EKONOMIA I PRAWO. ECONOMICS AND LAW
Volume 23, Issue 2, June 2024
p-ISSN 1898-2255, e-ISSN 2392-1625
www.apcz.umk.pl/EiP

ORIGINAL ARTICLE
received 18.06.2023; revised 06.07.2023; accepted 01.04.2024
Citation: Sekuła, A., & Flisikowski, K. (2024). The scope of fiscal decentralisation in EU countries: a comparative analysis. *Ekonomia i Prawo. Economics and Law*, 23(2), 287–309.
https://doi.org/10.12775/EiP.2024.015.

The scope of fiscal decentralisation in EU countries: a comparative analysis

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Abstract

Motivation: Decentralization is one of the main challenges in public sector reform. In democratic countries the level of decentralisation in individual countries is not identical. The varying scope of decentralization affects the quality, quick and efficient decision-making by public leaders.

Aim: Comparison of the extent of fiscal decentralisation in EU Member States; creation of groups of states with similar levels of decentralisation; identification of characteristics of countries where the average level of decentralisation is similar.

Results: As a result of the study 4 clusters were created. The first includes centralized countries (small area, small population, e.g. Malta, Cyprus). The level of decentralization is a little bit higher in federal states and most of the countries that joined the EU in 2004 or later (cluster 2, the most numerous). Larger and more numerous countries are characterized by a higher level of decentralization (cluster 3, e.g. Italy, Poland, France). Clusters 4th is composed of the Nordic countries, i.e. in countries where a welfare state model with an extensive public sector has been implemented. As a result, it was found that the level of decentralization is related to the size of the country, population and political system.

Keywords: decentralisation; public finances; public expenditure; European Union; fiscal decentralisation; cluster
JEL: H71; E62; H50

1. Introduction

The present-day form and scope of public authority depend on many factors. One of them is a declaration, usually expressed in the constitution of a given country, of the application of the decentralisation principle in the performance of public tasks. However, despite this declaration, it can be seen that the structure of the public sector and the tasks carried out at different levels in particular countries are not identical. This also applies to the countries of the European Union, although some issues related to legal order are regulated by treaties.

This fact became a premise for undertaking the research presented in this article. Its aim was to compare the extent of fiscal decentralisation in EU countries and then identify the characteristics of countries where the level is similar. An appropriate level of decentralisation under certain conditions makes it possible to, on the one hand, meet the needs of local communities better and, on the other, maintain a degree of centralisation that ensures the integrity of the state. This is especially important in post-transition member states, which began implementing decentralisation more than 30 years ago.

Earlier decentralization studies, the results of which were discussed later, did not focused on the European Union countries only. They also did not take into account both financial and macroeconomic indicators in one research and the optimal number of clusters was not calculated, but set by the authors. The above research gap is filled by this article. The conclusions of the research can be implemented in any country, not only in the European Union members, as each political authority should aim to improve revenue distribution, service delivery and political accountability.

First, the analysis on methods of determining decentralisation, characteristics of its types as well as methods of measurement was conducted in the theoretical part of the article. Then, in the empirical part, with the use of the hierarchical cluster analysis method, i.e. the agglomeration method with the use of Euclidean distance, attempts were made — based on the level of decentralisation in EU states in 2016–2021 — to create clusters containing countries with a similar level of decentralisation. On this basis, four clusters of countries were created, identifying common features of countries belonging to one group and the differences between them. Years 2016–2021 were considered as a sufficient timeframe for testing because of high immutability (stability) of the data. In addition, when the original research was carried out, data for 2022 was not yet available.

2. Literature review

2.1. The scope and meaning of decentralisation title

At present, it can be seen that the transfer of political and economic power to local governments is a global trend in fiscal policy reforms (Mauro et al., 2018, p. 874) persisting in many democratic countries despite the existing differences related to their political systems.

There are many reasons for the spread of the process of delegating tasks to lower levels in the structure. Those of great importance include bringing power closer to the electorate, increasing knowledge about the needs of the society and the resulting opportunity to satisfy them more quickly and fully (Bulut & Abdow, 2018, p. 183). Reduction of communication costs is also emphasised, as decision-making is delegated to an agent who has the most relevant information (Poitevin, 2000, p. 878). Rapid response of authorities to needs of a local community is possible as the preferences are adjusted to smaller, more homogeneous groups (Marks-Bielska et al., 2020, p. 466). Most research results also show that decentralisation reduces inter-regional disparities (Kyriacou et al., 2017, p. 947).

The explanation of the notion of decentralisation is relatively well presented in the literature, although it is easier to define its antonym — centralisation. Centralisation is defined as a concentration of resources and authorities in the centre. It is also suggested that decentralisation is not the opposite of centralisation, but its reduction (Săraru, 2018, p. 602). In this context, it means self-limitation of central authorities in favour of other entities with regard to the performance of tasks, disposal of public assets and management of public funds. The reason why decentralisation is more difficult to define is because it can mean institutional restructuring and transfer of central government functions not only to local governments, but also to non-governmental organisations or private companies (Bulut & Abdow, 2018, p. 180). Its application does not preclude the centralising of the performance of certain tasks. Thus, in fact, the decision does not concern the choice of one of the principles, but the determination of the proportions between them. The dynamics and scope of decentralisation carried out in a given country depend, among other things, on the political, demographic, geographical, economic and cultural factors. With regard to political conditions, decentralisation is possible in countries with a democratic system. There is a positive correlation between the demographic and geographical conditions: countries with large populations and countries with larger areas have a greater capacity to decentralise their authorities. It is also fostered by liberal economic models as well as multiculturalism and multinationalism. Historical conditions may be added to the aforementioned factors, including mainly the current directions in the creation of a political system of a state.

From the substance point of view, decentralisation to lower governance levels always involves delegation of tasks. Most often it refers to state structures and concerns the assignment of tasks to local government, however, it needs to be stressed that tasks can also be transferred within private organisations (Poitevin, 2000, p. 878), and in the case of the public sector the transfer does not necessarily have to take place in the relationship: government sub-sector — local government sub-sector, because tasks can be transferred to institutionally separated parts of state administration, e.g. special offices representing a subjectively separate part of state administration.

In the case of the public sector, decentralisation is about ensuring reasonable autonomy of bodies at lower levels of organisational structures with regard to bodies at higher level. When solving local public affairs, the starting point for local self-governments is better knowledge of local problems and, thus, greater likelihood of successful implementation of the solutions to these problems (Haček & Grabner, 2013, p. 216). Of course, it also has drawbacks or potential risks, e.g. coordination problems may arise.

