Coalitions in the EU Council: Pitfalls of Multidimensional Analysis

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Abstract The paper identifies the main problems, which are encountered in the statistical analysis of the patterns of decision-making of the EU Council. Compared to most legislative bodies in democratic political systems, in the EU Council decision-making we only see a scarce occurrence of contested legislation and in these cases, only few dissenting positions of the legislators are recorded. Consequently, when analysing the dimensionality of the Council policy space, we have to deal with extremely lopsided data, which may pose serious problems to standard multivariate methods. The paper aims to identify these problems and discuss the implications for the inference on the coalition formation in the EU Council. The assessment is done based on distribution of the data on voting in the EU Council and results of multivariate methods which are available.

Keywords Council of the EU, factor analysis, cluster analysis, multidimensional scaling
JEL classification C38

1. Introduction

Decision-making in the EU Council remains for a long time a puzzle attracting attention of various approaches to the analysis of decision-making. The supreme legislative body encompassing the representatives of the EU member states is veiled under the "culture of consensus", showing that the real preferences of the actors may often be suppressed by an incentive to end up on the winning side of the Council coalition game. Attempts to explain why member states do behave in such a way were numerous while major part of the research still relies on the spatial theory of voting, assuming that underlining preferences of the actors are the most significant factors which provide the basis of the structure of the EU policy space. Formal modelling and qualitative research aim to explain the processes leading to the mostly unanimous decisions, but these alone do not picture the essential motivations of the actors on agendas dealt with in the EU Council. Therefore, policy cleavages are looked for in most of the research projects on the EU decision-making, the EU Council in particular. The cleavages are defined either in traditional ideological terms, i.e. positioning the actors on specific sets of policies, or in terms of a composite definition, i.e. as a complex of qualities common to particular actors, which subsequently influence their position or behaviour on

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particular issues or under particular circumstances. Whereas the first concept reflects the intentional behaviour, stemming from a clear conceptual framework perceived and internalized by the actor, the second may emanate from a set of distinct qualities of the actors that may influence their behaviour without intentional or explicit framing of this behaviour into a particular structure. The first comes under the rationalist perspective on decision-making, while the second may be consistent with this perspective but the direct link between the behaviour and its active conceptualization by the actor may not be present.

The research on the Council cleavages relies on various types of empirical data, where records of the roll calls are the most explicit (e.g. Mattila and Lane 2001; Mattila 2004; Hagemann and De Clerck-Sachsse 2007). Even I accept the argument that voting records do not contain the information on the actor's real preferences and may indicate or signal other type of information (e.g. König and Junge 2008), still it is the official final position of the actors which is crucial for the fate of the legislative proposal and the shape of the policy and hence the study of the voting behaviour patterns has merit in its own right. Therefore, I assume that policy cleavages structure the EU policy space, but I do not anticipate specific policy content of these cleavages. Albeit I am aware of the unavoidable subjectivity of post hoc interpretation of the dimensions shown in the data when using multivariate analysis, I am at the same time sceptical that testing of independent variables on the data of the given distribution may bring robust results (Mattila 2009).

Looking for the policy cleavages in the EU Council, the analysis of the voting records comes with specific problems that relate to the distribution of the data. Voting records of the EU Council typically produce data that do not satisfy some of the criteria of the multivariate methods used for the analysis, e.g. the data reach the critical ratio of distribution acceptable for multivariate analysis of the binary data (Garson 2010) and the level of intercorrelation of the data is very high.

The paper aims to present the applications of the multivariate methods on binary data and discuss the results and limitations of these applications, focusing particularly on the effect of the growing dimensionality of the data.

