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TOWARDS A COMPREHENSIVE EVALUATION OF DECENTRALIZATION: A MULTIDIMENSIONAL INSIGHT OF OECD COUNTRIES

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Abstract. The present paper introduces a novel methodology for analyzing decentralization across three dimensions: political, administrative, and fiscal. Considering the challenges in determining the degree of decentralization, we have constructed synthetic measures for assessing political (MPD), administrative (MAD), and fiscal (MFD) decentralization employing the TOPSIS method (Technique for Order Preference by Similarity to an Ideal Solution). The use of this method allowed the creation of a linear rank of OECD countries. Furthermore, on the basis of constructed synthetic measures and utilizing the k-means clustering method, we also constructed a non-linear grouping of those countries. This approach enabled us to achieve the final objective of our research, the revelation of varied interrelationships among the different dimensions of decentralization in selected OECD countries. The combined application of the TOPSIS and the k-means methods enhances the methodology for analyzing decentralization by offering a multidimensional perspective. Given the potential repercussions of negative outcomes, such as overt or covert centralization, the findings of our study could turn out to be of significant relevance.

Keywords: local government, decentralization, multidimensionality, TOPSIS, k-means.

JEL Classification: C43, C61, H71, H72.

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1. Introduction

Theory as well as ample empirical research demonstrates numerous positive consequences of decentralization. Piekara (1995) for example, indicates that independent performance of entrusted tasks by local government units (LGU) grants them greater opportunities to improve the local situation which is more natural in providing greater care for "own" affairs or property rather than those "entrusted" by the central government. Additionally, according to the author, decentralization contributes to the increase of social awareness and creativity as well as greater involvement and participation of citizens in public affairs, and thus, to democratization. What is more, decentralization strengthens social bonds and increases the social integration of residents as well as contributes to reducing the degree of hierarchical subordination, a source of decreased administrative efficiency. Focusing on the economic and financial aspects of decentralization, Poniatowicz (2018) identifies several benefits such as increased effectiveness and efficiency of public authorities, lowered costs of operation, opti-

mized allocation of public goods and services, improved quantitative and qualitative aspects of provided public goods and services achieving greater compliance with the expectations of residents of local communities. Dillinger and Fay (1999), in turn, claim that decentralization can improve the efficiency and responsiveness of the public sector since it allows economic (financial) decisions to be made closer to the recipients of local public goods and services, thus contributing to greater stability and economic development. Crucial is the fact that many authors (Ebel & Yilmaz, 2002; Meloche et al., 2004; Akai et al., 2007) believe that decentralization not only brings higher efficiency in the allocation of public goods but also has a positive impact on macroeconomic development. In this light, analysis of decentralization is well-founded.

Although many opinions in the literature expound the advantages of decentralization and its superiority to centralization, there are also those that warn about the risks associated with this process. In the opinion of Kosek-Wojnar and Surówka (2007), for example, decentralization may increase income inequalities within a country, weaken national cohesion, or cause the growth of bureaucracy. Our results show that within the region, income redistribution is negatively associated with fiscal decentralization, especially when it takes the form of revenue decentralization. Pietrovito et al. (2023) in more recent studies also proved that within the region income redistribution is negatively associated with fiscal decentralization, especially when it takes the form of revenue decentralization. In another research focused on the effects of fiscal, administrative, and political decentralization on inequality at the cross-country level, Bojanic and Collins (2021) find that decentralization reduces income inequality, but – what is important – the effect diminishes and eventually reverses as economic development increases. In his paper, symptomatically titled *The Dangers of Decentralization*, Prud'homme (1995) lists such threats as increased public debt or diminished monitoring and control of the public finance system. Some studies have even found a link between decentralization and corruption Talamo (2013) or between two factors in political decentralization: the presence of local elections and the organizational structure of national parties on national levels of corruption (Shrestha et al., 2021). There are also very important studies that tie decentralization and income redistribution to fighting corruption (Bojanic, 2023). The results of Bojanic's study demonstrate, among other findings, that fiscal, administrative, and overall decentralization, by themselves, are not conducive to reducing corruption. However, corruption levels decrease when moderated by the Gini index.

Within scientific discussion concerning the consequences of decentralization, however, a pivotal conclusion reached by Prud'homme may be very relevant: *Decentralization measures are like some potent drugs*, *however: when prescribed for a relevant illness*, *at the appropriate moment and in the correct dose*, *they can have the desired salutary effect*; *but in the wrong circumstances*, *they can harm rather than heal* (Prud'homme, 1995, p. 201). It seems, therefore, that the "right dose" of decentralization may be of key importance to the success of the process. Measuring decentralization, however, is a challenge.

Taking the above into account, the paper presents a methodology for measuring decentralization in three dimensions: political, administrative, and fiscal. The authors decided to focus on OECD member states and using the TOPSIS method have constructed three synthetic measures for political (MPD), administrative (MAD), and fiscal (MFD) decentralization.

The TOPSIS method (a Technique for Order Preference by Similarity to an Ideal Solution) was selected because decentralization is expressed by many variables as well as the fact that it is widely accepted because its concept is reasonable, easy to understand and apply (Zeng & Xiao, 2018). Another argument favoring the use of the TOPSIS method is the fact that it allows assigning importance to variables (weights) used to build the synthetic measures, thus enabling us within this stage of our research to compare the degree of decentralization in analyzed countries as well as permits its graphic visualization.

An important reference should be made here regarding the paper entitled *Multicriteria and statistical approach to support the outranking analysis of the OECD countries* (Pereira et al., 2022). The paper presents a multivariate analysis approach that aims to reduce the dimensions of the analyzed index, namely the Better Life Index. Authors applied factor extraction by main components to reorganize BLI variables into three dimensions (factors), and these three factors were used as criteria for the PROMETHEE-SAPEVO-M1 multicriteria method. Adopting this hybrid methodology of multivariate analysis and multicriteria was very advantageous, as it reduced the evaluation criteria that the decision-maker needs to evaluate.

The final goal of our research, however, was to reveal the varied interrelations among different dimensions of decentralization in OECD countries and, based on MPD, MAD, and MFD synthetic measures, we identified similarities as well as differences in the interrelations between the different dimensions of decentralization in countries analyzed by the study. Schneider (2003), for example, indicates that the degree to which these dimensions are interrelated is crucial and decentralization along one dimension may influence another dimension (increasing decentralization in one dimension leads to an increase in decentralization in another dimension, for example). The analysis of such correlations, however, requires a proper methodology, and that developed for the present study offers a novel approach that might be useful in further studies on decentralization. Although the obtained results are not surprising considering theory, the use of the k-means method in empirical research dealing with decentralization is a novelty.

Through the combined use of the TOPSIS and the k-means methods for the analysis of decentralization, the authors developed a multidimensional method of decentralization analysis (MMDA). Thanks to this approach, some negative phenomena such as hidden centralization may be revealed. Since this type of methodology has not been previously developed, empirical research tracking such phenomena has, so far, been rare. Our research, therefore, through the introduction of the MMDA may become very useful for future research looking into decentralization.

2. Related work

The issue of decentralization lies within the realm of the optimal division of political rights, competencies, tasks, and public funds between the state and other levels of decentralized public authority. Decentralization thus refers to the process of transferring powers, duties, and resources from the central government to lower levels of authority, with the key form of decentralized administration being the local government. These issues are the subject of research within the concept of fiscal federalism, which emphasizes optimal levels of public

sector decentralization (Musgrave, 1959; Tiebout, 1956; Oates, 1972; Inman & Rubinfeld, 1997; Boadway & Keen, 2000; Rodden, 2004; Ahmad & Brosio, 2006; Buchanan, 2008; Boadway & Shah, 2009).

After the end of World War II, a worldwide[1] trend of dynamic decentralization, referred to in the literature as the "silent revolution", has been observed (Ivanyna & Shah, 2014). The name points to the fact that the decentralization process is not abrupt or radical but often gradual, imperceptible at first glance, yet possesses the potential to bring about deep and lasting changes in the structure and functioning of the public sector.