Moreover, decentralised governments are usually larger, although it is not interpreted as a manifestation of inefficiency; instead, it stems from the fact that the transfer of the ability to provide public goods that are more in line with voters' preferences to local authorities is linked to the fact that they receive more management resources (Stein, 1999, pp. 386–388). When implementing decentralisation, it is important to remember that public services of local scope need to be transferred from central government competences to some local public administration bodies. From the point of view of the political system, local authorities are to be not subordinated to the centre, but independent and autonomous (Săraru, 2018, p. 602).

The main effect of decentralising tasks and public finances should be increasing the economic and social efficiency of the public sector, and, as a result, achieving of higher economic growth rates, which will bring about an improvement in the standard of living and the quality of society's life.

Although, from the theoretical point of view, the above objective of decentralisation of tasks is often emphasised, a review of empirical studies dedicated to this issue indicates that apart from those studies which indicate positive economic effects of decentralisation, some researchers also observe a lack of such effects, or, in fact, even the occurrence of negative ones (Mauro et al., 2018, p. 873), and with regard to poverty reduction opportunities, it is observed that decentralisation itself, without strengthening and expanding the mechanisms of responsibility at a local and national level, will not bring results beneficial to the poor parts of society (Crook, 2003, p. 77).

The above statement emphasises that the delegation of tasks alone does not exhaust the notion of decentralisation. The definition covers three issues:

– the aforementioned delegation of tasks from the central to the local level;
– the use of assets and powers guaranteeing independence and ability to decide on matters relating to a particular area by authorities of the given level;

– local authorities having appropriate means to implement their own policies.

This definition is reflected in one of the types of decentralisation presented below.

2.2. Types of decentralisation

Due to the complexity and the multifaceted nature of the decentralisation process, different types of decentralisation are distinguished.

Some of the terms describe decentralisation as a process involving transfer of public tasks and financial resources enabling the implementation of these tasks to public sector entities at lower levels of the structure. Sometimes, the process aspect is referred to as the dynamic one, as opposed to the static one, characterised as the state of equipping entities below than the central level with tasks and means by which they perform these tasks.

Decentralisation is also subdivided into the regional and local level depending on the territorial level to which it applies. The first concerns (in Poland) voivodships, regions or provinces, the second one — communes, their associations and districts.

According to the next subdivision, if decentralisation takes place within a specific structure, it is referred to as the internal one, and if the delegation of tasks takes place outside of it, decentralisation is referred to as the external one (Fontana, 2018, p. 758).

However, the most common division includes system, administrative and financial decentralisation.

The former is referred to as political. Its essence boils down to the existence of democratically elected public authorities at local government level, which have an ensured political independence from the state. This means that entities located below in the structure of the state operate through selected representative bodies: the constituting and executive ones.

Administrative decentralisation means that state separates and delegates tasks and powers that, from the organisational point of view, are necessary to perform these tasks to local self-governments.

Decentralisation, when carried out properly, must also take the financial aspect into account. In simple terms, it is called decentralisation of public finances. This means transferring relevant tasks of public resources to local government units, adequate to those decentralised in the administrative sense, and the power to dispose of them. Therefore, it is a form of self-limitation of central authorities in favour of local self-government authorities within the area of free, independent disposal of public funds (Smoke, 2003, p. 10).

Among all aspects of decentralisation, the most complex one is decentralisation of public finances. It is stressed that this is a consequence of decentralisation of state administration, since the decision to decentralise tasks and competences of the state results in decentralisation of public finances. However, it is preferable to assume that it takes place in parallel with decentralisation of admin-

istration, which, together with decentralisation of the political system, results in decentralisation of the state. Decentralisation of the state becomes a fact only when it is accompanied by decentralisation of finances, without which the process is incomplete or even debatable.

Two sets of actions are distinguished in the process of financial decentralisation:

– the first one consists in equipping self-governments with their own sources of revenue, ensuring conditions for the independent gathering of funds and the possibility of setting their amount;
– the second is related to the delegation of powers to make decisions regarding the way funds are spent on public tasks.

Such division leads to the separation of revenue and expenditure financial decentralisations, however, in the case of their scope, expenditure decentralisation is greater than the revenue one (Karnowski & Rzońca, 2021, p. 802; Mauro et al., 2018, p. 874).

Particular aspects of decentralisation are illustrated in Scheme 1. In this division, system, administrative and financial decentralisation is also alternatively referred to as political, administrative and fiscal decentralisation (Bulut & Abdow, 2018, p. 180).

It is important to note that distinguishing between different types of decentralisation has much broader meaning than just terminological, and it does not only serve the purpose of describing the phenomenon more precisely, e.g. studies on the impact of decentralisation on quality of life have shown that while greater decentralisation of revenue increases population's satisfaction with life, decentralisation of expenditure is no longer linked to satisfaction with life (Gao et al., 2014, p. 1192).

In line with the 3 aspects of territorial decentralisation presented in Scheme 1, the indicators for measuring decentralisation are divided into 3 groups, i.e. the indicators for decentralisation of public finances, administrative and political decentralisation.

Apart from assigning the indicators to one of three aspects of decentralisation, they can be divided into qualitative (descriptive) variables, e.g. a list of competences of particular levels of self-government in a given country, and quantitative variables, e.g. the relationship between self-government sector expenditure and global public expenditure.

The indicators of the first group, i.e. the decentralisation of public finances, provide information on the division of powers between the central government and the lower level entities of territorial division within financial economy, especially competences associated with collecting and shaping revenues, directions and the volume of their disbursement or powers related to incurring liabilities. Quantitative information can be obtained by calculating, among others, the following indicators — the share of:

- local government sub-sector revenue in total public revenue;
- tax revenue of the local government sub-sector in tax revenue of the state budget;
- own revenue in the total revenue of the local government sub-sector (Sanogo, 2019, p. 218);
- local government sub-sector revenue in relation to the GDP (gross domestic product);
- the number of persons employed outside the central government in relation to the persons working for it (Fontana, 2018, p. 761);
- local government expenditure in total public expenditure (Halásková, 2015);
- local government sub-sector expenditure in government sub-sector expenditure (Stein, 1999, p. 370);
- local government sub-sector expenditure in relation to GDP (Guziejewska, 2018, p. 110); this indicator is also referred to as functional decentralisation.