2. Review of literature

Decision-making in the EU Council has been studied from various perspectives intensively from 1990s, particularly in connection with repeated waves of enlargements and continuous discussion on institutional reform of the EU. The spatial theory of voting provides a robust theoretical background for the analysis of the Council decision-making. Next to theoretical studies (e.g. Tsebelis and Yataganas 2002; König and Bräuninger 2004; Tsebelis 2008), empirical research made possible by more frequent open voting in the Council and its more transparent proceedings. These empirical studies brought major findings: decision-making in the Council tends to be mainly consensual irrespective of the extension of the qualified majority rule (Hayes-Renshaw and Wallace 1997; Heisenberg 2005), the level of contestation differs according to the issue area (Hayes-Renshaw et al. 2006), ideological position of the governments influences

the voting behaviour (left/right or integration/independence cleavages) (e.g. Aspinwall 2007; Hagemann and Høyland 2008), the size of the member country has an impact on the voting behaviour (e.g. Mattila 2004; Heisenberg 2005), the budgetary position, ev. pro/anti-regulation position is also relevant (e.g. Kauppi and Widgrén 2006). Various geographically defined cleavages were identified in number of articles dealing with the Council decision-making both before and after enlargement (e.g. Mattila 2004; Hayes-Renshaw et al. 2006; Hagemann and De Clerck-Sachsse 2007), as well as the divide among new and old members (Thomson 2007, 2008). Cultural ties were also recognized to have consistent effect on decision-making in the Council (e.g. Elgström et al. 2001; Naurin and Lindahl 2008). Differences in the findings of these empirical studies lie in—among other reasons—different statistical methods applied.

Decision making in the EU Council has been studied using diverse quantitative approaches recently. These methods fall basically into three groups: (i) multivariate methods that project the member states as points in low-dimensional orthogonal space and assume that reducing the dimensionality of the data may lead to identification of small number of dimensions which are interpretable—factor analysis, principal component analysis (Selck 2004; Keading and Selck 2005; Selck and Kuipers 2005; Selck 2006), correspondence analysis (Zimmern et al. 2005), multidimensional scaling (Mattila and Lane 2001; Thomson et al. 2004; König and Bräuninger 2004; Mattila 2008); (ii) item-response theory based methods, i.e. Nominate and Bayesian estimation based on simulation technique using Markov chains which stemming from assumption that objects of inquiry are located on a latent continuum, aim basically to the same goal (Hagemann 2007; Hagemann and Høyland 2008; Mattila 2009), and (iii) cluster analysis which compared to the other two approaches does not aim at limiting the dimensionality of the data and looks for "natural" groups of variables/member states across all the observations (Hayes-Renshaw et al. 2006).
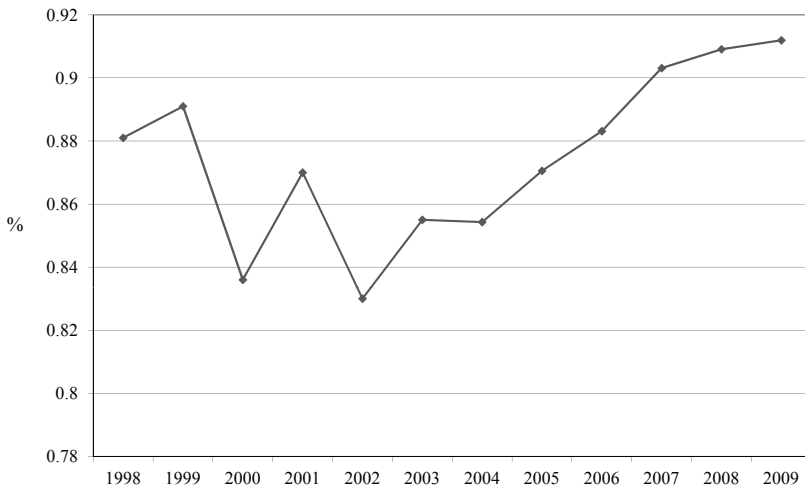
3. Research questions

Having in mind the aforementioned limits dealt with in previous research, the present paper aims to assess the applicability of the traditional multidimensional methods for the specific type of decision-making data that we run into when we analyze voting in the EU Council. My focus is on the situation after the eastern enlargement as the number of members raised, i.e. the dimensionality of the relations among the actors has grown significantly. Leaving aside the Bayesian approach, a recent entrant into this area of research, also encountering problems with extremely lopsided data (Plechanovová 2011), my focus will be on the potential contribution of the traditional multivariate methods. The main perspective is the influence of the growing dimensionality of relations among EU members on the inference regarding the policy cleavages, positions of individual member states within the EU policy space and the level of variance of the voting behaviour of the member states explained by these methods.