The following arguments are most often cited as key advantages of a decentralized model of public administration:

- Increased efficiency of public service provision – decentralization can lead to more effective management and delivery of public services since local authorities are often more aware of the needs and preferences of the local community (Wallis & Oates, 1988; Robinson, 2007).
- Strengthening economic growth – decentralization can enhance the efficiency and productivity of the public sector which in turn may lead to higher productivity in the private sector; decentralization could also result in increased investment in education and human capital, important factors for economic growth (Blöchliger, 2013).
- Strengthening of democratic processes and citizen participation – transferring powers to lower levels of public administration enables greater citizen participation in decision-making; this can lead to more democratic and accountable public governance (Bergh, 2004).
- Enhancing the innovation of the public sector – local government entities can serve as unique laboratories for testing innovative socio-economic solutions that can subsequently be implemented on a larger scale across the entire public sector (Parker, 2009).
- Increasing accountability and transparency of public authorities – decentralization can lead to greater accountability of public authority representatives, who are closer to their voters, and thus can be more effectively monitored and evaluated by them; however, the success of this process depends on the quality of institutions and control mechanisms at the local level (Faguet, 2014; Martinez-Vazquez, 2001).

Many authors also note that the decentralization process is not without specific disadvantages and risks, with the most frequently mentioned being:

- Deepening regional inequalities – decentralization may result in increased income disparities between rich and poor territorial units (Sepulveda & Martinez-Vazquez, 2011; Lessmann, 2012).
- Difficulties in coordinating public policy – decentralization can lead to a lack of coherence and coordination between different territorial units, which in turn can lead

[1] It should be emphasized that the global COVID-19 pandemic crisis, which began at the end of 2019, tested the resilience of the decentralization model (Sagan et al., 2021; Erkoreka & Hernando-Pérez, 2023). In some countries (e.g., Hungary and Poland) this crisis served as a pretext to slow down the decentralization process or even to revert to a path of re-centralization, a process that began to weaken democracy characterized by adverse changes in the law or other practices leading to the erosion of democratic institutions and values. This was accompanied by the systemic weakening of local governments, state appropriation of previous spheres of their activity, and distortion of local budget revenues (a decrease in the significance of own budget revenues, based on local taxes and fees, and an increase in the significance of transfer revenues, i.e., revenues from the state budget or other central funds).

to duplicated efforts or a lack of uniform standards in public policies (Bardhan, 2022; Treisman, 2007).

- Rising costs of operating public administration – diversifying public power always means creating additional "layers", which is usually a costly endeavor, especially from the standpoint of the impact of decentralization on the size of government and, consequently, increased administrative costs (Bodman & Ford, 2006).
- Risk of corruption – lower levels of public administration may be less transparent and more prone to corruption if not adequately monitored and controlled (Shah, 2006; Fisman & Gatti, 2002).
- Risk of weakening national cohesion and national and political conflicts – decentralization may intensify tendencies to prioritize local interests over the general interests of the state and increase the risk of political and national divides, especially in multi-ethnic countries (Brancati, 2008; Wimmer, 2012).

The literature draws attention to the fact that decentralization is complex and that there does not exist a single, ideal model of this process that is universally applicable and suitable for every country (Oates, 1972). Three fundamental forms (dimensions), political, administrative, and fiscal, of decentralization that are additionally interconnected with the scope and specifics of each one influencing the others, are also frequently mentioned (Ebel & Yilmaz, 2002; Ruśkowski, 2018; Organization for Economic Cooperation and Development, 2019; Sieklucki, 2022).

Political decentralization seeks to devolve political power to subordinate levels of public authority. This enhances democratization processes and augments citizen participation by granting them – or their elected representatives – more significant decision-making authority. The underlying concept emphasizes the detrimental effects of excessive concentration of political power. Thus, there is a need to distribute political authority more widely to ensure enhanced oversight and balance that is crucial to democratic systems. Rather than focusing on the economic ramifications of its actions, political decentralization concentrates on the institutional and political facets of public administration. It establishes the legal underpinnings for self-governance by clarifying the rights, responsibilities, and roles across various levels of public authority. Literature on political decentralization underscores, among other points, the diversity in the progression of this process, which hinges on a country's territorial arrangement. Oates (1972) – noted for his contributions to fiscal federalism – elucidated the particularities of political decentralization in the context of unitary states, federations, and confederations through his 'Continuum of Government System'. Other scholars illuminate the repercussions of political decentralization on diverse facets of political life (Treisman, 2007), its interplay with democracy (Manor, 1999), and its relevance in the framework of contemporary, multi-tiered public management (Rondinelli & Cheema, 2003; Hooghe & Marks, 2003).

Administrative decentralization refers to the process in which operational responsibilities for certain public tasks are shifted from a higher to a lower level of public authority. Various sources identify three forms of this process (Rondinelli et al., 1983; Schneider, 2003; Falleti, 2010; Cheema & Rondinelli, 2007): deconcentration, delegation, and devolution.

The first, deconcentration, is often perceived as the mildest form of decentralization. It involves the transfer of specific public duties by central authorities to their subsidiary units,

while still retaining legislative, decision-making, and control powers. This form is typically characteristic of centralized administrations. Delegation represents a more significant level of decentralization. In this approach, central authorities assign certain public duties to subordinate units, such as specialized government agencies, while also granting them a degree of autonomy. The last, devolution, represents the most comprehensive form of administrative decentralization. Beyond merely transferring public duties, it also involves the relocation of legislative, decision-making, and control functions.

The third dimension of decentralization is the fiscal one. It is sometimes mistakenly equated with the process of decentralizing public finances. While fiscal decentralization pertains to the transfer of responsibility for taxes and expenditures to lower levels of public administration, the decentralization of public finances encompasses broader changes in the structure of public finances. Nonetheless, in many countries, reforms related to fiscal decentralization are integral to more extensive public finance decentralization reforms.

Delving into fiscal decentralization Oates, in his seminal work "An essay on fiscal federalism" posits: "Fiscal decentralization refers to the devolution of taxing and spending powers to lower levels of government" (Oates, 1999). Essentially, this process involves transferring specific financial resources and the authority to manage them to subordinate levels of public administration, including territorial self-government entities. Within the realm of local governments, this authority is synonymous with financial autonomy, serving both as an objective and a result of the decentralization initiative. Such autonomy encompasses both a revenue aspect (revenue autonomy) and an expenditure aspect (spending autonomy). The former pertains to the liberty of local authorities in shaping budget revenues, while the latter relates to their discretion in public expenditure. In the context of fiscal federalism, these aspects of decentralization are deemed pivotal. Oates stresses the fact that the primary concern in fiscal federalism theory is determining which fiscal instruments (on the revenue side), and which public responsibilities/tasks (on the expenditure side) are best suited for decentralized tiers of public authority (Oates, 1999). The significance of the research topic at hand is evident in the plethora of scientific publications related to it. A classic work introducing the theory of fiscal decentralization is the previously mentioned work by Oates (Oates, 1972). Important sources of information on the role of public finance and fiscal decentralization in economics also include the works Musgrave and Musgrave (1989); Rodden et al. (2023) accurately diagnose the main challenges associated with fiscal decentralization, especially in the context of budgetary constraints. The literature also analyzes the impact of fiscal decentralization on regional inequalities (Rodríguez-Pose & Ezcurra, 2010). Specific aspects of the influence of fiscal decentralization on macroeconomic stability (Tanzi, 1996; Prud'homme, 1995; Ter-Minassian, 1997) and on economic growth (Martinez-Vazquez & McNab, 2003) are also studied. Additionally, there's a popular research thread related to the specifics of the fiscal decentralization in developing countries (Bird & Vaillancourt, 2008; Smoke, 2001).

The phenomenon of decentralization is multifaceted and complex, one of the many reasons for the ongoing search for new methods for its measurement. The starting point for many studies, as in our case, is the uncontroversial and previously mentioned division into three dimensions of decentralization: political, administrative, and fiscal. Some studies focus solely on one dimension like the work of Ebel and Yilmaz (2002) or Gong et al. (2021), a

widely accepted practice. Other research, however, encompasses all three dimensions, and based on this, individual countries are classified in terms of the level of advancement of political, administrative, and fiscal decentralization. Special sub-indices are created and assigned to specific dimensions of decentralization and are subsequently aggregated to obtain general measures (Ivanyna & Shah, 2014). The popularity of decentralization indices stems, among other things, from the fact that they can be treated as useful indicators for comparative analyses concerning varied public policies applied in individual countries. These indicators are used to create various rankings useful for scholars, public decision-makers, journalists, etc. (e.g., in debates on the independence referendum in Catalonia). Decentralization indices also allow for the identification of causes and effects of various phenomena, such as the impact of fiscal decentralization on economic development. A detailed review of the literature on the diversity of decentralization indices was presented by Harguindéguy et al. (2021).

