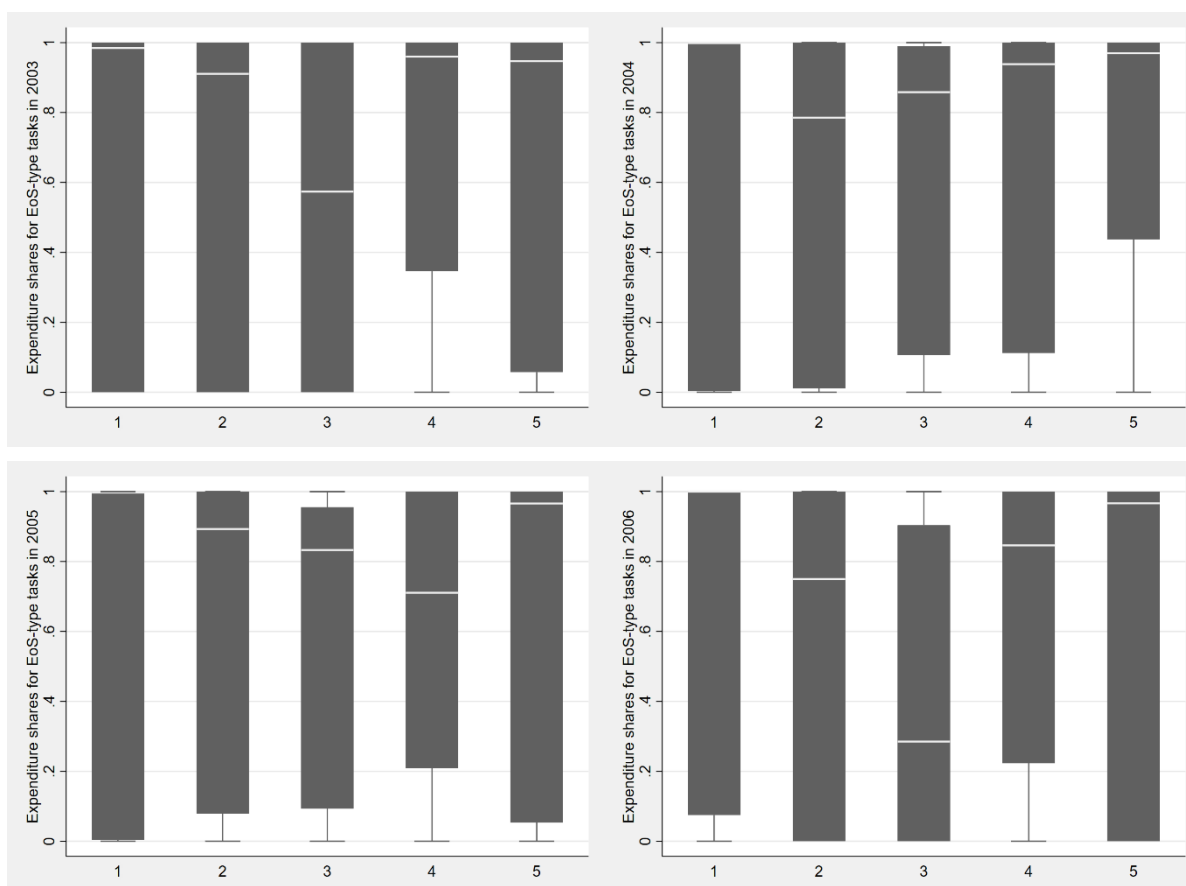
Table 4. Z-test statistics reported from Dunn’s multiple comparison test with the Bonferroni adjustment in 2003–2018 for Multi-type tasks

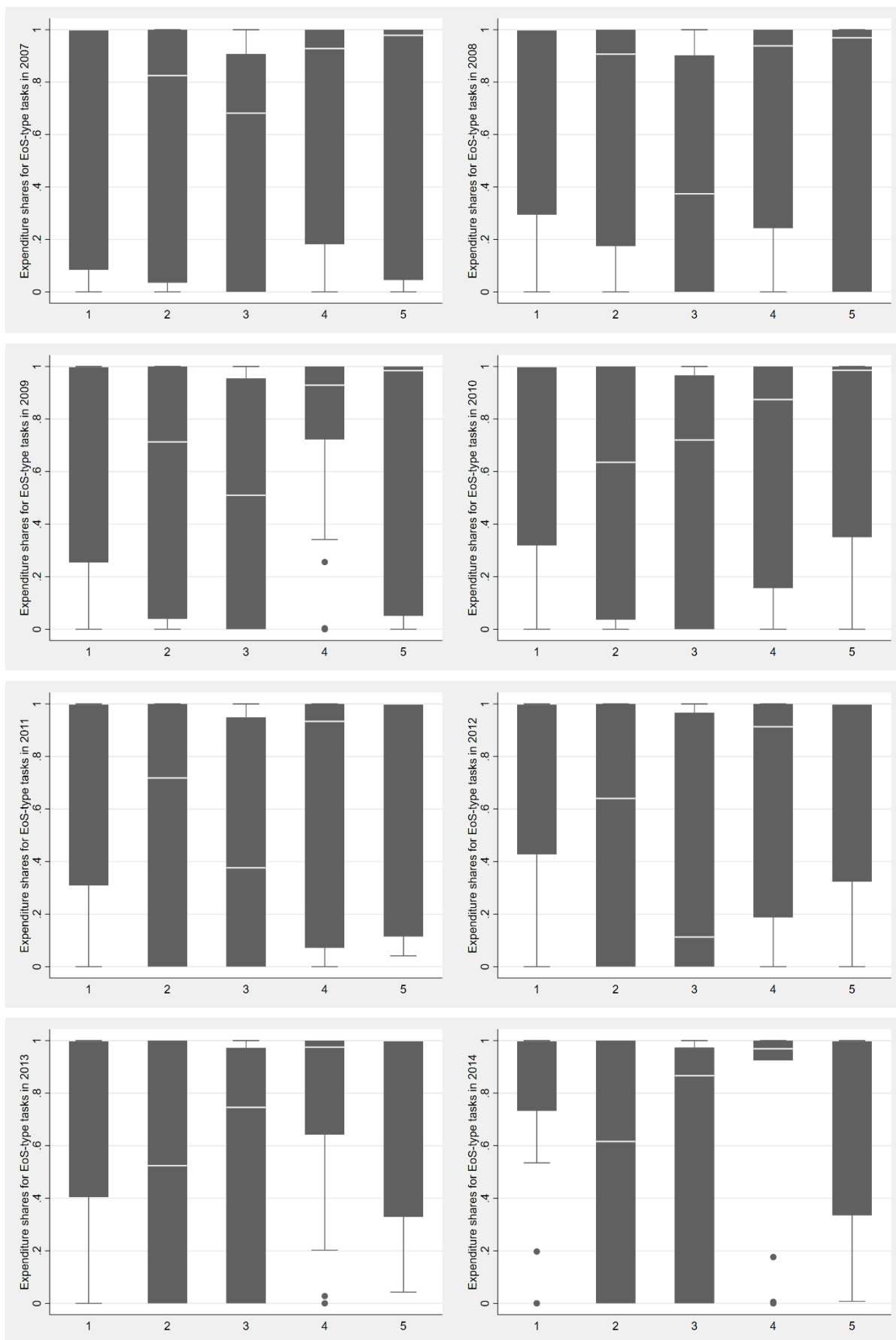
2013	1	2	3	4	2018	1	2	3	4
2	-2.409*				2	-3.299**			
3	-2.206	0.191			3	-2.225	1.190		
4	-0.507	1.849	1.654		4	-0.952	2.079	1.078	
5	0.229	1.918	1.790	0.607	5	0.056	2.299	1.589	0.758
2017	1	2	3	4					
2	-3.123**								
3	-2.101	1.169							
4	-0.891	1.980	1.018						
5	-0.274	1.921	1.209	0.414					