The analyses included 4 indicators, i.e. no. 1, 4, 6, 8. In addition to financial variables, they also include macroeconomic ones.

2.3. Previous empirical studies

As it has already been pointed out, there are no fully decentralised democratic states. There are areas of centralisation in all of them. However, studies have shown that it is possible to determine in which country the level of decentralisation is greater and in which it is lesser. Maličká and Martinková (2018, pp. 157–171) grouped EU countries into clusters, taking into account data from 1995–2015 and using 4 variables:

- sub-national expenditure to total government expenditure;
- sub-national revenue to total government revenue;
- sub-national tax revenue to sub-national total revenue;
- sub-national grants and transfers received to total sub-national revenues.

EU countries were clustered into 3 groups in accordance with fiscal decentralisation average values. Cluster 1 included 12 countries, i.a. Belgium, Germany and Spain. The next cluster comprised 8 unitary countries, including Poland, with multi-tiered local governments. The last cluster comprised 8 unitary countries (the only exception — Austria), e.g. Estonia or Lithuania, with single-tier local governments. Studies focused on the search for the determinants of fiscal decentralisation did not provide a clear answer to the question.

In a study conducted by Chernov et al. (2019, pp. 117–128), clustering was one of the methods used to assess the impact of the level of financial decentralisation on the indicators of socio-economic development of territories. The results of the simulation showed that revenue decentralisation is associated with a stronger effect on economic growth than expenditure decentralisation. Furthermore, high level of financial decentralisation (the original set of 28 EU countries was divided into two clusters) is typical for countries with high level of economic development and high quality of institutional environment and ad-

ministrative decentralisation. As a consequence, it leads to an increase in the efficiency of public sector operation and economic growth.

Another article (Laboutková et al., 2016, pp. 79–91) identified the relations between the degree of decentralisation and economic imbalance on the basis of a cluster (exploratory) analysis. Decentralisation was measured using a decentralization index, which contained both quantitative and qualitative components. Financial decentralisation had a weight of 40% and included information about the amount of revenue and expenditure in relation to the central government. The article focused on the argument that the degree of decentralisation affects the level of economic inequalities. One of the conclusions was that countries in the groups with a higher degree of decentralisation are among countries with more favourable values of economic imbalance indicators.

In an article dedicated to fiscal decentralisation (Halásková, 2015, pp. 45–58), the results of decentralisation of public administration in relation to public expenditures were presented, and a comparison of fiscal expenditure decentralisation in the EU countries in the years 2001, 2005, 2009 and 2012 was provided. A comparison of general government expenditures according to the levels of public administration was made with the use of the cluster analysis method. Three input variables — total general government expenditures (% of GDP), local government expenditures (% of GDP) and local government expenditures (% of the total general government expenditures) — were selected for the comparison. The output of the hierarchical cluster analysis consisted of three clusters; cluster 1 consisted of 10 countries, incl. Germany, Spain and Cyprus. The second cluster consisted of 15 countries, incl. Poland, France and the Netherlands. The last cluster consisted of 3 countries: Denmark, Finland and Sweden.

None of the studies mentioned met all the conditions: a longer time horizon allowing to draw conclusions about the stability of data, the number of clusters calculated (not set by the authors), consideration of financial (revenue, expenditure) and macroeconomic indicators.

3. Methods

The data analysis was performed in several steps. As the entry data we used four variables: local government sub-sector revenue to GDP (%); local government sub-sector revenue to government sub-sector revenue (%); local government sub-sector expenditure to GDP (%) and local government sub-sector expenditure to government sub-sector expenditure (%). First, the clustering tendency of our data (in years 2016–2021) has been verified. Then, we determined the optimal number of clusters for all consecutive years. Finally, we performed hierarchical clustering for entry variables. The EU countries were grouped in clusters following Ward's approach and k-means method, taking into consideration the level of aforementioned variables. The selected methodology is very useful in data presentation for groups of countries with diversified situation like the EU member states (Rollnik-Sadowska & Dąbrowska, 2018, pp. 143–158).

All results were verified due to statistical testing for each hierarchical clusters so clustering noise or sampling error has been excluded. The research hypothesis was verified, according to which the larger the country, the greater the degree of decentralization.

It is very important to assess whether the dataset contains significant clusters (i.e.: non-random structures) or not. This process is referred to as assessing clustering tendencies or the feasibility of cluster analysis (Han et al., 2012, pp. 348–362). We used the approach proposed as the Hopkins statistic (Lawson & Jurs, 1990, pp. 36–41). This measure tests the clustering tendency of a data set by measuring the probability that a given data set is generated by a uniform data distribution (it tests the spatial randomness of the data). The formula is defined as follow:

$$H = \frac{\sum_{i=1}^{n} y_i}{\sum_{i=1}^{n} x_i + \sum_{i=1}^{n} y_i}. \tag{1}$$

The Hopkins statistic (H) is equal to the mean nearest neighbor distance in the random data set divided by the sum of the mean nearest neighbor distances in the real and across the simulated data set. If our data were uniformly distributed, then both sums: x — distances from each real point to each nearest neighbor and y — distances from each artificial point to the nearest real data point would be close to each other (H=0.5). If there are any clusters present, then the distances for artificial points (y) would be substantially larger than 0.5 (Lawson et al., 1990, pp. 36–41). It is a common practice, that we may assume a clustering tendency for H statistic larger than 0.75 (at the 90% confidence level). In our case, in all consecutive years (2016–2021) the Hopkins H statistic was equal from 0.89 to 0.93. It means, that there is a strong clustering tendency for a chosen set of entry variables. Together with this assessment, it is possible to provide the visual assessment of clustering tendency (VAT), The method was first introduced by Bezdek and Hathaway in 2002. VAT is based on the dissimilarity matrix between the objects in the data set using the Euclidean distance measure. As it is visible on the Chart 1, the dissimilarity matrix image confirms that there is a cluster structure in our data.