It should be noted that studies exploring the interrelationships between various dimensions of decentralization are relatively rare. One domain where such interrelationships might be studied is fiscal federalism. Researchers, such as Oates, have delved deeply into this topic (Oates, 1972). Another valuable source of information in this context is the World Bank, specifically their Multilevel-Governance and Decentralization for Delivery Program (MDDP), which has done significant work in analyzing various aspects of decentralization and promoting knowledge in this area.

Addressing the challenges of measuring the advancement of decentralization from various angles, one author notes: "While diversity in the degree of decentralization across the world is a fact yet there is no consensus in the empirical literature over questions like 'which country is more decentralized?' This is because decentralization is defined and measured differently in different studies" (Sharma, 2006). The authors of this study, aware of the complex issues tied to evaluating the progress of decentralization in the previously discussed dimensions and intending to propose their distinct measurement indicators, initiated their research with a review of indicators suggested in the existing literature. The results of this review are presented in Table 1.

3. Data and methodology

Recognizing that decentralization as a phenomenon cannot - at least to a degree – be observed directly, the present research was based on the many variables that reflect its level.

At the first stage of our research, data concerning political decentralization was gathered from databases created by the OECD and V-Dem (Varieties of Democracy). The former was used to establish indicator MPD_1 – the average number of municipalities (per 100 000 inhabitants) in analyzed countries (Organization for Economic Cooperation and Development, n.d.). The latter, the V-Dem database, is the largest global dataset on democracy with over 31 million data points for 202 countries spanning the time from 1789 to 2022 and is a part of a project being conducted at the University of Gothenburg (Papada et al., 2023). What is crucial – it also includes subnational governance indicators and was the source (Coppedge et al., 2021) of data concerning elections of subnational governments. The inclusion of elections as one of the variables describing political decentralization should not be surprising.

Table 1. Decentralization metrics derived from a review of the literature (source: own elaboration, 2023)

Author	Index	Brief Description of the Index
Political Decentralization Indicators		
Ladner et al. (2016)	Local Autonomy Index	Measures the degree to which local authorities have the right to perform government functions independently of the central government.
Treisman (2007)	Electoral Decentralization Scale	Assesses the degree of decentralization of the electoral process and the election of local authorities.
Putnam et al. (1992)	Civic Participation Index	Assesses citizen engagement in public affairs at the local level.
Hooghe et al. (2010)	Power Division Indicator	Evaluates the distribution of power between different levels of government.
Chhibber and Kollman (2004)	Political Diversity Indicator	Assesses the diversity of political parties at the local level.
Goldsmith and Page (2010)	Local Freedom Scale	Measures the level of freedom that local authorities have in managing their territory and resources.
Fung and Wright (2003)	Local Democratization Index	Assesses the degree to which local institutions are democratic and open to citizen participation.
O'Leary and Vij (2012)	Scale of Local Authorities' Accountability	Measures how local authorities are accountable to their voters and society.
Dickovick and Eaton (2013)	Power Transfer Index	Assesses the degree of power transfer from the central government to lower levels of governance.
Administrative Decentralization Indicators		
Goldsmith and Page (2010)	Administrative Autonomy Index	Assesses the degree to which local administrative bodies have freedom from the central government.
Smoke (2003)	Scale of Delegation of Powers	Assesses the degree of transfer of powers from the central government to local bodies.
Andrews and Shah (2003)	Local Efficiency Indicator	Assesses the effectiveness and efficiency of local administration in delivering public services.
Gisselquist (2012)	Administrative Responsiveness Index	Measures the ability of local administration to respond to the needs and demands of citizens.
Litvack et al. (1998)	Scale of Resource Transfer	Assesses the degree of transfer of resource management from the central government to local bodies.
Rodden (2005)	Indicator of Local Self-Government Activity	Assesses the degree to which local governments participate in decision-making processes on their territory.
Musgrave (1959)	Vertical Integration Index	Measures the degree of coordination and integration between different levels of administration.
Agrawal and Ribot, (1999)	Scale of Access to Administrative Services	Assesses the accessibility of administrative services for citizens at the local level.
Fiscal Decentralization Indicators		
Ahmad and Brosio (2006)	Tax Decentralization Index	Assesses the extent to which taxes are collected by local authorities relative to the central government.
Rodden (2002)	Expenditure Autonomy Ratio	Shows the degree to which local units have independence in spending.

End of Table 1

Author	Index	Brief Description of the Index
Political Decentralization Indicators		
Bahl and Linn (1992)	Scale of Local Revenue Ownership	Evaluates the percentage of local revenues generated by the local unit itself, not transferred from the central government
Shah (2007)	Resource Transfer Index	Assesses the extent of transferring financial resources from the central government to local authorities.
Oates (1972)	Scale of Financial Self-reliance	Assesses the extent to which local units can independently generate and spend funds.
Ebel and Yilmaz (2002)	Income Source Elasticity Index	Measures the ability of a local unit to adapt to changing economic conditions by modifying income sources.
Martinez-Vazquez and Timofeev (2009)	Cost Recovery Ratio	Assesses the degree to which local units recover the costs of provided services through fees and other revenues.
Jin and Zou (2002)	Scale of Local Revenue Stability	Evaluates the regularity and predictability of revenue inflows for local units.
Weingast (1995)	Financial Leverage Ratio	Assesses the ability of a local unit to leverage loans and financial leverage to finance investments.
Lockwood and Barankay (2006)	Fiscal Responsibility Index	Measures the degree to which local units are accountable for their spending and revenue decisions.

In their study, Harguindéguy et al. (2021) point out that elections are one of the most frequently used indicators concerning political decentralization. It could not be different in our study and the indicator MPD_2 (v2ellocelc) identifies whether elections are held but does not determine whether these elections are free and fair with a separate indicator, MPD_4 (v2elffelr) being utilized for this purpose. Furthermore, indicator MPD_5 (v2elsnlsff) was developed to establish whether the levels of freedom and fairness of subnational elections varied throughout different areas of the country. MPD_3, the last indicator derived from the data originating from the V-Dem database, demonstrates whether the power or authority of elected subnational officials is greater than that of non-elected subnational officials (v2ellocpwr/) enabling them to act on their citizens' preferences and thus ensure more inclusive, participatory, and representative decision-making. All indicators related to political decentralization have been presented in Table 2.

Table 2. Political decentralization indicators (source: own elaboration, 2023)

Indicator	*MPD_1*	*MPD_2*	*MPD_3*	*MPD_4*	*MPD_5*
Variable	Average number of municipalities (per 100 000 inhabitants)	Elections of subnational governments: selection of local officials (v2ellocelc)	Relative power, in practice, of elected versus non-elected offices at the local level (v2ellocpwr)	Identification of whether subnational elections are free and fair (v2elffelr)	Subnational election unevenness (v2elsnlsff)
Source	OECD	V-Dem	V-Dem	V-Dem	V-Dem

The next stage of research concerned the gathering of data reflecting administrative decentralization (Table 3). This was achieved through the use of the already-mentioned OECD database. The utilization of subnational government (SNG) expenditures as a proxy of its administrative function is typical and raises no concerns.

Table 3. Administrative decentralization indicators (source: own elaboration, 2023)

Indicator	MAD_1	MAD_2	MAD_3	MAD_4
Variable	Compensation of employees in SNG as a share of public expenditure	SNG_Expenditures by function: Education	SNG_Expenditures by function: Social protection	SNG_Expenditures by function: Healthcare
Source	OECD	OECD	OECD	OECD

The last stage of data collection involved the gathering of data related to fiscal decentralization (Table 4). The choice of indicators is well justified and grounded in literature (Poniatowicz, 2018). At this point it becomes necessary to stipulate that, thus far, all established indicators were stimulants. However, concerning fiscal decentralization, one variable, that of SNG transfers, was a destimulant. To define, stimulants are those variables where higher values indicate a higher level of the analyzed phenomenon, while destimulants are variables whose lower values indicate a higher level of the phenomenon.