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: own calculations

It is important for the reader to note that z-test statistics demonstrate whether the differences between pairwise groups are statistically significant, but they do not inform us about the direction of the difference or its size. Therefore, the results from Tables 3 and 5 are supported by the box plots (see Figures 8, 9 and 10) showing the median of each IMC-union group and the within-group variability.





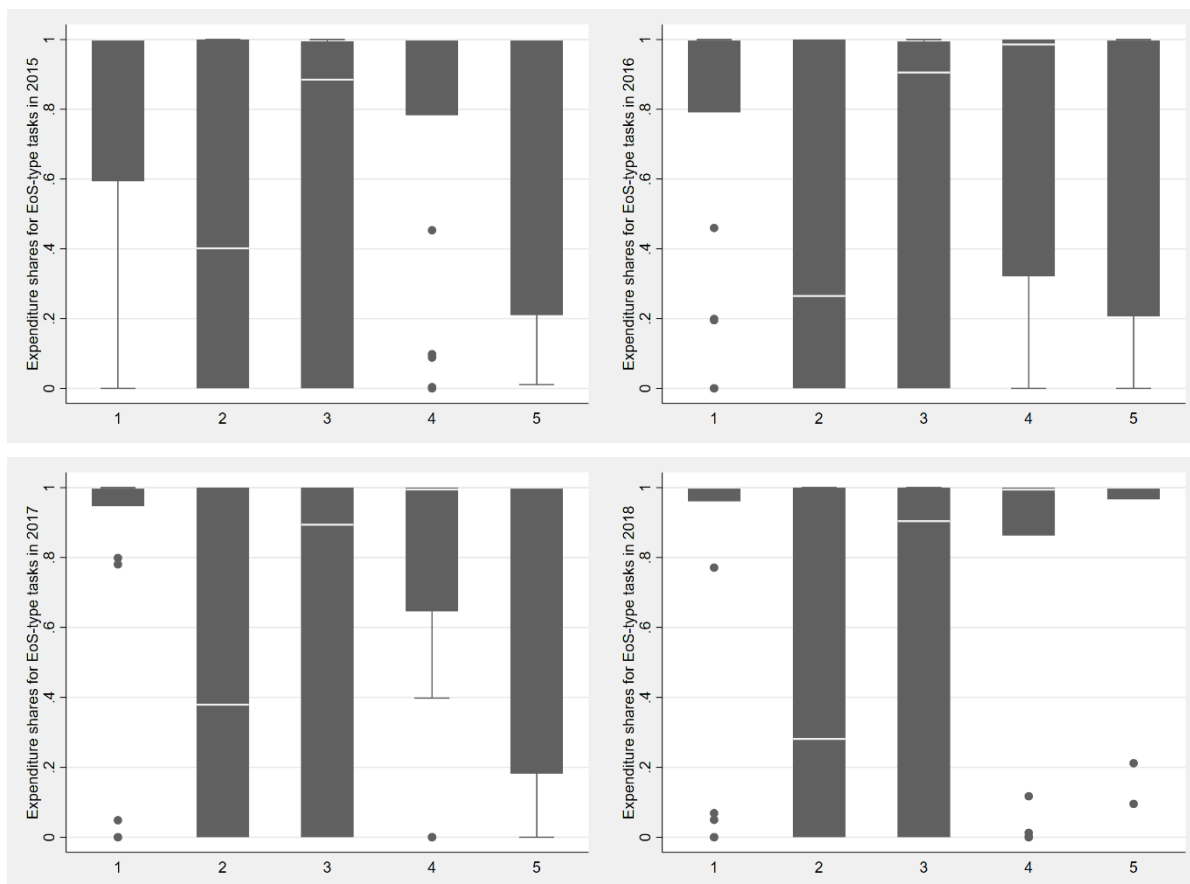
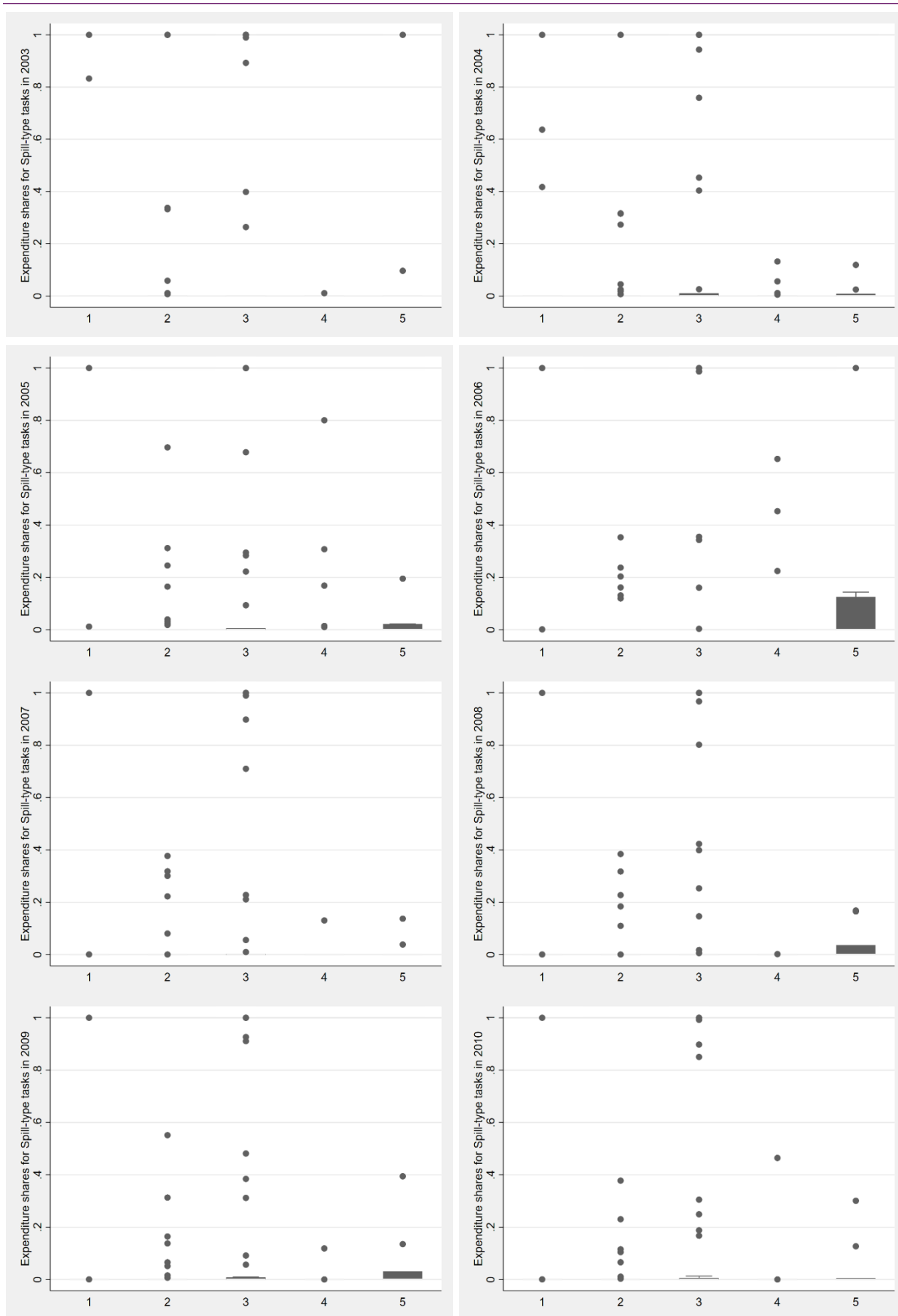
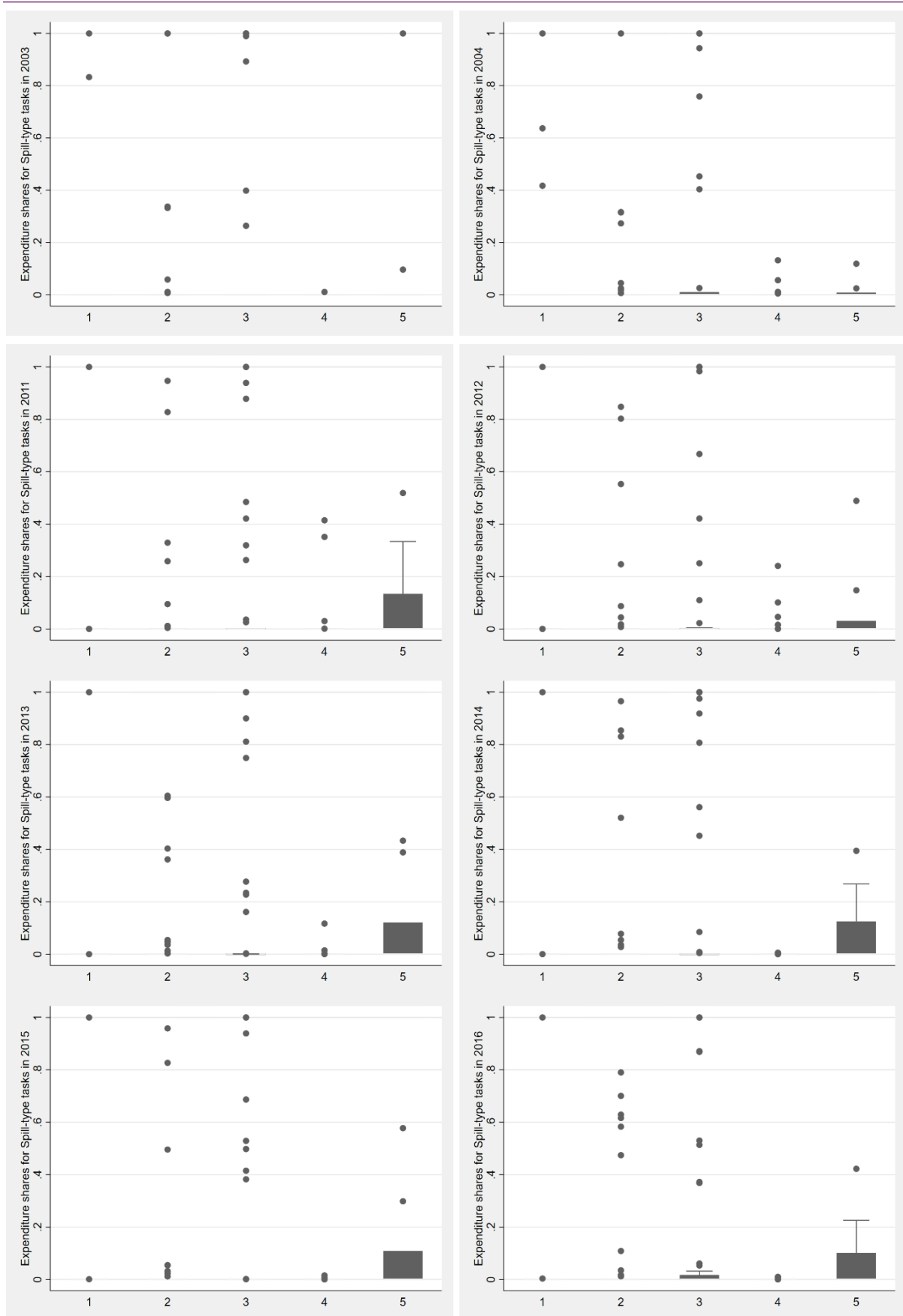