Q: Considering the fact that the distribution of the information in the voting records in the EU Council remains for years largely similar (Figure 1), do traditional multivariate methods yield results comparable to the pre-enlargement situation after 2004?

Q1: Has the number of dimensions/policy cleavages in the EU grown after the eastern enlargement?

Q2: Can we identify different patterns of coalition behavior compared to pre-enlargement period?

Note: Data for 1998–2004 (Hayes-Renshaw et al. 2006), data for 2004–2009 (author).

Figure 1. Ratio of positive votes cast on contested proposals, 1998–2009 (%)

Considering the relevance of the qualified majority decision-making rule, I am going to treat the data on voting primarily as binary $(1, 0)$, i.e. assuming that the abstention and negative vote have the same effect in most cases of legislative proposals decided upon by qualified majority (QM) or simple majority (SM) rules. This being said I have decided to use four methods: factor analysis and principal component analysis, methods based on correlation matrix as the basic tool for analyzing the relationships among the variables; and multidimensional scaling and cluster analysis, methods approaching similar task using proximity/dissimilarity matrix. All these methods are applied to the dataset of voting positions of member states during the period 2004–2009, after two waves of eastern enlargement.

The paper is structured as follows: First, the data on voting in the Council of the EU and the procedure of its survey are briefly described. Second, each method is briefly introduced, particularly from the point of view of the basic assumptions it bears and the potential contribution to the general aim of the research of the voting behaviour in the EU Council. Third, all methods are applied to the dataset of the contested proposals of the period 2004–2009 and the findings are presented. The last part discusses the findings and assesses the applicability of these methods on EU Council voting data.

4. Decision-making in the EU Council 2004–2009

We use a dataset resulting from a thorough data survey of various documents potentially including information on position of EU member governments on proposed legislation in the Council, i.e. on positions openly taken in the moment of decision or eventually in the moment when official positions are being recorded on the level of Committee of Permanent Representatives (COREPER). These are all proposals presented to the EU Council after first eastern enlargement from May 2004 until June 2009, on which the decision was really taken. Included are all decisions, irrespective of the stage of the legislative process or the type of the proposal—political agreements, common positions, opinions, recommendations, resolutions etc. Recorded positions relate only to voting, i.e. statements which are attached often to the approved piece of legislation/decision and which indicate that the preference of the member state may actually differ from the voting position, are not included. Voting data were collected on a nominal scale for 25 and from 2007 for 27 member states as three value categories "for", "abstain" and "against". For the analysis the data were converted to binary scale: 1 – "for" and 0 – "dissent" ("abstain" or "against").

Altogether, 6733 proposals were recorded by the survey that were subject to decision in the Council during the given period, on which we have all relevant information, including the individual voting positions of member states. Of these only 414 were contested by at least one member of the Council, i.e. only 6.1 percent.

Table 1. Contested votes in EU Council, 2004–2009

MS	AT	BE	BG	CY	CZ	DE	DK	EE	ES	FI	FR	GB	GR	HU
Dissenting votes	52	45	7	22	39	56	89	48	32	68	22	76	45	28
Solitair dissenting votes	11	3	1	6	3	14	5	2	4	3	6	23	2	3
Positive votes	362	369	407	392	375	358	325	366	382	346	392	338	369	386

MS	IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK	Total	%
Dissenting votes	20	54	38	24	37	37	64	56	46	5	124	24	23	1181	0.11
Solitair dissenting votes	1	15	1	4	1	5	9	19	4	0	18	1	0	164	0.40
Positive votes	394	360	376	390	377	377	350	358	368	409	290	390	391	9997	0.89
Total votes														11178	

The data was collected from the documents of the EU Council by the author and her collaborators on the project Eastern Enlargement and the Patterns of Decision-Making in the European Union. All outputs presented in tables and figures are based on calculations performed by the author.

Note: ISO alpha 2 country codes are used for the names of European Union member states through all tables and figures in this article.