Table 4. Fiscal decentralization indicators (source: own elaboration, 2023)

Indicator	MFD_1	MFD_2	MFD_3	MFD_4	MFD_5	MFD_6	MFD_7
Variable	Revenues as a percentage of general government, same transaction	SNG transfers: As a percentage of the total transaction, the same level of government	SNG taxes: As a percentage of GDP	Capital expenditures: As a percentage of GDP	Capital expenditures: As a percentage of general government, the same transaction	Debt: As a percentage of GDP	Debt: As a percentage of the general government, the same transaction
Source	OECD	OECD	OECD	OECD	OECD	OECD	OECD

The division of variables into stimulants and destimulants is grounded in theory. The variable MFD_2 represents the income independence of the local governments from the state budget – the lower the share of external transfers, the greater the level of independence, making the SNG transfer variable a destimulant. Descriptive statistics of all variables are presented in Table 5.

As a result of statistical verification, the MPD_2 variable was, in the end, not considered for the study because it failed to meet the established condition for variables, that is that diagnostic features should be characterized by an appropriate level of variability, i.e., they should provide information differentiating the examined objects (Migała-Warchoł, 2011). Due to a lack of data for Canada, Chile, Colombia, Costa Rica, and Mexico, the final analysis covered only 33 of the 38 OECD member countries.

Table 5. Basic descriptive statistics of variables (source: own elaboration, 2023)

Variable:	Mean	StDev	CV	Max	Min
MPD_1	12.208	15.824	130%	58	0.436
MPD_3	2.008	0.555	28%	3	0.610
MPD_4	2.453	0.645	26%	3	–0.338
MPD_5	1.511	0.932	62%	2	–1.822
MAD_1	47.152	24.671	52%	83.61	7.11
MAD_2	2.976	1.793	60%	6.94	0.00
MAD_3	2.763	3.411	123%	18.46	0.00
MAD_4	1.991	2.393	120%	8.15	0.00
MFD_1	33.089	16.851	51%	65	8
MFD_2	52.761	19.659	37%	90	10
MFD_5	5.110	4.103	80%	13	0
MFD_4	1.807	0.646	36%	3	0
MFD_5	47.291	15.929	34%	78	13
MFD_6	12.086	10.636	88%	40	1
MFD_7	14.008	11.959	85%	52	1

The goal formulated for our study, to measure decentralization (in OECD countries), in a complex and multidimensional way, required the use of appropriate quantitative methods. The authors decided to use the linear ordering method TOPSIS: *Technique for Order Preference by Similarity to an Ideal Solution* (Hwang & Yoon, 1981). This method uses the concept of the so-called synthetic measure. Ratings of objects with respect to the considered variables are aggregated into one value/utility function with values in the form of real numbers. This approach has many advantages. Among other things, this approach excludes the situation of incomparability of objects, which allows for their complete ordering. Another advantage is that the TOPSIS method is a compensatory method, which means that a low result for one variable (e.g., MAD_1) can be compensated for by a good result for another variable (e.g., MAD_2).

Linear ordering methods determine the order of objects based on a synthetic measure that is representative of a number of variables that describe the objects (Bąk, 2013). Linear ordering may relate to various objects, such as countries (e.g., in terms of the degree of decentralization or economic development), enterprises (in terms of their financial condition) or products (in terms of their usefulness). Economic development, financial condition or use value cannot be measured directly – these are aggregated measures whose values result from the observation of diagnostic variables that are directly measurable. The results obtained in terms of the synthetic measure enable ordering the objects in the context of the research problem. In our study, the TOPSIS method was used within taxonomy, therefore, in order to ensure representativeness of variables, only those in a given group that were not very strongly correlated with the rest of variables within the same group and were characterized by greater discrimination ability (higher coefficient of variation) were included in the final set (Malina, 2020). This means that, in general, each variable provides unique information about objects.

Like others, the TOPSIS method also orders examined objects on the basis of a value obtained for constructed synthetic measures and was utilized by the authors because it can be used on numerous variables, which occurs in the present study as exemplified by Tables 2–4.

The first method of linear ordering was proposed by Hellwig (in 1968) on the basis of economics (taxonomy), while the second one by Hwang and Yoon (in 1981) on the basis of decision theory (multi-criteria decision-making). In his publication, Hellwig employed mathematical statistics nomenclature, which is considered to be the main factor distinguishing his work from that of Hwang and Yoon. Notably, the TOPSIS method relies on the construction of a synthetic feature grounded in both ideal and anti-ideal solutions, whereas Hellwig's method utilizes only the ideal solution.

The TOPSIS method has many practical applications including its use in the selection of investment projects Mahmoodzadeh et al. (2007), in the selection and ranking of service providers Bottani and Rizzi (2006), in research on negotiations (Roszkowska et al., 2013; Roszkowska, 2013), in the analysis of the level of sustainable development of Polish voivodeships Roszkowska et al. (2014), in identifying different levels of fiscal decentralization Poniatowicz (2018), and in the study of corporate financing risk (Konopka, 2021). A review of the various applications of the TOPSIS method can be found in both Behzadian et al. (2012) and Zavadskas et al. (2016). Additionally, TOPSIS is also used in hybrid methods. For example, De Souza et al. (2018) presented a new hybrid multicriteria method that consists of the analytic hierarchy process (AHP) and technique for order of preference by similarity to ideal solution-2 normalization (TOPSIS-2N) techniques. What is crucial, the application of the hybrid AHP–TOPSIS-2N model proved to be consistent and robust. In case of the research of Silva et al. (2018), the use of a TOPSIS (with two normalizing methods) was preceded by a treatment of qualitative data with the measuring attractiveness by a category based evaluation technique (MACBETH).

In accordance with the TOPSIS method, the process of creating a synthetic measure consists of the following steps:

Step 1. Determination of variables and a finite set of assessed objects. Let:

$$X_i = \left[x_{i1}, x_{i2}, \ldots, x_{in} \right] - i\text{-object representation}, \tag{1}$$

where x_{ij} is a value of i – the object, with respect to j – the variable (i = 1,2, ..., m; j = 1, 2, ..., n); where X_i is an object (in our case – a country).

Step 2. Definition of a set of weights w_j for the variables (j = 1, 2, ..., n) whose sum equals one:

$$w_1 + w_2 + \ldots + w_n = 1. \tag{2}$$

Step 3. Normalization of variable values whose purpose is to convert the data into forms where its values can be compared. There are many normalization formulas in the literature (Hwang & Yoon, 1981; Trzaskalik, 2014; Roszkowska et al., 2013) but for this research, linear normalization was used as defined by the following:

$$z_{ij} = \begin{cases} \dfrac{x_{ij} - \min\limits_i x_{ij}}{\max\limits_i x_{ij} - \min\limits_i x_{ij}} \text{for the stimulants,} \\ 1 - \dfrac{x_{ij} - \min\limits_i x_{ij}}{\max\limits_i x_{ij} - \min\limits_i x_{ij}} \text{for the destimulants.} \end{cases} \tag{3}$$

Step 4. Calculation of normalized weighted variable values. A normalized *i*-object with vector weights is expressed as:

$$\tilde{X}_i = \left[\tilde{x}_{i1}, \tilde{x}_{i2}, \ldots, \tilde{x}_{in}\right], \tag{4}$$

where: $\tilde{x}_{ij} = z_{ij} w_j$.

Step 5. Designation of reference variants.

The ideal (I) solution is represented as:

$$X^+ = \left[\max_i \tilde{x}_{i1}, \max_i \tilde{x}_{i2}, \ldots, \max_i \tilde{x}_{in}\right]. \tag{5}$$

The anti-ideal (AI) solution is formulated as:

$$X^- = \left[\min_i \tilde{x}_{i1}, \min_i \tilde{x}_{i2}, \ldots, \min_i \tilde{x}_{in}\right] \tag{6}$$

for $i = 1, \ldots, m, j = 1, \ldots, n$.