Figure 8. Expenditure shares for EcoS-type tasks incurred by small (1), very small (2), medium size (3), big (4), and large (5) IMC-unions in each year from 2003 to 2018

Source: own calculations





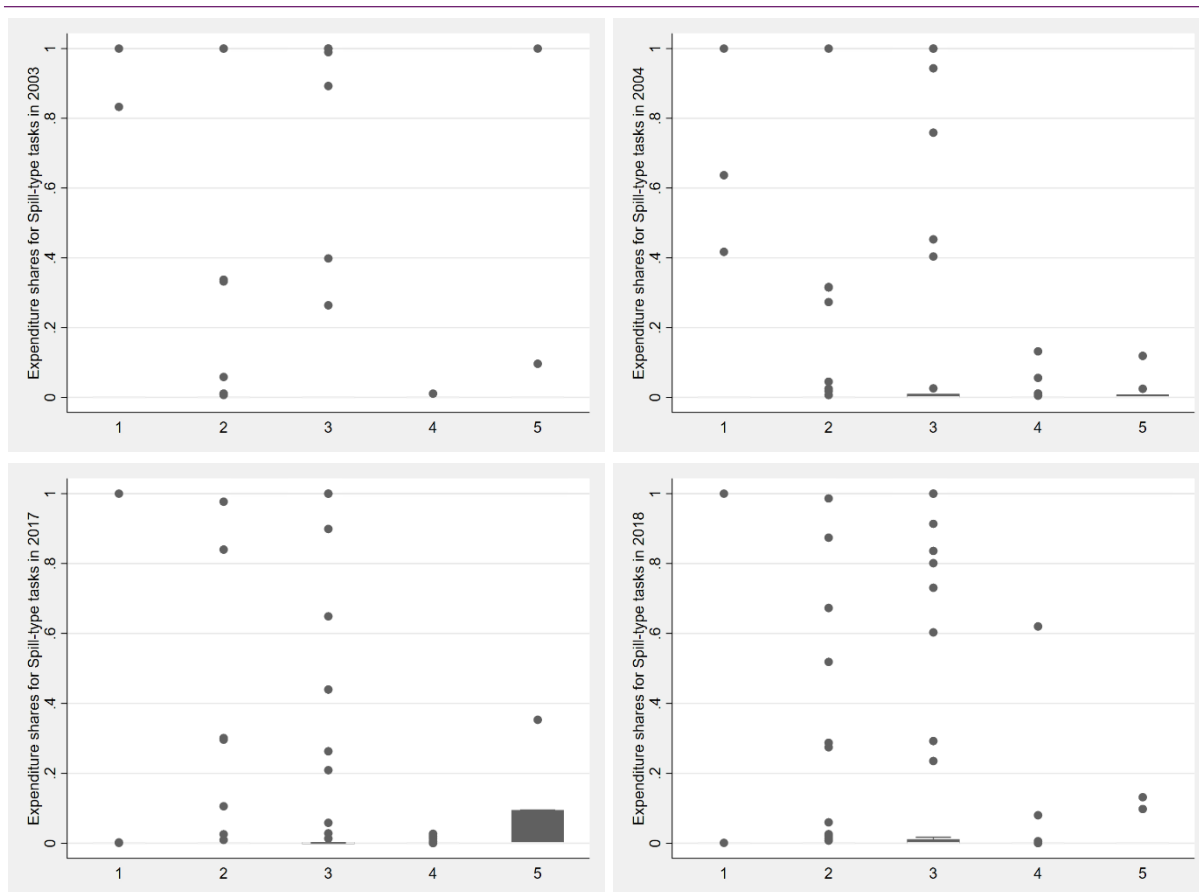
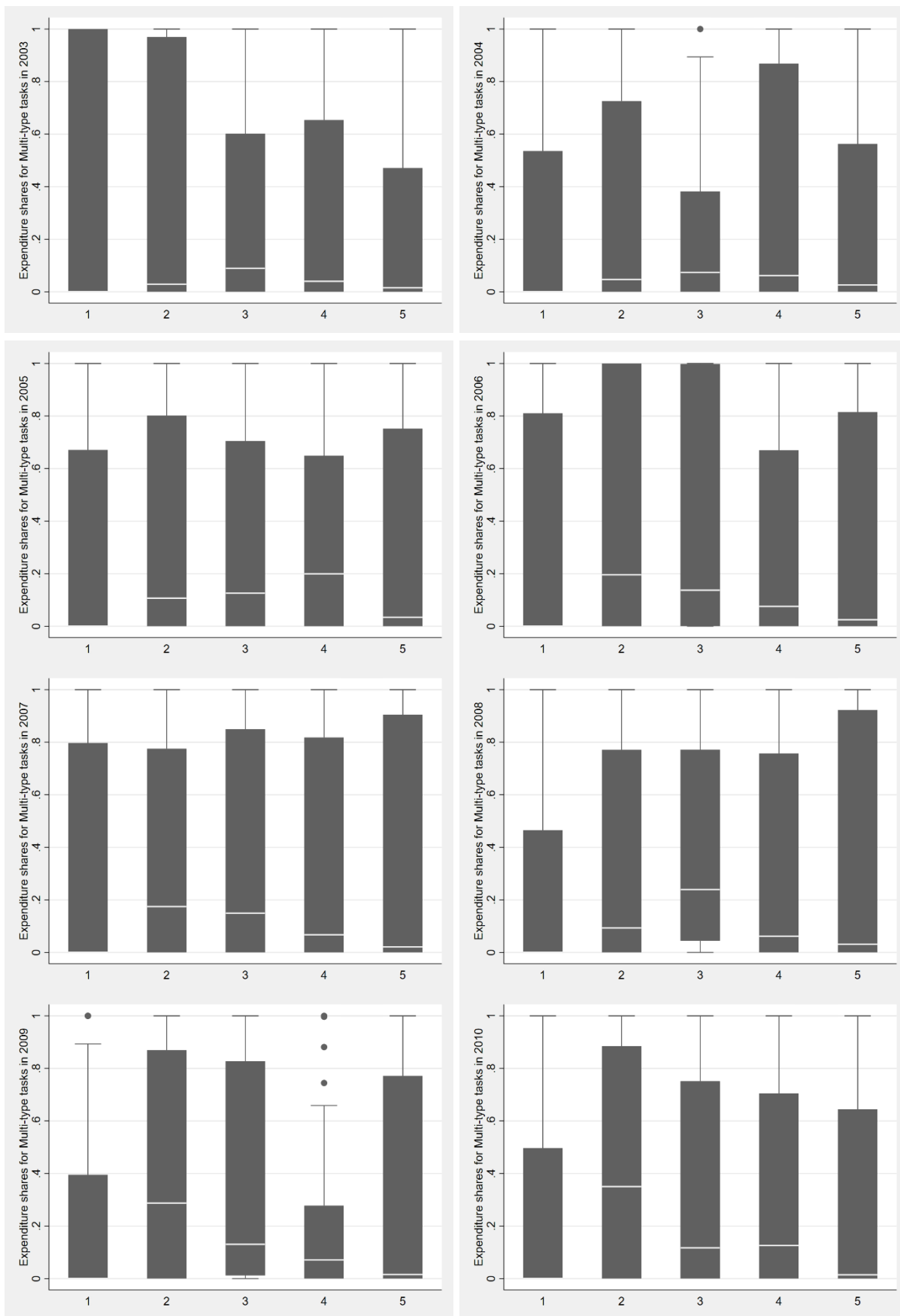
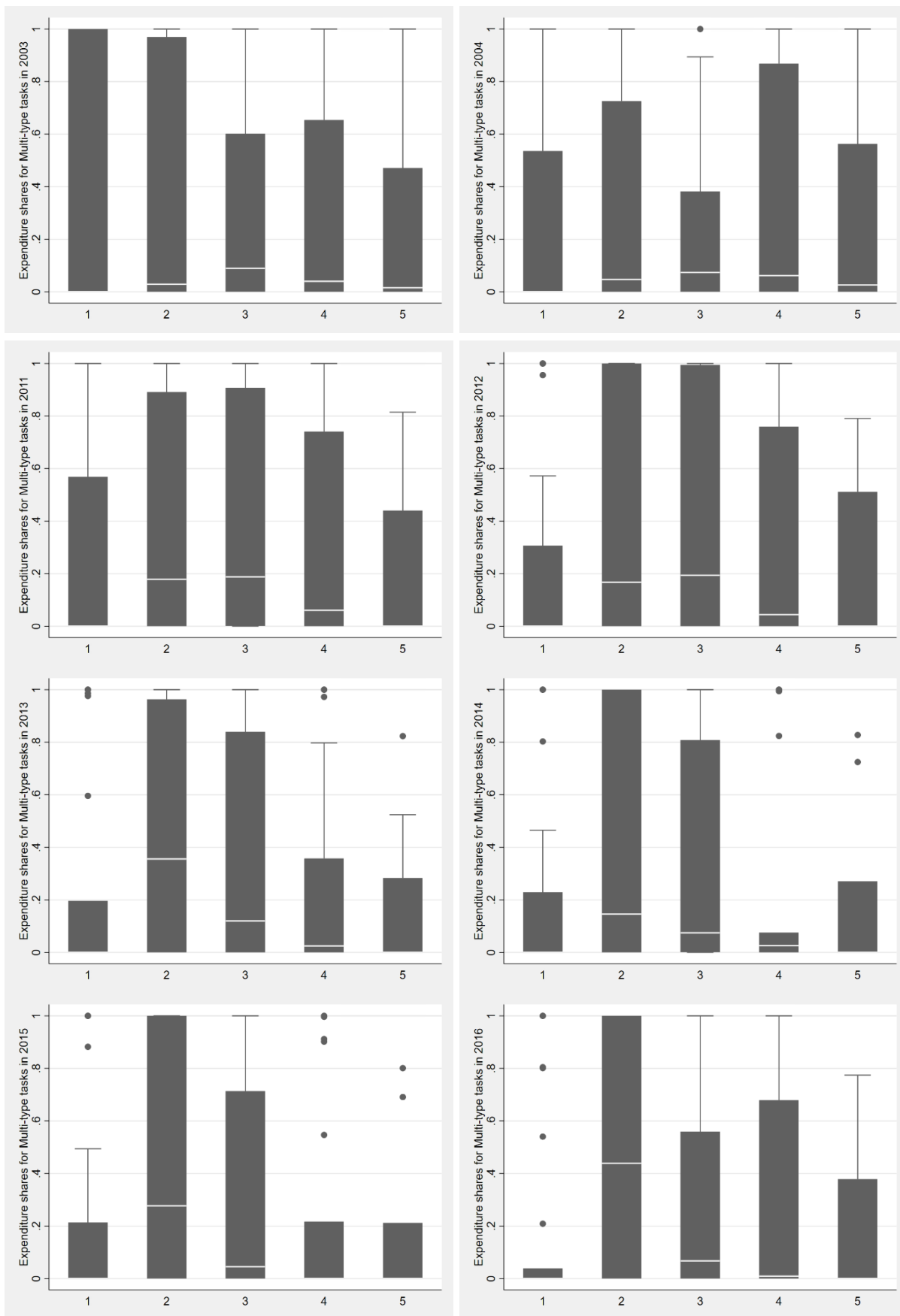