Next, we standardized our entry variables in all consecutive years using min-max method. Then, the classical Euclidean distance measures d_{euc} were calculated.

$$d_{euc}(x,y) = \sqrt{\sum_{i=1}^{n} (x_i - y_i)^2}. \tag{2}$$

In the third stage of our analysis, we tried to determine the optimal number of clusters for entry data in years 2016–2021. Usually, the assessment

of optimal number of clusters is subjective and depends on the method used for measuring similarities and the parameters used for partitioning. We used one of the most popular direct methods: the average silhouette approach. Here, we simply measure the quality of a clustering (it is determined how well each object lies within its cluster). A high average silhouette width indicates a good clustering (Kaufman & Rousseeuw, 1990, pp. 16–30). We didn't use the popular elbow method, based on finding WCSS (within-cluster sum of square) i.e. the sum of the square distance between points in a cluster and the cluster centroid, because it is very often not clear visually how many final divisions to provide (i.e. the soft-slope, without any significant cut-off point).

$$S = (b-a)/max(a,b). \tag{3}$$

For the score we use two measures: "a" as the average distance between each point within a cluster and "b" as the average distance between all clusters. Silhouette score ranges from –1 to 1. For the value closer to 1, points are perfectly assigned in a cluster and clusters are easily distinguishable. For 0: clusters are overlapping. For values closer to –1: points are wrongly assigned in a cluster (Charrad et al., 2014, pp. 1–36). Our results for all years, are very close to this presented on the Chart 2. It means, that we should use 4 clusters with the score close or higher than 0.6 (points are quite well fitted to a given divisions and distinguishable).

In the next step, we determined the best clustering method. To solve this problem, we used the R package "clValid" (Brock et al., 2008, pp. 1–22; Handl et al., 2005, pp. 3201–3212), which can be used to compare simultaneously multiple clustering algorithms in a single function call for identifying the best clustering approach and the optimal number of clusters. Here the clustering algorithms are compared using two cluster validation measures: internal measures (like the connectivity, the silhouette coefficient and the Dunn index) and stability measures (i.e. the consistency of a clustering result by comparing it with the clusters obtained after each column is removed, one at a time). We proved at this stage, that hierarchical clustering with four clusters performs the best in each case (i.e. for connectivity, Dunn and Silhouette measures). It is worth to notice, that also regardless of the clustering algorithm, the optimal number of clusters seems to be four using the chosen four measures.

In the last stage of our analysis, we performed the hierarchical clustering based on k-means approach with the implemented Ward's method. Ward's clustering combines the advanced k-means approach and provides the accurate optimal clustering with the lowest possible approximation error for each cluster number (Kharinov, 2012, pp. 1–11). The obtained clusters are visualized with the use of dendrograms on Charts 3–8 for years 2016–2021.

Finally, we used the bootstrap resampling techniques to compute p-value for each hierarchical clusters to avoid sampling errors (Suzuki & Shimodaira, 2015, pp. 15–245). This method of statistical testing is based on thousands of bootstrap samples by randomly sampling elements of the data. It computes hierar-

chical clustering on each bootstrap copy. For each cluster bootstrap probability (BP) value (which corresponds to the frequency that the cluster is identified in bootstrap copies) and the approximately unbiased (AU) probability values (p-values) by multiscale bootstrap resampling are calculated. Clusters with AU higher than 95% are considered to be strongly supported by data. To sum up, it is worth to point out that derived clusters, presented on the dendrograms (Charts 3–8) achieved AU significantly higher than 95% and are considered to be strongly supported by data.

4. Results

The main aim of the study was to determine the extent of decentralisation in EU countries and identify the characteristics of countries in which its level is similar. Data obtained from Eurostat (2023) were subjected to statistical analysis — hierarchical grouping. Analyse was made for years 2016–2021 for 27 European countries. United Kingdom was excluded due to not available date in Eurostat from year 2019. To perform analysis 4 variables were taken into consideration: local government sub-sector expenditure to GDP, local government sub-sector revenue to GDP, local government sub-sector expenditure to government sub-sector expenditure, local government sub-sector revenue to government sub-sector revenue in EU countries in 2016–2021 (%). Data used to analysis is shown in Table 1. All data have been subjected to data standardization to get proper results. The results of the cluster analysis are shown in the graphical way dendograms (Charts 3–8) and also in the Table 2.

On the basis of the performed analysis it can be concluded that there is a varying level of decentralisation in European Union states. The amount of revenue decentralization almost coincides with expenditure decentralization, e.g. in Ireland, the average for the years 2016–2021 for the "local government expenditure to GDP" variable was 2.68%, and for the "local government revenue to GDP" variable — 2.66%. Greater differences occur in the relation between the local government sector and the government sector (the share of revenues is higher than the share of expenditures), which proves a greater deficit and debt of the government sector.

The average level of decentralization (revenue and expenditure) in relation to GDP is 10.15–10.22% and in relation to the government subsector 33.78–36.624%. The dominant level is 6–9% (to GPD), which occurs in 11 of the countries. This means that such a part of GDP makes up the expenditure (or revenue) of the local government sub-sector. Although the theory does not provide recommendations or guidelines regarding the optimum rate or degree of decentralisation, it can be unequivocally stated that expenditure decentralisation (to GPD) at the level of 6–9% dominates in European Union countries.

Greater differences are in the third and fourth variables — from 1.4% (Malta) to 88–89% (Finland). In Finland, in some years, e.g. in 2020, the rev-

enue of the local government sector was similar in size — amounted to over 96% — to the revenue of the government sector.

5. Discussion

In each year from 2016 till 2021 four clusters were created, where cluster 1 is composed of centralized countries (the least decentralized), and cluster 4 of Nordic countries — with the highest decentralization level. The detailed characteristics are as follows:

- cluster 1:
  - apart from 2019, it consists of two subgroups; the first one includes, among others, the following countries: Austria, Luxembourg, Belgium, the second one is made up of 4 countries: Malta, Cyprus, Ireland, Greece;
  - the exception is the year 2019, in which the aforementioned 4 countries are a separate, first cluster;
  - Cyprus, Malta, Greece, Luxembourg are examples (to GDP) where the level of decentralization does not exceed 5%. Their characteristic feature is a relatively small area and small population. Therefore, it seems that central distribution of public funds does not slow down management of a country to a significant extent;
  - Austria and Belgium are federal countries with the federal states as the second tier of government; in EU statistics, this group also includes Spain due to the high independence of the autonomous communities;
- cluster 2 (the most numerous one):
  - small countries, mainly from Central and Eastern Europe (Slovakia, Estonia, Lithuania) and large European federal country, Germany;
  - their indicator to GPD is relatively stable, at a similar level of 7–10%;
  - an exception is the aforementioned year 2019;
- cluster 3:
  - larger and more numerous countries (the Netherlands, Czechia), as well as countries with an extensive, three-tier local government — Italy, Poland, France;
  - until 2017 it consisted of 5 countries, then of 7;
- cluster 4:
  - Nordic countries: Finland, Sweden, Denmark.
  - they implemented a welfare state model with an extensive public sector;
  - local government revenue (and expenditure) exceeds 80% of government revenue (and expenditure).