Step 6. Determination of the distance of normalized weighted objects from the ideal and anti-ideal variant, i.e., the values:

$$d_i^+\left(\tilde{X}_i, X^+\right) = \sqrt{\sum_{j=1}^{n}\left(\tilde{x}_{ij} - \max_i \tilde{x}_{ij}\right)^2}, \tag{7}$$

and

$$d_i^-\left(\tilde{X}_i, X^-\right) = \sqrt{\sum_{j=1}^{n}\left(\tilde{x}_{ij} - \min_i \tilde{x}_{ij}\right)^2}. \tag{8}$$

The study assumes that d_i^- and d_i^+ are Euclidean metrics[2].

Step 7. Calculation of the value of the synthetic measure according to:

$$V_T\left(X_i\right) = \frac{d_i^-\left(\tilde{X}_i, X^-\right)}{d_i^+\left(\tilde{X}_i, X^+\right) + d_i^-\left(\tilde{X}_i, X^-\right)}. \tag{9}$$

In the present study, a synthetic measure (of a given object) is a value that satisfies the condition:

$$V_T\left(X_i\right) \in \left[0,1\right], \tag{10}$$

where higher values of $V_T\left(X_i\right)$ mean higher levels of decentralization.

The weights for all variables (Table 6) were determined using the objective weighting method – i.e., based on the coefficient of variation. According to this approach, the greater the level of variability of a given variable, the higher the weight (more on this method in Roszkowska et al., 2013).

In the next stage of research, on the basis of the k-means method, the varied interrelations between different dimensions of decentralization in OECD countries were analyzed.

The k-means method is accredited to MacQueen (1967), but it must be noted that a few years earlier, a Polish mathematician from the Polish Academy of Sciences, Steinhaus (1956), in his paper entitled "*Sur la division des corps matériels en parties*", presented his

[2] The most popular as well as the most frequently used is the Minkowski metric which, in special circumstances, also functions as a Euclidean metric (for p = 2). Still, other solutions are also used. See the paper of Silva et al. (2020), where instead of using Euclidean distances, TOPSIS was reckoned by the ellipse length.

Table 6. Weights of variables (source: own calculation, 2023)

POLITICAL DECENTRALIZATION	MPD_1	MPD_3	MPD_4	MPD_5
weights	59.69%*	17.63%	10.26%	12.42%
ADMINISTRATIVE DECENTRALIZATION	MAD_1	MAD_2	MAD_3	MAD_4
weights	16.85%	16.48%	33.77%	32.89%

FISCAL DECENTRALIZATION	MFD_1	MFD_2	MFD_3	MFD_4	MFD_5	MFD_6	MFD_7
weights	13.83%	10.96%	17.22%	9.90%	9.51%	20.28%	18.31%

Note: * Using the objective weighting method for variable MPD_1 very high levels of weight were obtained; however, according to the authors' knowledge of decentralization, this result raises no concerns.

algorithmic approach to clustering. However, since MacQueen was the first person to use the term k-means, he is credited with developing the algorithm (Pérez-Ortega et al., 2020). The k-means clustering is a non-hierarchical method and is one of the iterative optimization methods Walesiak (1994) where each object is assigned to one of the clusters (classes). One of its classic variants is that proposed by Hartigan (1972) where the number of groups to which objects are assigned is predetermined. In the present study, the k-means method was utilized to group countries according to their structure of decentralization and the analysis was performed using the Python programming language.

The employment of the k-means method allows the isolation of homogeneous groups (clusters). The aim is to isolate groups of objects in which intra-group variability is minimized while, simultaneously, inter-group variability is maximized. The algorithm is formulated in such a way as to group most similar objects, on the basis of their examined features, together (Pietrzykowski & Kobus, 2008). The analysis resulted in the grouping of *n* objects (analyzed countries) into *k* non-empty, disjoint, and possibly homogeneous clusters (groups) in a manner where objects contained within a given cluster are similar to each other and, at the same time, dissimilar to those belonging to other groups.

The grouping of countries using the k-means method was carried out based on previously constructed synthetic measures of decentralization, i.e., MPD, MAD, and MFD. There are previously published studies in which the grouping of analyzed objects was performed using the k-means method on the basis of synthetic measures created using the TOPSIS method (for instance, in Trstenjak et al., 2015; Bieniasz et al., 2012; Wojarska, 2014; Iwacewicz-Orłowska & Sokołowska, 2017, Piekutowska, 2023).

4. Results and discussion

According to study results presented in Figure 1 (calculations are presented in Appendix, Table A1) from among the analyzed countries in 2021 Slovakia, followed by the Czech Republic and France, were leaders in terms of political decentralization. The value of the measure of political decentralization, MPD of these three countries exceeded 0.845 (maximum attainable level being 1). On the other side of the spectrum, Turkey's MPD which was below 0.1 shows it to be the least politically decentralized.

In terms of administrative decentralization, MAD values calculated within our study show Denmark to be the leader in this category. Sweden and Finland placed 2nd and 3rd, respectively, having achieved MAD values above 0.5 (the maximum value of the measure being 1). On the other end of the graph, there are four countries, Ireland, Greece, Turkey, and New Zealand, whose MAD values were below 0.05 (Figure 2).

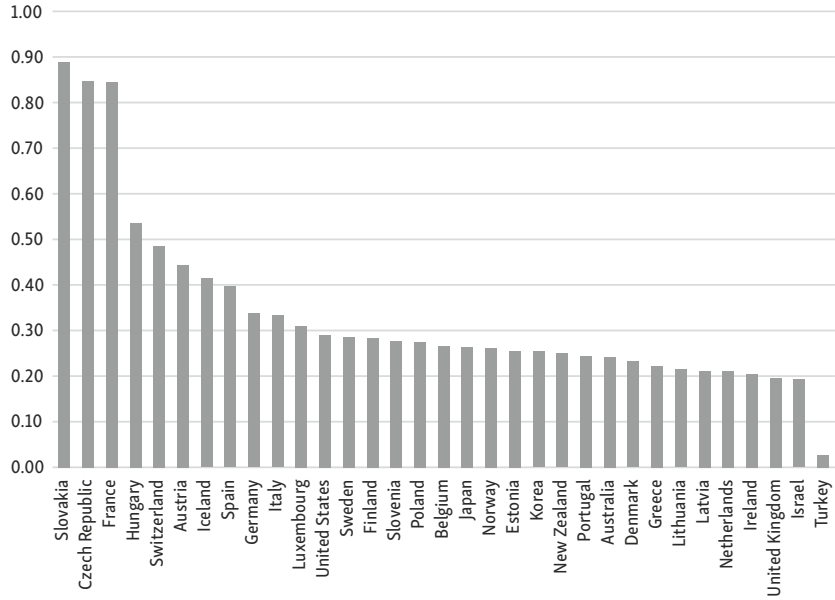


Figure 1. Synthetic measure of political decentralization (MPD) in OECD countries in 2021 (source: authors' calculations based on data presented in Table 2)

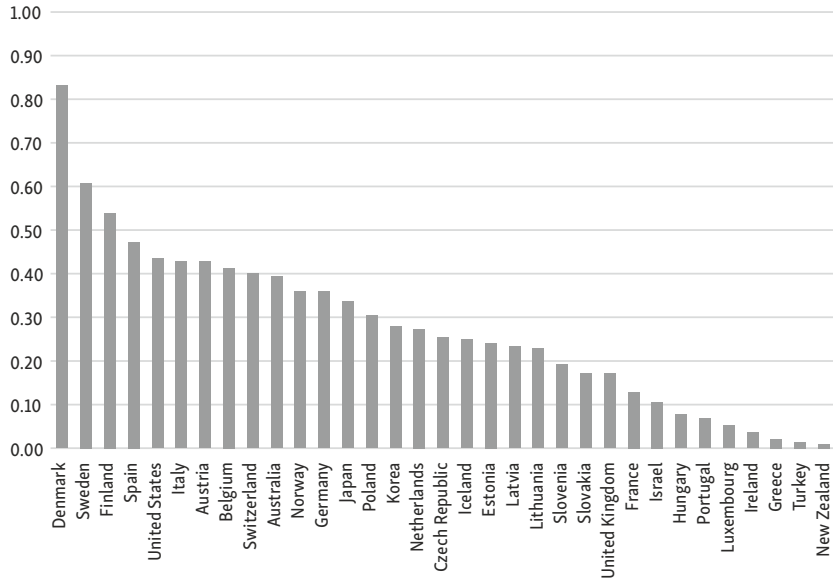


Figure 2. Synthetic measure of administrative decentralization (MAD) in OECD countries in 2021 (source: authors' calculations based on data presented in Table 3)

According to study results, in 2021 Switzerland exhibited the greatest level of fiscal decentralization among analyzed countries, followed by the United States and Germany. None of the countries considered in the research, however, achieved an MFD value that exceeded 0.8. Two nations: Ireland, and Turkey, closed out the list having attained MFD values below 0.01 signifying the lowest level of fiscal decentralization within the group of analyzed countries (Figure 3).