The specificity of the EU Council voting data is encountered here for the first time; i.e. its extreme skewness. Of this small fraction of 414 contested proposals 164, i.e. almost 40 per cent, were contested by just single member state. Next, more than 90 per cent of contesting coalitions have less than six members out of twenty seven member states and of all the individual positions of the member states only 11 per cent of

positions were dissenting, i.e. member states voted against or abstained. The new members of the EU, Bulgaria and Romania, have cast during their first two and a half years in the EU only twelve dissenting votes together, i.e. compared to all the other member states significantly less. I find a clear difference between the large and the smaller member states in their willingness to stay on the losing side alone; all large countries, Germany, France, UK, and Italy, joined by Poland, cast 25 to 34 per cent of their dissenting votes alone, whereas the other member states follow this lonely route only in app. 9 per cent of their dissenting votes.

Considering the appropriate method for analysis, we have to think about this type of the data and its distribution. The problem of the extreme skewness of the data means that the relationship among legislators' behaviour is given by distribution of very small amount of dissenting votes.

5. Statistical models and analysis of voting data

5.1 Principal Component Analysis/Factor Analysis (PCA/FA)

Analyses of voting behaviour typically focus on finding relationships/cleavages among legislators (geographical, religious, ideological, policy preferences etc.). To find these various statistical methods are used aiming at representing relationships in the data numerically and graphically in a low dimensional policy space. PCA is a dimension-reducing method, which seeks a linear combination of variables such that the maximum variance is extracted from the variables. It then removes this variance and seeks a second linear combination, which explains the maximum, finally resulting in a set of orthogonal (uncorrelated) factors/components, embodying the total, i.e. common and unique variance. The common factor analysis seeks the least number of factors, which can account for only the common variance (correlation) of a set of variables. The model for FA/PCA aims to 'reduce the dimensionality of a data set consisting of a large number of interrelated variables, while retaining as much as possible of the variation present ... by transforming to a new set of variables, the principal components ..., which are uncorrelated, and which are ordered so that the first *few* retain most of the variation present in *all* of the original variables' (Jolliffe 2002, p. 1).

Various forms of factor analysis (common factor analysis, principal components analysis, correspondence analysis) were already used to describe legislators' relationships in a low dimensional space of orthogonal axes (factors) in previous studies on Council decision-making before eastern enlargement, as mentioned above. As our basic aim is to find similarities in voting behaviour of EU member states we need to use a mode which associates the variables (member states) (*R* mode) rather than the observations (contested proposals) (*Q* mode).

As the factor model is constructed under an assumption that the data are basically of a metric character, for binary type of data I use a variant of FA, an *underlying variable approach*, method developed specifically for binary data. The underlying variables are assumed to be continuous variables of which we only know whether they exceed certain threshold (incompletely observed variables), i.e. if they reach the threshold they take value 1, otherwise they take value 0. The underlying variables are expected to fol-

low bivariate normal distribution. FA is then applied to tetrachoric correlation matrix representing the relationship among the variables. Tetrachoric correlations between two dichotomous items estimate the Pearson correlation that would be obtained if the two items were measured continuously, i.e. for our data the estimation is based on the contingency table 2x2 of observed frequencies of possible voting positions (a, b, c, d) of two member states j and k (see Table 2). This method yields identical results as the *latent variable approach*, another method from a FA family developed on the basis of *item-response theory* for binary data (Bartholomew et al. 2008, p. 224–225; Bartholomew 1987, p. 95–106).

Table 2. Contigency table 2x2: voting positions of pairs of MS

Member state j k	0	1	Totals
0	a	b	$a+b$
1	c	d	$c+d$
Totals	$a+c$	$b+d$	n

PCA/FA methods should indicate whether observable dimensions do show in the data, which would be interpretable in terms of either expected cleavages among the member state's positions or in terms of any other pattern of behaviour. Component/factor loading for each variable—member state are at the same time a sign of the level to which the given member state's behaviour can be explained on the basis of the identified dimension.