The proposed grouping fits quite well into the model of Loughlin (2000, p. 26), who, describing relations between local government and government powers, distinguished 4 types of states: the federal type and 3 unitary types — regional, decentralised and centralised. Comparing the results obtained in the study with Loughlin's classification propositions it has to be stated that, with a few exceptions, centralised countries correspond to group 1, decentral-

ised ones belong to group 4, federal states and most of the countries that joined the EU in 2004 or later — to group 2 and 1, and regional states — to group 3. In addition, the results are in line with earlier studies, according to which countries with a very high level of decentralisation, e.g. Finland, are characterised by a high degree of autonomy of local governments and a broad spectrum of their own resources (Sekuła & Śmiechowicz, 2016, p. 731).

Most of the obtained results are in line with those obtained by Halásková (2015), especially in the countries where the level of decentralisation is the lowest (Malta, Cyprus, Ireland, Greece, Luxemburg) or the highest (Finland, Sweden, Denmark). The difference between the previously obtained results concerns the number of clusters. Both in the research by Halásková (2015) and Maličká and Martinková (2018) 3 groups were distinguished, although the second article included a comment stating that in the first cluster there were 3 countries (Malta, Greece and Cyprus) forming an isolated sub-cluster.

An interesting observation is that the countries of Central and Eastern Europe are (except Hungary) in the 2nd and 3rd cluster. It can be concluded that countries with longer democratic systems better adapted (differentiated) the level of decentralization to their own conditions.

Moreover, it has been observed that minor variations in the indicator occur in all countries over the 6 years covered by the survey, so it can be assumed that data from the six-year period (2016–2021) were sufficient to perform the survey.

6. Conclusion

The article presents a cross-sectional-temporal analysis in the form of building 4 clusters based on input data, each of which groups EU countries according to the level of decentralization present in them. The method of hierarchical cluster analysis for all entry variables with the Ward's k-means approach was used. The results were additionally verified thanks to the procedure of statistical testing performed for each hierarchical cluster so the clustering noise and sampling error has been excluded.

It has been shown that less decentralization occurs in:

- smaller;
- less populous;
- and federal countries.

A greater degree of decentralization has been observed in:

- large;
- unitary;
- numerous countries;
- with many levels of local government;
- and an extensive public sector, where a large part of the tasks is performed by the local government level.

Public authorities of any country, improving management of the state system, should pay attention to the above-mentioned issues and adjust the scope of decentralization to the size (area, demographic) of the country, also taking into account the number of levels of the government subsector and the size of the public sector. Historical conditions, not taken into account in the analysis, are also significant.

Our paper contributed to the existing empirical literature in several ways: none of the studies mentioned in "Literature review" section met all the conditions: a longer time horizon allowing to draw conclusions about the stability of data, the number of clusters calculated (not set by the authors) and consideration of financial (revenue, expenditure) and macroeconomic indicators.

Due to the time range of the research, they do not show the impact of COVID-19 or the war in Ukraine. Taking Poland as an example, it can be concluded that the degree of fiscal decentralization has decreased. Both the expenditure on fighting the effects of the pandemic and the expenditure related to the military are of a government nature. An increase in the expenditure of the government sub-sector results in a decrease in the degree of decentralization.

The research limitation was the use of quantitative variables. Taking into account qualitative variables could change the assignment of some countries to a specific cluster. The use of quantitative and qualitative variables would provide a more complete form of decentralization. It is planned to conduct such research in the future.

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Acknowledgements

Author contributions: authors have given an approval to the final version of the article. Authors contributed to this work equally.

Funding: this research was undertaken as part of the *Managing the organization of the future* project and was fully funded by the Gdańsk University of Technology (grant no 033104-01).

Note: the results of this study were presented at *12th International Conference on Applied Economics Contemporary Issues in Economy* (June 29–30, 2023, Poland).

Table 1.
Local government sub-sector revenue to GDP (1), Local government sub-sector revenue to government sub-sector revenue (2), Local government sub-sector expenditure to GDP (3), Local government sub-sector expenditure to government sub-sector expenditure (4) (%)