At this stage of the analysis, noticeable differences between analyzed countries concerning the structure of their decentralization could be seen (Figure 4). Some countries, for example, exhibited a high level of political decentralization, a low level of administrative decentralization, and limited fiscal decentralization (this was true of France, for example). However, the authors wanted to ascertain whether there was a structure of decentralization that was typical for all considered states or did those countries differ completely in this respect. This was the goal of the subsequent phases of the study.

The first step aimed to determine, using the Elbow curve analysis, the optimal number of groups of similar countries. This was achieved by minimizing total variability within groups. The variability of each group is calculated by summing up the squares of the distance from the group center (also called the cluster centroid). Iteratively, assuming a varying number of groups (from 1 to 9), the sum of the squares of the distances from the centroids in each group is determined and then in each iteration these values are added (e.g., when the number of groups is 3, the squares of the distances from centroids for these 3 groups are calculated and then the obtained values are added up). The results of that analysis are presented in Figure 5.

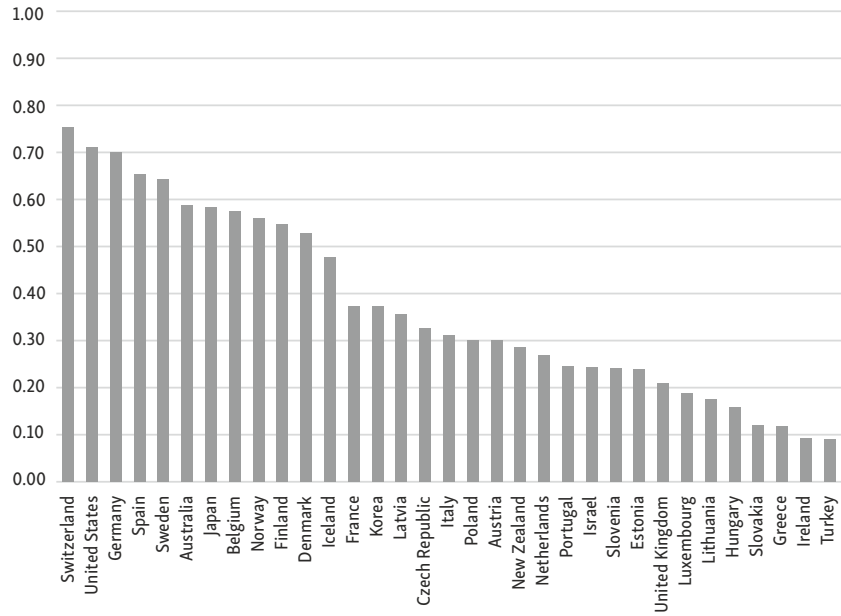


Figure 3. Synthetic measure of fiscal decentralization (MFD) in OECD countries in 2021 (source: authors' calculations based on data presented in Table 4)

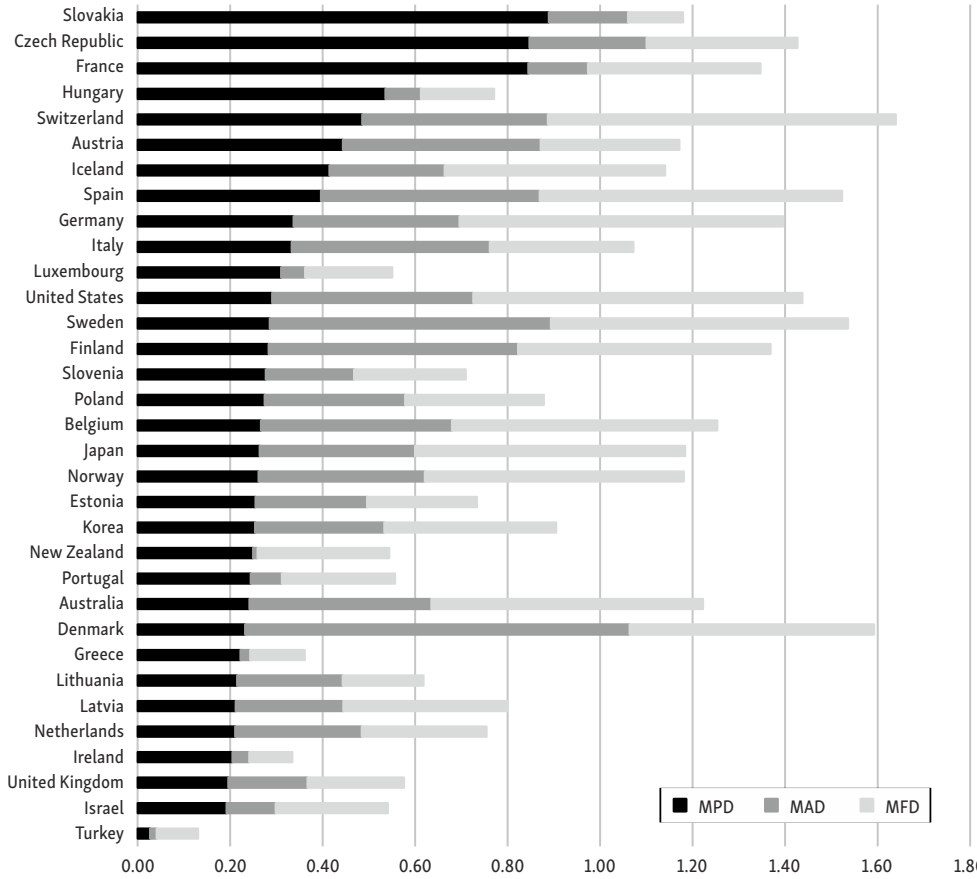


Figure 4. Decentralization in OECD countries in 2021
(source: authors' calculations based on data presented in Figures 1–3)

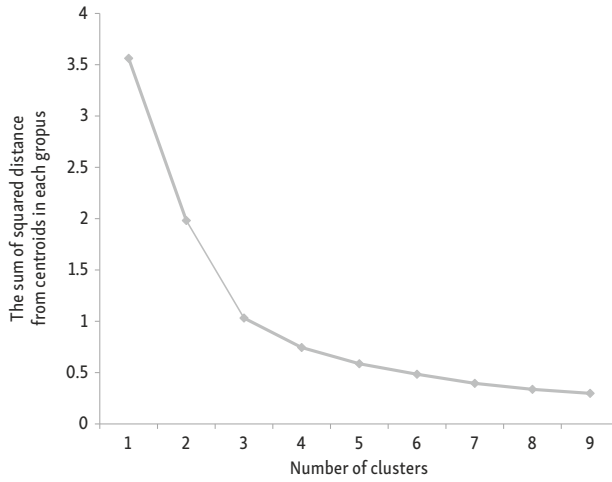


Figure 5. Elbow curve (source: authors' calculations, 2023)

Through the utilization of the elbow method, it was determined that the optimal number of groups is three. Upon this assumption, k-means clustering was performed for k = 3. Detailed results of the grouping of analyzed countries have been presented in Table 7.