Figure 9. Expenditure shares for Spill-type tasks incurred by small (1), very small (2), medium size (3), big (4), and large (5) IMC-unions in each year from 2003 to 2018

Source: own calculations





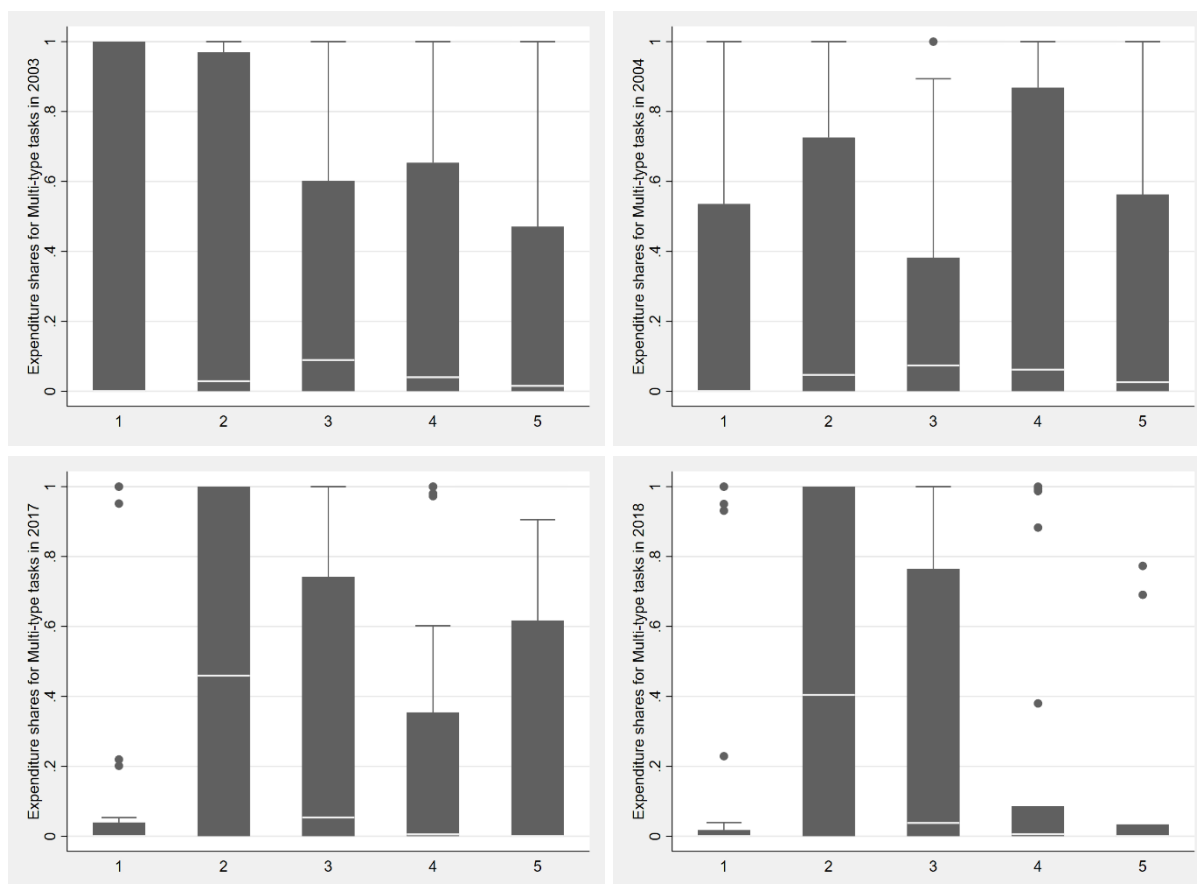


Figure 10. Expenditure shares for Multi-type tasks incurred by small (1), very small (2), medium size (3), big (4), and large (5) IMC-unions in each year from 2003 to 2018

Source: own calculations

Out of 13 identified statistically significant differences in the median scores of expenditure shares for EoS-type tasks (see Table 3), 10 concerned very small IMC-unions (1). In every case, very small IMC-unions spent a larger share of their budget on EoS-type tasks than:

1) medium-sized IMC-unions on average by:

- 62.53 pp. in 2008,
- 88.73 pp. in 2012,
- 25.42 pp. in 2013,
- 13.34 pp. in 2014,
- 11.52 pp. in 2015,
- 9.42 pp. in 2016,
- 9.59 pp. in 2018;

2) small IMC-unions on average by:

- 73.53 pp. in 2016,
- 62.08 pp. in 2017,
- 71.92 pp. in 2018.

The analysis revealed that the differences between very small and medium-sized IMC-unions diminished in the following years, but the differences between very small and small IMC-unions turned out to be relatively stable.

The other three statistically significant differences revealed that medium-sized IMC-unions spent less of their budget on EoS-type tasks than:

1) big IMC-unions on average by:

- 41.93 pp. in 2009,
- 10.22 pp. in 2014;

2) large IMC-unions on average by:

- 13.34 pp. in 2014.