5.2 Cluster analysis (CA)

Next to methods which aim to project the dimensionality of the data into the space with orthogonal axes we also have available method which looks for groups within the data. Cluster analysis, method from the family of multivariate methods used in various fields for a variety of tasks (exploration of the data, generating hypotheses, classification, testing hypotheses etc.) (e.g. Wolfson et al. 2004; Laver and Budge 1992; Castles and Obinger 2008), including the exploratory analysis of voting behaviour in U.S. Senate (Jakulin et al. 2009). Cluster analysis identifies natural groupings (clusters) of objects/variables in the data. Finding clusters is based on definition of distance between variables, a dissimilarity measure, calculated as a distance between each pair of variables. Distance measures for binary variables and clustering methods are well researched (e.g. Anderberg 1973; Romesburg 2004). As a non-parametric method it approaches the data without any preliminary assumptions about their dimensionality therefore is able to use complete information contained in the data, which is particularly relevant for data with low information content and highly skewed distribution. Compared to other approaches used for the analysis of voting behaviour in legislatures, it should work well even with low number of variables and observations, which is typically the case of analysis of EU Council voting.

Cluster analysis is based on a measure of relationship given by the score of concurrent and contrary votes of each pair of member states produces the distance/dissimilarity matrix which gives the graphical shape to the dendrogram outlining the mode of clustering of the member states of the EU. The clusters are graphically identified by closed branches of approximately equidistant vertical lines representing individual member states in horizontal direction: the higher the closing, the more distant position the state has to its neighbour/s.

We use *complete linkage* method, applying the 'city-block' distance metric (Anderberg 1973, p. 117) for the measurement of the dissimilarity of the voting behaviour of the member states in the Council, assessing the probability of discordant positions (a complement to *simple matching* coefficient for binary data).

$$D_{jk} = \sum_{i=1}^{i=n} \left| x_{ij} - y_{ik} \right| = b + c,$$

where D_{jk} is distance of the states j and k, i is contested proposal and x, y are discordant voting positions.

The distance between two clusters is the distance between their two furthest member points. Clusters should form distinct, spatially compact clumps. These may indicate the essential structure of the relationships/divides among variables-member states, i.e. show possible dividing lines among groups of states.

The interpretation of the mode of clustering is dependent on additional information. For EU Council voting data the most important aspects are the low share of negative votes on the total of votes cast (11 percent). This results in showing as closest partners the member states which cast negative votes most rarely—the similarity of their positions is given primarily by their prevailing concurrent positive votes.

The graphical output of the analysis—a dendrogram—shows the sequence and the distance at which individual objects of analysis join each other. The accuracy of this picture, i.e. how well the dendrogram actually portrays the dissimilarity matrix, may be assessed by cophenetic correlation index r.

$$r_{X,Y} = \frac{\sum xy - (1/n)(\sum x)(\sum y)}{\left\{ \left[\sum x^2 - (1/n)(\sum x)^2 \right] \left[\sum y^2 - (1/n)(\sum y)^2 \right] \right\}^{1/2}}$$

Cluster analysis is not used very often in the analysis of the EU Council voting. It was already used by Hayes-Renshaw et al. (2006) on EU Council voting with the aim to discover hints of intended coalition behaviour or coalition-building before eastern enlargement, using *average linkage method* (Euclidean distance measure), not finding any significant patterns of coalition behaviour.

5.3 Multidimensional scaling (MDS)

Multidimensional scaling is a multivariate technique that aims to reveal the structure of the data by plotting points in typically two dimensions, representing subjective attributes in objective scales. The MDS output takes the form of a set of scatterplots ("perceptual maps") in which the axes are the underlying dimensions and the points

represent the subjects of comparison. The aim is to display points in multidimensional space such that the distances separating points physically on the scatterplot reflect as closely as possible the subjective distances obtained from the data. MDS is mainly used to compare objects when the content of the dimensions are not known or are not evident, eventually may differ from objective dimensions that are observable directly from the data. Goodness of fit of an MDS model is shown by the stress statistic. The most commonly used example to depict the method is a construction of a map from geographical coordinates of several locations, e.g. cities. The distance between each two cities determines the place of each city in a two dimensional space. Unlike the case of map-construction in typical MDS problem we cannot know how many dimensions will be needed to reproduce the given distance between the objects of interest. Also the measure of distance may be defined in different ways (see e.g. Anderberg 1973). The choice of the metric depends on the underlying assumptions about the scale applied. The input of the data to multidimensional scaling is, similarly to cluster analysis, a dissimilarity matrix representing the distances between the pairs of objects, i.e. the matrix produced by the scores of concurrent and contrary votes of each pair of member states. The method should provide the distances and mutual position of member states in the two dimensional policy space given the condition of reliable fit is met.