Table 7. Assignment of countries to clusters (source: own calculation, 2023)

Country	*Cluster*	*Country*	*Cluster*	*Country*	*Cluster*
Czech Republic	1	Estonia	2	Australia	3
France	1	Greece	2	Austria	3
Hungary	1	Ireland	2	Belgium	3
Slovakia	1	Israel	2	Germany	3
		Korea	2	Spain	3
		Latvia	2	Switzerland	3
		Lithuania	2	United States	3
		Luxembourg	2	Denmark	3
		Netherlands	2	Finland	3
		New Zealand	2	Iceland	3
		Poland	2	Italy	3
		Portugal	2	Japan	3
		Slovenia	2	Norway	3
		Turkey	2	Sweden	3
		United Kingdom	2		

The number of countries assigned to a specific number of groups (k = 3) has been presented in Table 8.

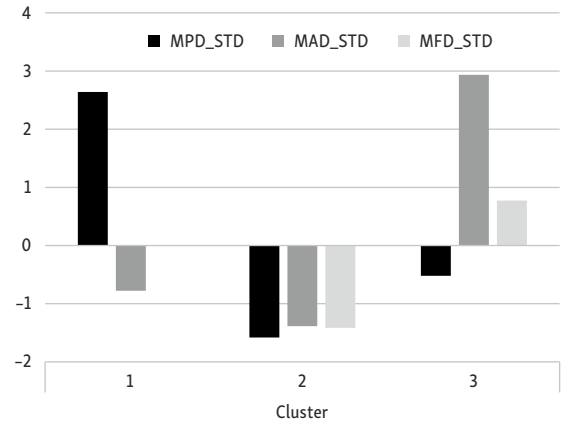
Table 8. Number of observations in each cluster (source: own calculation, 2023)

		Number of observations
cluster	1	4
	2	15
	3	14
	valid	33
	no data	0

Established cluster centers have been presented in Table 9.

Table 9. Cluster centers (source: own calculation, 2023)

	1	2	3
MPD_STD	2.64	–1.58	–0.52
MAD_STD	-0.78	–1.39	2.93
MFD_STD	0.00	–1.41	0.77



Note: * Where 0 is the average level of MPD, MAD, and MFD for all analyzed countries.

Figure 6. Characteristics of groups of countries according to the level of political, administrative, and fiscal decentralization* (source: authors' calculations, 2023)

Finally, we could reveal the differences between countries in terms of their political (MPD), administrative (MAD), and fiscal (MFD) decentralization. To achieve this, the MPD, MAD, and MFD measures were standardized followed by determining an average value for MPD, MAD, and MFD in each cluster. The results are presented in Figure 6.

The analysis allowed the authors to distinguish three groups of countries:

1. group I consisted of states which exhibited very high levels of political decentralization but also displayed low levels of administrative decentralization and average degrees of fiscal decentralization;
2. group II included countries demonstrating the lowest levels of political, administrative, and fiscal decentralization;
3. group III contained countries that were characterized by the highest level of administrative decentralization and low levels of political decentralization (differentiating them from group I) as well as having the highest levels of fiscal decentralization.

5. Conclusions

A review of literary sources conducted by the authors of the present study revealed that decentralization of public administration, in the form of territorial decentralization, is an extremely complex and multidimensional phenomenon that encompasses political, administrative, and fiscal dimensions that are intricately interrelated. Although it is a source of potential benefits such as increased efficiency of public services, strengthening of economic growth and democratic processes, and innovation of the public sector, it also poses certain risks. These include deepening territorial inequalities, difficulties in coordinating public policy, increased administrative costs, risks of corruption, and the potential to weaken national cohesion. For this reason, the continued need to study, assess, and adapt decentralization models is necessary and without further research success in the implementation of this process in diverse national contexts will be difficult. One of the greatest challenges caused by the multifaceted

and complex nature of this process is its measurement. To gain a solution to this problem and in pursuit of effective measurement tools, the authors of the present study have decided to employ two complementary methods, the TOPSIS method, enabling the linear ordering of analyzed countries based on the advancement of the decentralization process, and the k-means method allowing a non-linear clustering of countries into specific groups based on similarities in their decentralization characteristics. This permitted a better understanding of the specific nature of the phenomenon as existing within each country as well as facilitated the development of generalized conclusions which have been presented below.

Diverse indicators of political decentralization demonstrate the variety of political systems and decentralization models in practice. The results of the present study confirmed that there does not exist a single, universal model of political decentralization that is suitable for all countries, with research on political decentralization revealing specific patterns. Among other findings, it was determined that federal and quasi-federal states typically exhibit a higher level of political decentralization compared to unitary states, although the results of this research have revealed three unitary countries, namely Slovakia, the Czech Republic, and France, as displaying the highest levels of political decentralization. Their leadership in this area is primarily attributed to their relatively high average number of local territorial self-government units per 100,000 residents (the MPD_1 diagnostic feature), a figure that is unusual when compared to other unitary countries and even some states with a federal system such as Australia and Austria. Turkey was found to have the lowest level of political decentralization. Significant challenges in the area of political decentralization in this country are highlighted by its negative values concerning diagnostic features MPD_4 (fairness and freedom of elections at a level lower than national) and MPD_5. The country also displays one of the lowest values seen among analyzed countries for the MPD_3 diagnostic feature, indicating the power of elected local officials compared to unelected ones.

For administrative decentralization, the highest values of the indicator associated with this area (MAD) were recorded in Denmark, Sweden, Finland, and Spain, while the lowest were noted in New Zealand, Turkey, Greece, and Ireland. This aspect of decentralization illustrates which public tasks and functions are decentralized to lower levels of public authority, and what the priorities are regarding decentralized public expenditures. The conducted analyses showed that this varies considerably among different countries. Federally structured countries seem to be more decentralized in the context of the ratio of local government employee wages to total public expenditure (the MAD_1 diagnostic variable) compared to unitary states. The highest levels of MAD_1 were exhibited by Switzerland, Spain, Belgium, and Germany, while the lowest were in Turkey, Ireland, New Zealand, and Greece. It is also noteworthy that Denmark's level of decentralized public spending on social care (the MAD_3 diagnostic variable) is several times higher than that of other countries, suggesting differences in political priorities. Conversely, the SNG level in New Zealand showed a lack of expenditure on education (MAD_2), social care (MAD_3), and health care (MAD_4), quite a unique phenomenon compared to most countries. The research also suggests that European countries appear to be more decentralized in terms of spending on education and health care compared to non-European countries. It was additionally observed that in some countries, healthcare expenditures at the SNG level are much higher than expenditures on social care (e.g., Australia, Spain,

the United States, and Italy), which may reflect a prioritized approach in the decentralization process to healthcare tasks. There are also countries where the prioritized approach in this area concerns social care (e.g., Belgium, Germany, the United States, Iceland, Denmark, France, the Netherlands, Norway).

In the context of fiscal decentralization, it was observed that even countries classified within the same category (federal vs. unitary), demonstrated considerable variation in their levels of this type of decentralization. This means that the political and territorial system of a country is not the ultimate determinant of the level of its fiscal decentralization. The MFD index, depicting this aspect of decentralization, was highest in Switzerland, the United States, Germany, Spain, and Sweden and lowest in Turkey, Ireland, Greece, and Slovakia.

Empirical data also shows that federal countries generally have a higher percentage of the SNG subsector's budgetary revenue in total public finance sector revenues (diagnostic variable MFD_1) than most unitary states. Moreover, federal countries typically have lower transfer income indicators, as seen in the percentage of total SNG subsector revenues (diagnostic variable MFD_2). There was also strong differentiation in the SNG subsector's tax revenues in relation to GDP (diagnostic variable MFD_3), determining the scope of tax decentralization, with federal countries displaying the highest values for these indicators, some above 10%. Another key metric for fiscal decentralization is the SNG subsector's capital expenditure, analyzed in terms of both GDP and total public expenditures. Studies reveal that the highest capital expenditures of the SNG subsector relative to GDP (diagnostic variable MFD_4), approaching 3% of the GDP, were observed in Korea, Australia, Japan, and Finland. The lowest, below 1%, were seen in Turkey, Ireland, and the UK. Meanwhile, the highest values of capital expenditures in relation to total public expenditures (diagnostic variable MFD_5) concerned Belgium and Australia (above 70%), while the lowest was seen for Turkey (about 13%).