Variable	1						2						3						4					
Year	16	17	18	19	20	21	16	17	18	19	20	21	16	17	18	19	20	21	16	17	18	19	20	21
Belgium	7.1	7.1	7.0	6.9	7.4	7.0	16.0	15.8	15.2	15.8	17.2	15.8	6.9	6.9	7.1	6.9	7.3	6.9	14.7	15.0	15.3	15.1	13.9	13.9
Bulgaria	6.9	7.3	7.4	7.3	7.4	8.2	27.9	28.5	29.0	27.3	29.9	33.4	6.9	7.0	7.3	7.4	7.1	8.1	27.8	29.3	30.3	30.1	24.5	27.8
Czechia	11.3	11.5	12.2	12.4	13.5	13.8	39.2	40.0	41.7	42.5	46.4	48.2	10.3	10.7	11.7	11.7	13.0	12.9	35.1	37.8	40.4	39.5	37.1	37.4
Denmark	34.5	33.7	33.1	33.1	34.8	33.9	89.6	86.9	87.4	82.5	87.2	81.7	34.1	33.5	33.1	33.0	34.5	33.8	87.6	90.0	89.2	91.0	86.4	88.6
Germany	8.2	8.3	8.6	8.4	8.9	8.8	30.8	31.2	31.8	31.3	32.6	30.2	8.0	7.9	8.1	8.2	8.8	8.7	30.8	30.7	31.0	31.5	28.4	26.2
Estonia	9.2	9.3	9.7	9.9	10.5	9.8	27.6	28.0	29.4	29.4	30.9	28.9	9.1	9.5	9.5	10.0	10.5	10.1	26.7	28.4	27.9	29.6	27.3	27.8
Ireland	2.2	2.1	2.3	2.2	2.4	2.1	8.3	9.8	10.7	10.9	12.7	10.7	2.1	2.1	2.2	2.4	2.4	2.2	7.8	9.4	10.5	11.7	10.6	10.4
Greece	3.9	3.9	4.1	3.4	4.0	3.9	10.3	10.9	11.3	9.7	11.3	11.0	3.5	3.5	3.7	3.4	4.0	4.0	9.2	9.6	10.0	9.7	8.7	9.1
Spain	6.4	6.5	6.4	6.3	6.7	6.7	20.4	20.4	19.5	19.6	18.7	17.7	5.8	5.9	5.8	6.0	6.4	6.4	16.6	17.3	17.0	17.5	14.8	14.6
France	11.3	11.1	11.1	11.1	11.5	11.2	57.3	55.2	56.2	59.2	61.7	59.7	11.1	11.1	11.0	11.2	11.6	11.2	47.7	47.3	48.5	49.8	45.7	45.7
Croatia	11.7	11.5	12.1	12.2	13.3	12.9	40.7	39.6	43.0	42.5	46.8	44.2	11.7	11.5	12.2	12.6	14.3	13.1	39.2	40.4	43.4	44.6	41.1	41.3
Italy	14.5	14.0	14.1	13.9	15.3	15.0	51.6	50.8	51.7	50.4	54.9	52.3	14.3	13.9	13.9	13.9	15.4	14.9	46.3	45.5	46.6	47.4	41.3	41.4
Cyprus	1.4	1.5	2.4	1.6	1.6	1.6	4.9	5.3	8.1	5.6	5.8	5.2	1.4	1.4	1.5	1.5	1.6	1.6	4.8	5.0	4.2	5.0	4.6	4.8
Latvia	10.3	10.7	10.7	11.4	10.9	10.5	47.2	49.3	47.8	54.3	49.8	49.8	10.1	11.0	11.3	10.8	11.0	10.8	46.0	48.7	48.5	46.7	41.5	37.4
Lithuania	8.3	7.9	8.2	8.5	9.6	9.4	36.7	36.6	37.8	33.5	37.9	35.8	7.8	7.7	8.1	8.5	9.7	9.1	34.1	35.4	26.6	32.8	29.4	31.4
Luxembourg	4.8	4.7	5.2	5.3	5.0	4.8	16.7	16.3	16.7	17.3	17.0	15.8	4.6	4.6	4.8	4.9	4.9	4.7	15.8	15.6	15.8	15.6	14.4	15.3
Hungary	6.2	6.2	6.5	6.6	6.5	6.2	20.2	19.8	20.9	21.2	20.3	20.0	6.0	6.2	6.4	6.7	6.4	6.0	18.1	18.2	19.2	20.4	16.6	15.5
Malta	0.5	0.5	0.5	0.5	0.5	0.5	1.3	1.3	1.3	1.5	1.5	1.3	0.5	0.4	0.5	0.5	0.5	0.4	1.2	1.2	1.3	1.3	1.1	1.0
Netherlands	13.7	13.2	12.9	12.7	13.8	13.7	53.7	49.8	49.0	46.8	51.0	49.5	13.6	13.2	13.1	13.0	14.0	13.5	51.4	52.2	51.4	50.1	45.0	43.3
Austria	8.3	8.3	8.4	8.4	8.7	9.0	20.3	20.5	20.6	20.6	21.7	21.7	8.4	8.4	8.4	8.4	8.9	9.1	19.7	20.2	20.6	21.0	18.8	19.2
Poland	13.2	13.5	13.9	14.1	15.0	14.8	63.5	63.0	63.4	64.5	67.6	61.0	13.0	13.4	14.2	14.3	14.8	14.2	55.4	53.4	63.2	62.3	49.3	54.4
Portugal	6.1	6.0	6.0	6.0	6.5	6.7	20.2	20.0	20.0	20.5	22.1	21.6	5.7	5.8	5.8	5.7	6.6	6.9	16.9	17.1	18.2	18.5	18.2	20.1
Romania	9.4	9.1	8.0	8.2	9.1	9.2	41.9	43.5	39.4	40.7	45.2	43.5	9.2	8.9	8.1	8.4	9.4	9.0	36.4	37.5	34.4	34.3	32.1	31.6
Slovenia	8.4	8.2	8.3	8.3	9.0	9.0	31.6	31.3	31.3	31.8	36.4	34.5	8.2	8.2	8.5	8.4	8.9	8.9	28.8	31.0	33.0	32.8	27.1	28.6
Slovakia	7.1	6.9	7.2	7.7	7.9	7.8	29.5	28.9	29.6	31.1	31.8	29.8	6.6	7.0	7.1	7.5	7.7	7.8	24.4	27.5	27.7	28.7	25.1	24.5
Finland	22.0	21.5	20.9	20.8	23.0	22.4	89.0	87.6	84.7	84.4	96.3	91.2	22.4	21.7	21.8	22.0	23.0	22.6	82.0	82.4	84.0	85.7	78.3	81.2
Sweden	24.4	24.7	24.6	24.1	25.6	25.2	78.7	79.7	79.8	79.1	85.5	82.5	25.0	24.9	25.3	25.0	25.4	24.5	84.4	85.0	85.7	85.9	77.6	78.0

Source: Own preparation based on Eurostat (2023).

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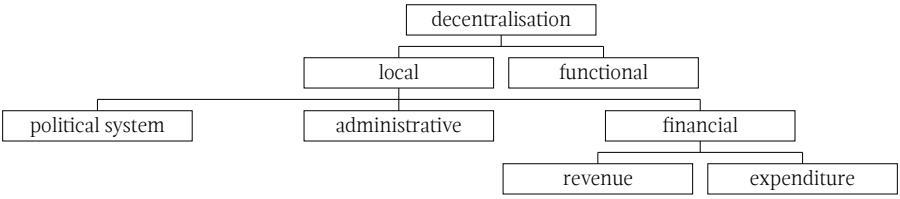
Table 2.
Presentation of clusters for years 2016–2021