H2 receives moderate support. Very small IMC-unions spent more on the analysed type of tasks than small and medium-sized IMC-unions. However, in a few cases, bigger IMC-unions spent more than smaller ones, which is unclear and indicates the need for further causal analyses. This finding is in line with the previous study of Kołsut (2015). The results supporting H2 can be also compared to findings of Niaounakis and Blank (2017), who found smaller IMC entities performing better at exploiting scale economies. However, this paper does not allow us to draw conclusions on the effects of cooperation or to assess IMC entities performance based on their size. It concentrates solely on determining whether the observed differences were statistically significant between the groups of IMC-unions in the period of observation.

5. Conclusions

This paper fills the research gap by providing insight into the differences in spending on particular tasks depending on the size of IMC-unions. It addresses the questions of whether small IMC-unions aim at scale effects more intensively than larger ones, just like smaller municipalities do, and if bigger IMC-unions engage more often in the joint provision of tasks generating spillovers. Its originality lies in not concentrating on members constituting the IMC-union, which has already been well recognised in the literature, and in the usage of very detailed official financial data that allows us to study the size of the budget spent on particular categories of tasks, differentiate and compare it to different sizes of IMC-unions.

The analyses are based on inter-municipal unions operating in Poland in 2003–2018. A nonparametric alternative to ANOVA, the Kruskal-Wallis rank test, was chosen to compare the median score of the particular outcome variable across five size groups of IMC-unions. To pinpoint which specific medians are statistically different from the others in each year of analysis, Dunn's multiple comparison test with the Bonferroni adjustment was performed.

The results substantially support the first hypothesis since the distributions of expenditure shares for EoS-type and Multi-type tasks over several years are not equal across the size groups of IMC-unions. Further investigation into which groups are statistically different from each other revealed that in some years very small IMC-unions spent a larger share of their budget on EoS-type tasks than small and medium-sized IMC-unions. This is an interesting finding illustrating that regardless of the number of members, but based on the number of inhabitants, smaller IMC-unions more often focus on tasks which, when performed jointly, enable the exploitation of economies of scale and scope. It is partially consistent with pragmatic decisions to start cooperating often taken by smaller municipalities vulnerable to economies of scale or scope problems. The theoretical (e.g. Ostrom, Tiebout, Warren, 1961) and empirical literature (e.g. Blaeschke, 2014) on fiscal federalism provides evidence that administrative borders need not coincide with efficient provisions of public goods and services. This difficulty is even more important for a country like Poland, which underwent a radical reform in the process of systemic transformation in the 1990s and set its final administrative structure only in 1999 (Regulski, 2003). Very small IMC-unions spent more on the analysed type of tasks than small and medium size IMC-unions. However, in a few cases, bigger IMC-unions spent more than smaller ones, which requires further analyses of causal interference to be conducted.

The study draws valuable policy implications and recommendations in two dimensions – national in the context of Polish municipalities and international. Firstly, in terms of differences in IMC entities' size and their spending on EoS-type tasks. The number of duties that Polish municipalities are responsible for has been increasing since the economic transformation. Some of them result not only from statutory obligations imposed by the legislator at the central level, but to a large degree also from the 4th industrial revolution – the New Economy, new technologies and digitalisation. It definitely affects the public sector and forces local governments to develop smart specialisations (Bal-Domańska, Sobczak, Stańczyk, 2020), policies aimed at promoting circular economy (Razminiene, 2019), as well as various e-services and technological solutions while ensuring an appropriate level of cybersecurity. Moreover, the COVID-19 pandemic has undoubtedly become a 'digital accelerator' for municipalities in their road of transition to 4.0 economy standards.

At the same time, fiscal constraints and budgetary challenges arising also from the pandemic impose financial pressure on municipalities. The vast majority of the indicated tasks concern the field dominated by economies of scale and scope – tough to achieve especially by small municipalities. The results show that most of the Polish IMC-unions allocated most of the budget for capital-intensive tasks in 2003–2018. Though sewage systems or waste disposal systems have been built or established and do not appear to pose a problem in the 21st century, undoubtedly, municipalities face completely

new challenges related to, primarily, e-administration and cybersecurity. These tasks should be performed jointly in order to share experiences, solve problems jointly and, given the current complex circumstances, effectively use even more limited public funds. Because IMC-unions operate for a very small or small number of inhabitants, the introduction of a system of incentives by the central government is recommended. This could cause municipalities to be more prone to start cooperation with their neighbours without limiting their political autonomy. Many local governments across Europe and beyond face similar challenges, hence such policies could be introduced also by supranational organisations such as the European Union.

On the other hand, policy recommendations stem also from rejecting hypothesis H3. While analysing the share of IMC-unions' budget spent on tasks that generate spillovers, in order to reduce these externalities, no statistically significant differences depending on the size of the IMC-union were observed. However, the research provided additional evidence of the municipalities' limited interest to cooperate in non-capital-intensive tasks – tasks in which it is difficult to assess satisfaction and potential benefits of collaboration. Activities in the field of environmental protection, sustainable development, circular economy and those aimed at reducing the bias of digital transformation and diminishing inequalities in the post-COVID-19 societies may not be of interest to singular local governments, but such activities are undoubtedly of great importance to entire societies and mankind. Municipalities are already equipped with the tools to diagnose the above-mentioned difficulties and to tailor their policies accordingly, but the lack of funds may prevent them from providing services not yet required by law. However, in the absence of internal incentives to undertake such cooperation, the role of upper-tier governments or supranational organisations would be to implement programs aimed at encouragement or coercion. In fact, the concept of industry 4.0 was just a beginning. Nowadays industry 5.0 is gaining importance by concentrating on human-centric, sustainable and resilient growth (Cotta et al., 2021). The European Union already announced the allocation of funds to boost investments in digital transformation and fill the existing gaps in this field (Arjona, 2021). Such top-down policies may also create an incentive for municipalities to join their forces in applying for European or national funds to overcome at least financial difficulties restraining them so far – as was the case with the previous financial perspectives (e.g. Swianiewicz et al., 2016).