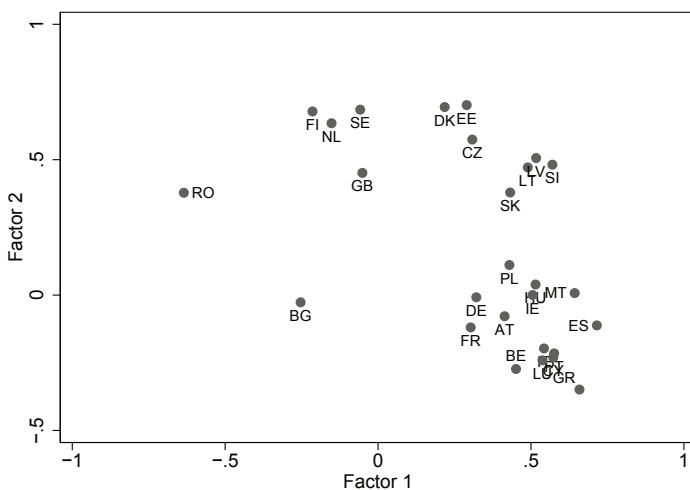## 6. Analysis of the voting patterns in the Council 2004–2009

6.1 PCA/FA

Before applying particular method I analyze the relationships among the variables in our dataset to assess the prospects of its application. The pair-wise correlation analysis applied for all couples of member states for the subset of contested proposals shows 133 related couples at 0.05 significance level of the total number 351 couples. Kaiser-Meyer-Olkin (KMO) coefficient of sampling adequacy based on partial correlations has been used to merit the use of factor analysis; its value (0.691) indicates mediocre level of associations between member states (Hair et al. 1998). I deal with data that is considered largely unpromising for the use of FA/PCA.

The application of the method should provide the basic picture of the dimensionality of the data, i.e. if there are few independent dimensions/factors that could explain significant amount of variance in the data and are interpretable, although the KMO test already indicated that the amount is not going to be very high. Interpretation of the results is based on the graphical outputs of the relationship of the variables towards the components/factors based on the underlying values of loadings on these factors and the level of communality and uniqueness of the variables for the PCA and the level of communality for the FA, i.e. percentage of variance explained by the components/factors for each variable.

First, we proceed with application of FA on tetrachoric correlation matrix of the data. Factor analysis indicates that the policy space of the EU Council after eastern enlargement has two main dimensions (Figure 2), but the results point to problems with interpretation. First, the overall level of explained variance by the first two factors is less than 37 per cent (Table 3). This result shows that with the growing number of

Table 3. Factor analysis using tetrachoric correlation matrix (% of variance explained)

Member state	Factor 1	Factor 2	Communality (2 factors)	Member state	Factor 1	Factor 2	Communality (2 factors)
AT	0.1713	0.0062	0.1775	IE	0.2551	0.0000	0.2551
BE	0.2037	0.0744	0.2780	IT	0.2942	0.0388	0.3330
BG	0.0642	0.0007	0.0649	LT	0.2396	0.2221	0.4617
CY	0.3282	0.0529	0.3812	LU	0.2891	0.0580	0.3472
CZ	0.0949	0.3301	0.4249	LV	0.2672	0.2558	0.5230
DE	0.1030	0.0001	0.1031	MT	0.4134	0.0001	0.4135
DK	0.0474	0.4822	0.5296	NL	0.0231	0.4027	0.4259
EE	0.0841	0.4921	0.5762	PL	0.1844	0.0123	0.1967
ES	0.5121	0.0125	0.5246	PT	0.3317	0.0463	0.3780
FI	0.0460	0.4594	0.5054	RO	0.4034	0.1427	0.5461
FR	0.0917	0.0143	0.1060	SE	0.0034	0.4691	0.4725
GB	0.0027	0.2039	0.2065	SI	0.3251	0.2317	0.5569
GR	0.4340	0.1216	0.5556	SK	0.1866	0.1436	0.3302
HU	0.2652	0.0015	0.2668	Mean EU-27	0.2098	0.1583	0.3682