Year	Cluster 1	Cluster 2	Cluster 3	Cluster 4
2016	Austria, Luxembourg, Belgium, Hungary, Spain, Portugal, Malta, Greece, Ireland, Cyprus	Bulgaria, Slovakia, Estonia, Germany, Slovenia, Czechia, Croatia, Lithuania, Romania	France, Latvia, Poland, Italy, Netherlands	Denmark, Finland, Sweden
2017	Austria, Luxembourg, Belgium, Hungary, Spain, Portugal, Ireland, Greece, Cyprus, Malta	Bulgaria, Slovakia, Estonia, Germany, Slovenia, Czechia, Croatia, Lithuania, Romania	Poland, France, Latvia, Italy, Netherlands	Denmark, Finland, Sweden
2018	Austria, Belgium, Luxembourg, Hungary, Spain, Portugal, Malta, Cyprus, Ireland, Greece	Lithuania, Romania, Bulgaria, Slovakia, Estonia, Germany, Slovenia	Poland, Czechia, Croatia, Italy, Netherlands, France, Latvia	Denmark, Finland, Sweden
2019	Ireland, Greece, Cyprus, Malta	Austria, Hungary, Spain, Portugal, Belgium, Luxembourg, Romania, Estonia, Lithuania, Germany, Slovenia, Bulgaria, Slovakia	Poland, France, Latvia, Czechia, Croatia, Italy, Netherlands	Denmark, Finland, Sweden
2020	Austria, Luxembourg, Belgium, Portugal, Spain, Hungary, Ireland, Greece, Cyprus, Malta	Bulgaria, Slovakia, Romania, Estonia, Lithuania, Germany, Slovenia	Poland, Czechia, Croatia, Italy, Netherlands, France, Latvia	Denmark, Finland, Sweden
2021	Austria, Luxembourg, Belgium, Portugal, Spain, Hungary, Ireland, Greece, Cyprus, Malta	Bulgaria, Slovakia, Romania, Estonia, Lithuania, Germany, Slovenia	Poland, Czechia, Croatia, Italy, Netherlands, France, Latvia	Denmark, Finland, Sweden

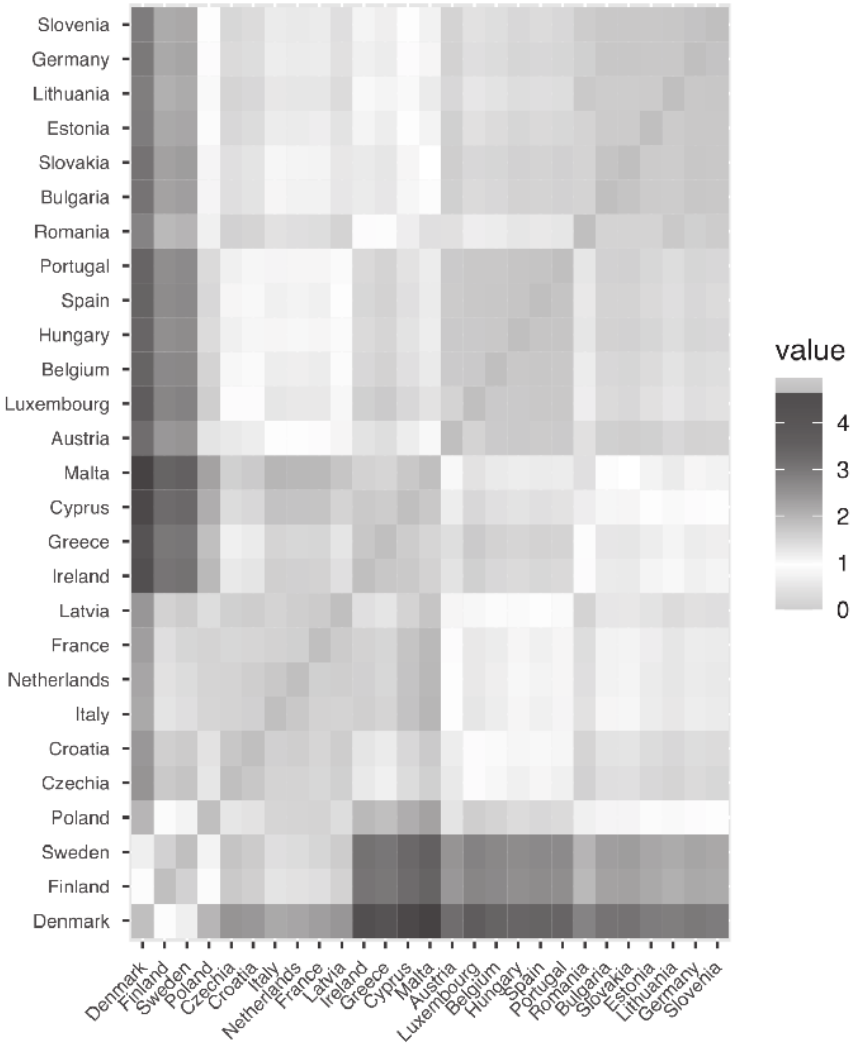
Source: Own preparation.

Scheme 1.
Types of decentralisation



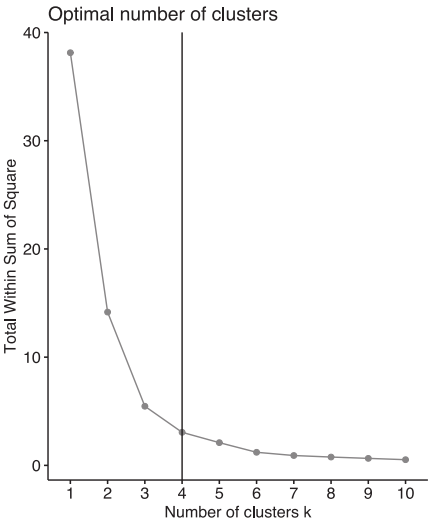
Source: Own preparation.

Chart 1.
The dissimilarity matrix (VAT approach) for the entry variables in 2016



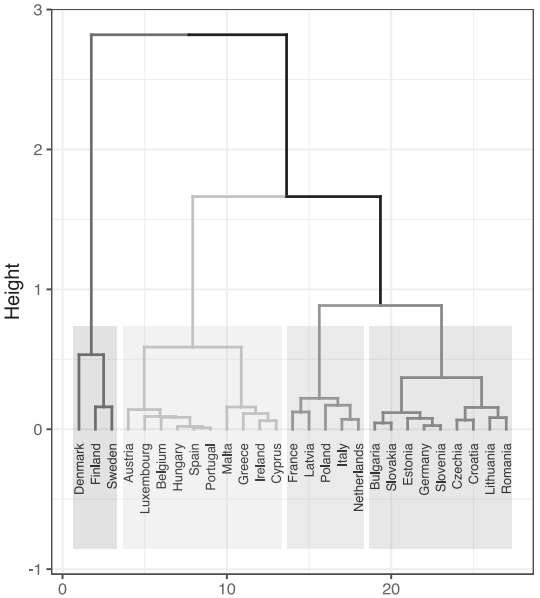
Source: Own preparation in the R software based on Eurostat (2023).