Though the study provides relevant information on types of activities undertaken collectively by municipalities depending on the size of the IMC-union and constitutes a base for policy recommendations, it has its limitations. The method used does not allow for deriving a causal relationship. Hence, it remains unclear what the reasons for identified differences are. From the perspective of implementation and coordination of possible top-down policies aimed at promoting voluntary IMC, the findings of this research should be supported by further analyses. We need to understand what drives municipal-

ities to constitute an IMC entity of a particular size – are these political, socio-economic or geographical factors? To what extent various incentives offered by upper-tier governments or supranational organisations cause IMC emergence? The answers to these questions can help and should be provided by research in the near future.

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Annex. The list of tasks classified to each group of expenditures

Tasks that performed jointly enable the exploitation of economies of scale and scope	Water supply and sanitation infrastructure in the village
	Removal of the effects of natural disasters
	Heat supply
	Water supply
	Electricity supply
	Removal of the effects of natural disasters
	Local public transport
	Communal public roads
	Internal roads
	Telecommunications infrastructure
	Land and real estate management
	County offices
	Municipal councils
	Municipal offices
	Field units of the Police
	Voivodship Police Headquarters
	Border guards
	Voivodship headquarters of the State Fire Service
	County headquarters of the State Fire Service
	Volunteer fire brigades
	Mountain and water rescue tasks
	Handling of securities, credits and loans of local government units
	Settlements for sureties and guarantees granted by the State Treasury or a local government unit
	Service of domestic loans and credits of other public finance sector entities and entities from outside the public finance sector
	Settlements between local government units
	Various financial settlements
	General and specific reserves. This chapter includes only reserves which cannot be divided into sections and types of expenditure in the period of adopting the budget.
	Elementary schools
	Pre-school departments in primary schools
	Before school
Secondary schools	
Driving students to schools	

	Centres for training, education and improvement of personnel
	Other forms of education not specifically mentioned
	Training and education of teachers
	Implementation of tasks requiring the use of special organisation of learning and working methods for children and youth in primary schools
	Provide students with the right to free access to textbooks, educational materials, or practice materials
	General hospitals
	Outpatient treatment
	Emergency medical services
	Social welfare homes
	Labour Fund
	Wastewater management and water protection
	Waste management
	Cleansing of towns and villages
	Lighting of streets, squares and roads
	Municipal economy plants
	Proceeds and expenditures related to the collection of funds from fees and fines for using the environment
	Other tasks in the field of culture
	Houses and community centres, day-rooms and clubs
	Sports facilities
	Tasks in the field of physical culture
Water supply and sanitation infrastructure in the village	
Tasks generating spillovers	Organic farming
	Control of infectious diseases in animals and monitoring of chemical and biological residues in animal tissues and animal products
	Restructuring and modernisation of the food sector and rural development
	Entrepreneurship development
	Tasks in the field of promoting tourism
	Promotion of local government units
	Health policy programmes
	Atmospheric air and climate protection
	Protection of soil and groundwater
	Protection of biodiversity and landscape
Protection of monuments and care of monuments	

Tasks that performed jointly enable the exploitation of economies of scale and scope and generate spillovers at the same time	National public roads
	General Directorate for National Roads and Motorways
	Voivodeship public roads
	County public roads
	Public roads in cities with county rights
	Proceeds from other fees constituting the income of local government units on the basis of acts
	Animal shelters
	Research and development activities
	Other activities

Source: own elaboration based on the Ministry of the Interior and Administration (2020) and the Ministry of Finance (2018)

Czy związki międzygminne różnią się w polityce wydatkowania środków w zależności od ich wielkości? Wyniki na przykładzie Polski



Streszczenie:

Literatura dotycząca współpracy międzygminnej (IMC), skupiająca się na charakterystyce jej członków i czynnikach decydujących o jej nawiązaniu, jest bogata. Różne badania wskazują, że korzyści skali i zakresu osiągają głównie małe gminy, w związku z czym są one bardziej chętne do podejmowania współpracy niż większe jednostki. Z drugiej strony małe gminy bywają niekiedy skłonne do korzystania z dóbr i usług świadczonych przez większe samorządy, co wiąże się z efektami zewnętrznymi. Nie jest jednak jasne, czy istnieje powiązanie między wielkością związków międzygminnych (mierzoną ich populacją) a rodzajami zadań wykonywanych wspólnie przez partnerów (często w różnej liczbie). Niniejszy artykuł ma na celu wypełnienie istniejącej luki poprzez zbadanie, czy udział wydatków na jedną z trzech kategorii zadań (zakwalifikowanych jako zadania cechujące się ekonomią skali i zakresu, generowaniem efektów zewnętrznych bądź mieszane) w wydatkach ponoszonych łącznie różni się istotnie w zależności od wielkości podmiotu IMC. Wykorzystano do tego test rang Kruskala-Wallisa. Aby wskazać, które konkretne mediany różnią się statystycznie od pozostałych w każdym roku, przeprowadzono test wielokrotnych porównań Dunna z korektą Bonferroniego. Badanie dotyczy polskich związków międzygminnych oraz ich sprawozdań finansowych za lata 2003–2018 i obejmuje 2541 obserwacji. Wyniki pokazują, że zdecydowaną większość statystycznie istotnych różnic zaobserwowano w udziale wydatków na zadania cechujące się ekonomią skali i zakresu w wydatkach ogółem, co sugeruje, że bardzo małe związki międzygminne przeznacza-

ły na te zadania większą część swojego budżetu niż średniej wielkości i małe związki międzygminne (przez kilka lat). Nie odnotowano istotnych różnic w udziale wydatków na zadania charakteryzujące się efektami zewnętrznymi. Znaczące różnice w wydatkach na zadania o charakterze mieszanym wystąpiły tylko w 2017 i 2018 roku. Świadczy to o tym, że małe związki międzygminne wydały więcej niż bardzo małe związki międzygminne. Wyniki badań uzupełniają literaturę przedmiotu, prowadząc do wniosku, że mniejsze związki międzygminne koncentrują się bardziej na redukcji wydatków w przeliczeniu na jednego mieszkańca.

Słowa kluczowe: współpraca międzygminna, samorząd terytorialny, ekonomia skali i zakresu, efekty zewnętrzne, Polska

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