Figure 2. Factor loadings, 414 obs., binary scale, tetrachoric correlation matrix

member states of the EU after the eastern enlargement, the two main dimensions of the EU policy space explain less variance in the relations among the member states. (Selck 2006, p. 56; Plechanovová 2011). Significant differences in the level of representation of most of the main actors in the Council remain a problem for interpretation. The factor loadings indicate that only 15 member states, mostly either southern or northern

smaller countries, are explained by these two factors on the average or higher level (37 percent or more). All four largest member states remain outside these groups; voting of Germany, UK and France is explained by these two factors only between 10 and 20 per cent, Italy reaches to 33 per cent, coming closer to the group of southern states. The exception is Spain, i.e. of the six largest EU member states only Spain's behaviour is explained by the first two factors above the mean level (52 per cent).

Having such a low level of explained variance in the data, the interpretation of the factors is difficult. It is clear that majority of member states are positively correlated with the first factor, exceptions are UK, Sweden, the Netherlands and Finland; Bulgaria and Romania also fall into this group but the reason is the outlier position due to significantly lower level of dissenting votes compared to other member states. Both first two factors seem to relate somehow to the North/South divide, as on the second factor load all prevailingly Northern countries accompanied by UK, Czech Republic and Slovenia.

Next I proceed with PCA on correlation matrix on data with original scale, mainly to check for the degree of distortion due to tetrachoric correlation used in FA. After extracting the eigenvalues I come up to only 28 percent of variance explained by the first three components and I need eight components to get over 50 percent of variance explained. The screeplot of eigenvalues in Figure 3 indicates that I should consider four components but the estimate produces nine eigenvalues overreaching 1. These results indicate that I cannot hope for any significant findings, it seems that in fact the data do not contain enough information to justify the use of linear fit to low-dimensional orthogonal space (Figure 4).
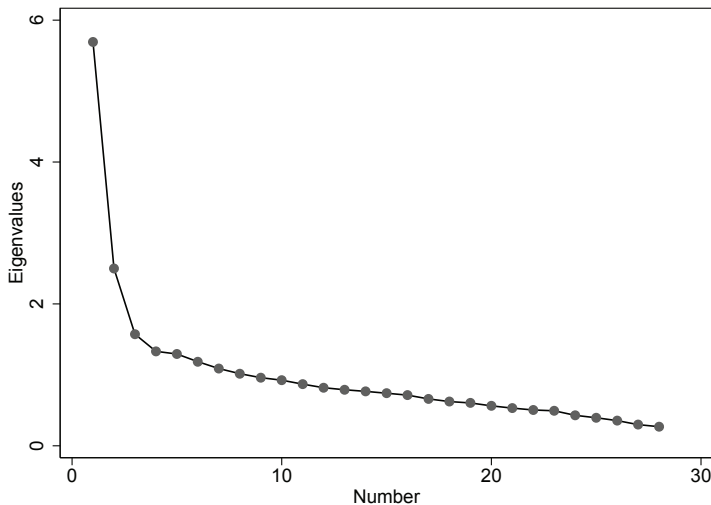

Figure 3. Principal component analysis, scree plot, 414 obs., nominal scale, correlation matrix
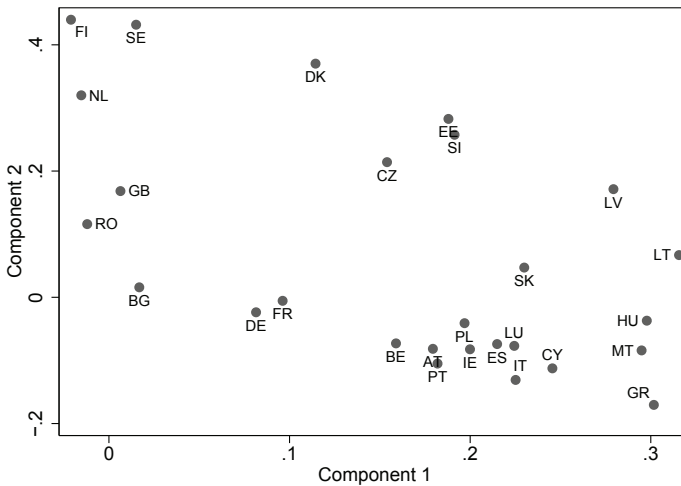
Figure 4. Principal component analysis, loadings, 414 obs., nominal scale, correlation matrix

But in terms of graphical representation, I come up with picture very similar to the FA of the binary data, albeit also with very similar problem of interpretation. I encounter here the same problem of very low level of the variance in the data explained, as a whole and for particular groups of member states as well.