Chart 2.
Determining the optimal number of clusters (2016–2021)



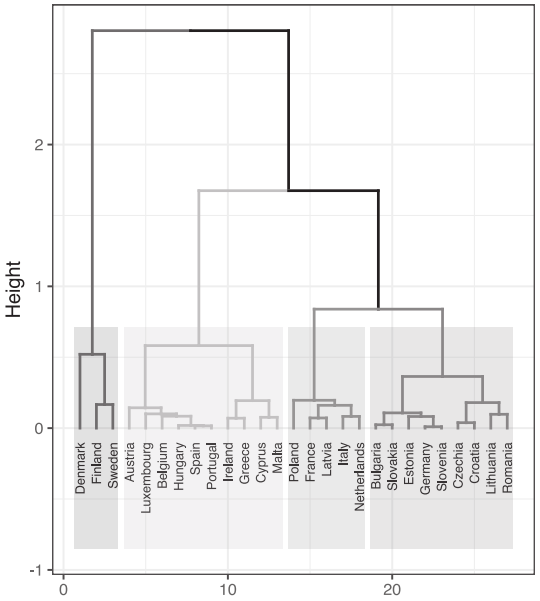
Source: Own preparation in the R software based on Eurostat (2023).

Chart 3.
Dendrogram: decentralisation in EU countries in 2016



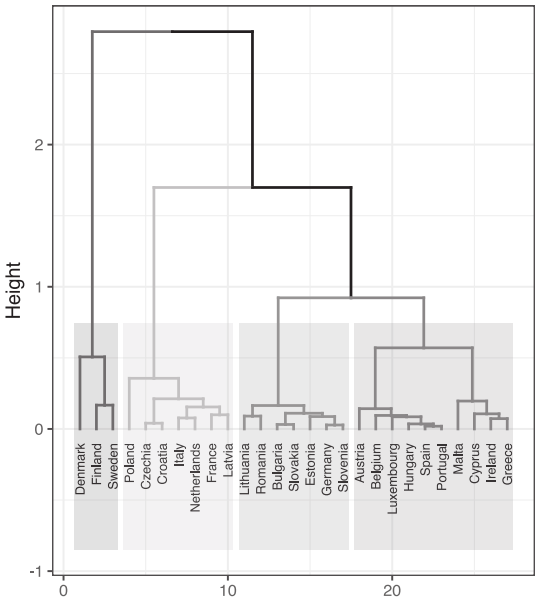
Source: Own preparation in the R software based on Eurostat (2023).

Chart 4.
Dendrogram: decentralisation in EU countries in 2017



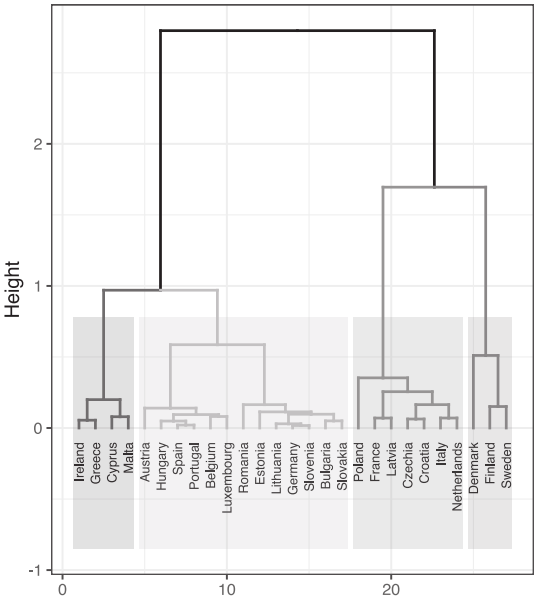
Source: Own preparation in the R software based on Eurostat (2023).

Chart 5.
Dendrogram: decentralisation in EU countries in 2018



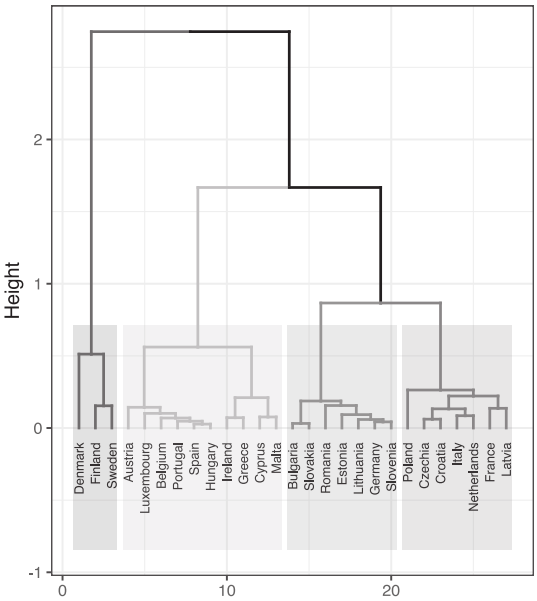
Source: Own preparation in the R software based on Eurostat (2023).

Chart 6.
Dendrogram: decentralisation in EU countries in 2019



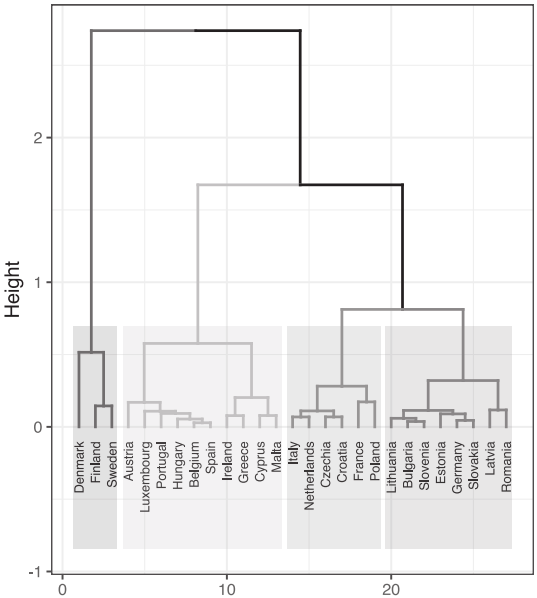
Source: Own preparation in the R software based on Eurostat (2023).

Chart 7.
Dendrogram: decentralisation in EU countries in 2020



Source: Own preparation in the R software based on Eurostat (2023).

Chart 8.
Dendrogram: decentralisation in EU countries in 2021



Source: Own preparation in the R software based on Eurostat (2023).