The last two diagnostic variables considered by the authors in their studies of the level of fiscal decentralization were debt of the SNG subsector as a percentage of GDP (diagnostic variable MFD_6) and SNG debt in relation to the size of total public debt (diagnostic variable MFD_7). High values of these indices may demonstrate a local government's higher debt autonomy from that of a given country's central authorities as well as a more relaxed fiscal discipline, usually stipulated by fiscal rules varying in restrictiveness in different countries. Results of research conducted by the authors show the highest level of fiscal decentralization considered in the context of public debt as characterized by the SNG subsector units in the United States, Spain, and Japan (MFD_6 above 30%) with the undisputed leader in the context of the MFD_7 index level (above 50%) being Switzerland. The lowest level of debt decentralization in the SNG subsector for the MFD_6 criterion concerns Greece and Luxembourg (whose index values do not exceed 1.5%), and for MFD_7 – Greece (0.5%).

The authors found the conclusions of the analysis into the differentiation of the decentralization structures exhibited by countries considered within the study to be very interesting. Research using the k-means clustering method identified three distinct groups of countries, with the first group consisting of states having a high level of political decentralization but a low level of administrative decentralization and a medium level of fiscal decentralization, and including the Czech Republic, Slovakia, France, and Hungary. The decentralization model dominant in these countries can best be described as a "balance between politics and admin-

istration" where, although local public authorities possess significant political powers, it is the central government that retains administrative oversight. This can be likened to a scenario where a project manager enjoys decision-making autonomy in terms of project direction yet the resources and tools he utilizes are closely controlled by upper management.

The second group contained countries where levels of political, administrative, and fiscal decentralization were all very low and included Estonia, Greece, the Netherlands, Ireland, Israel, Korea, Lithuania, Latvia, Luxembourg, New Zealand, Poland, Portugal, Slovenia, Turkey, and Great Britain. The model of decentralization within these nations can be described as "centralist domination". In this context, the central public authority exerts significant influence over most operations falling into political, administrative, and fiscal domains conducted by subordinate public authorities.

The third group is made up of states which display a high degree of administrative decentralization combined with a low level of political decentralization and a pronounced level of fiscal decentralization and includes Australia, Austria, Belgium, Denmark, Finland, Germany, Spain, Iceland, Japan, Norway, Switzerland, Sweden, the United States, and Italy. The decentralization model utilized by these nations can be defined as "strength in decentralized public authority" where local administrations enjoy substantial administrative autonomy and decentralized funding for public tasks, but the central government retains oversight in political matters and can be likened to the franchise model used in business with franchise holders enjoying significant operational autonomy but also having to comply with guidelines set by the franchisor. One can attempt to justify the patterns shown in Table 7 and Figure 6, which indicate that the most administratively and fiscally decentralized countries are also the economically wealthiest (cluster 3). The main arguments related to this can be distilled into four key issues: economic efficiency, investments in local/regional development, a favorable business climate, and the effectiveness of public administration. Firstly, decentralization promotes increased economic efficiency by providing local public authorities with better conditions to make more flexible decisions regarding resource allocation and public financial management. This can contribute to a more efficient use of public resources and, consequently, an overall improvement in the country's economic situation. Secondly, decentralized countries can focus on investments and development in local communities, which can contribute to local/regional development, the creation of new jobs, and, consequently, economic growth at the national level. Thirdly, in decentralized countries, local public authorities are interested in creating a business-friendly environment in their area, attracting investors, and promoting the growth of the private sector. This, in turn, can lead to increased economic activity, job creation, and overall economic growth and development of the entire country. And fourthly, decentralization can contribute to better public administration and more effective resolution of public policy issues than from the central government level. Greater effectiveness of local public policies usually also translates into a higher level of economic development for the entire country.

The research results allow for at least preliminary policy recommendations. The results enable the assessment and potential adjustment of the decentralization model in the analyzed countries. In the case of countries falling into the first group (high political decentralization, low administrative decentralization, and medium fiscal decentralization), policymakers could,

for instance, consider fostering a more balanced decentralization approach. This would ensure that while local public authorities have significant political powers, there is also an appropriate level of administrative autonomy. In countries with "centralist domination" (cluster 2), characterized by low political, administrative, and fiscal decentralization, policies could focus on enhancing local autonomy. This could be achieved by encouraging the central government to devolve certain administrative powers and fiscal responsibilities to local authorities. It may involve designing policies that allow local governments to have more control over specific functions or resources, promoting efficiency and responsiveness at the local level while maintaining an overarching central authority. Recognizing the characteristics of the third group (high administrative decentralization, low political decentralization, and pronounced fiscal decentralization), a more flexible decentralization in the political dimension could be considered. This could be achieved by providing guidelines that strike a balance between local autonomy in administrative and fiscal matters, while maintaining a level of central oversight in political affairs. Establishing clear guidelines will ensure that local administrations have the flexibility to address local needs while adhering to national policies.

These recommendations aim to tailor decentralization strategies to the specific characteristics of each country group, promoting effective governance, local autonomy, and overall system efficiency. Thus, in light of the proposed methodology, findings, and the preliminary policy recommendations, our paper contributes to the body of important studies on decentralization, offering valuable insights for policymakers.

Author contributions

Conceptualization: M. P., P. K.; data curation: M. P., A. P.; software, P. K.; formal analysis, M. P., A. P., P. K.; investigation: M. P.; methodology: P. K.; validation: P. K.; visualization: P. K., A. P.; project administration: M. P.; writing – original draft: M. P.; writing – review & editing: M. P., A. P., P. K.

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APPENDIX

Table A1. Calculations of distance to ideal and anty-ideal solutions regarding MPD, MAD, MFD (source: own calculation, 2023)

Country	Political decentralization		Administrative decentralization		Fiscal decentralization	
	distance to ideal solution	distance to anty-ideal solution	distance to ideal solution	distance to anty-ideal solution	distance to ideal solution	distance to anty-ideal solution
Australia	0.583	0.186	0.362	0.235	0.169	0.242
Austria	0.368	0.293	0.321	0.24	0.283	0.121
Belgium	0.552	0.201	0.367	0.258	0.178	0.239
Germany	0.47	0.239	0.391	0.219	0.124	0.288
Spain	0.425	0.279	0.331	0.297	0.146	0.276
Switzerland	0.348	0.329	0.36	0.241	0.106	0.323
United States	0.482	0.198	0.356	0.273	0.124	0.306
Czech Republic	0.111	0.613	0.429	0.145	0.289	0.14
Denmark	0.589	0.178	0.101	0.498	0.218	0.244
Estonia	0.544	0.186	0.435	0.138	0.324	0.101
Finland	0.545	0.215	0.265	0.31	0.192	0.231
France	0.102	0.552	0.476	0.071	0.264	0.157
Greece	0.581	0.166	0.521	0.011	0.369	0.049
Hungary	0.3	0.346	0.496	0.041	0.349	0.066
Iceland	0.408	0.289	0.442	0.147	0.231	0.211
Ireland	0.608	0.157	0.514	0.019	0.37	0.038
Israel	0.582	0.139	0.495	0.059	0.335	0.108
Italy	0.473	0.236	0.374	0.28	0.282	0.127
Japan	0.588	0.211	0.383	0.194	0.177	0.248
Korea	0.598	0.203	0.421	0.163	0.289	0.171
Latvia	0.585	0.157	0.443	0.134	0.266	0.147
Lithuania	0.585	0.16	0.436	0.129	0.355	0.075
Luxembourg	0.47	0.211	0.508	0.028	0.345	0.081
Netherlands	0.592	0.158	0.427	0.161	0.296	0.109
New Zealand	0.591	0.196	0.525	0.005	0.307	0.123
Norway	0.538	0.191	0.35	0.196	0.178	0.227
Poland	0.537	0.203	0.386	0.168	0.29	0.125
Portugal	0.575	0.186	0.497	0.036	0.322	0.104
Slovakia	0.073	0.581	0.479	0.099	0.356	0.048
Slovenia	0.504	0.193	0.451	0.107	0.322	0.103
Sweden	0.573	0.229	0.231	0.358	0.151	0.272
Turkey	0.628	0.017	0.523	0.007	0.366	0.036
United Kingdom	0.607	0.148	0.457	0.094	0.317	0.084