6.2 MDS

Next I approach the data by multidimensional scaling (MDS), another method of graphical representation of the dimensionality of the data (see e.g. Mattila and Lane 2001; Mattila 2008; Thomson et al. 2004). Due to different assumptions about the nature of the relationship among the data, i.e. based on the distance among the variables the resulting graphical representation of the relationships in the data is different from the results of FA/PCA. In two-dimensional plot in Figure 5 we find overwhelming majority of member states clustered around the intersection of the axes, i.e. these countries have very small distance to each other, which is understandable when we recall the low share of the negative votes on the amount of all possible voting positions. Member states most often vote together supporting the proposal in the Council, i.e. there is much higher score of concurrent positive votes of pairs of member states than the number of votes when the two countries disagree with each other. Countries from this group tend to contest proposals less often and if they do, they do it most probably together with member of this large group.

Countries which stay detached from this dense group cast negative vote more often than the others (Sweden, Denmark, UK, Finland, the Netherlands) and they contest proposals either together with some other country from this "dispersed" group (Fin-

land, the Netherlands, Denmark, Sweden) or cast the negative vote often alone, i.e. against all the others (UK). Also here we do not find a significant difference between the picture given by the binary data and the one given by the scale, where the only one being even shorter distances among the members of the clustered group which is joined also by Poland whereas Italy and Greece get little bit more detached from it. Even these pictures seem to provide an intuitive interpretation, I cannot be very happy with the fit for both the 2D and 3D models assessed by Kruskal stress measure, as this has proved to be (very) poor (0.31– 2D, 0.25 – 3D).
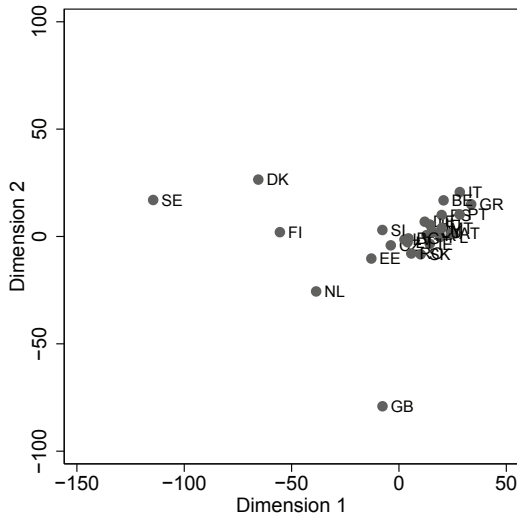

Figure 5. Multidimensional scaling, 414 obs., binary scale, dissimilarity matrix (Minkovski)

6.3 Cluster analysis CA

Finally we come to the results given by cluster analysis. The dendrogram in Figure 6 provides a picture of relationships among member states based on the binary form of the data. Member states fall basically into two clusters; first largest cluster encompasses two smaller groups, one with seven members (Germany, Austria, Italy, Greece, Malta, Portugal, Belgium), second, more relaxed with 15 members (France, Spain, Hungary, Slovenia, Ireland, Bulgaria, Romania, Luxembourg, Cyprus, Latvia, Czech Republic, Lithuania, Estonia and Poland). The second cluster consists of the Northern countries—Sweden, Denmark and Finland accompanied by the Netherlands. The UK stays in-between the two clusters, more inclined to join the large one.

To establish the findings of the cluster analysis presented in the dendrogram, I have run a technical test, i.e. computed cophenetic correlation index to find how accurate the dendrogram is in portraying the dissimilarity matrix. Its value (for binary data) is
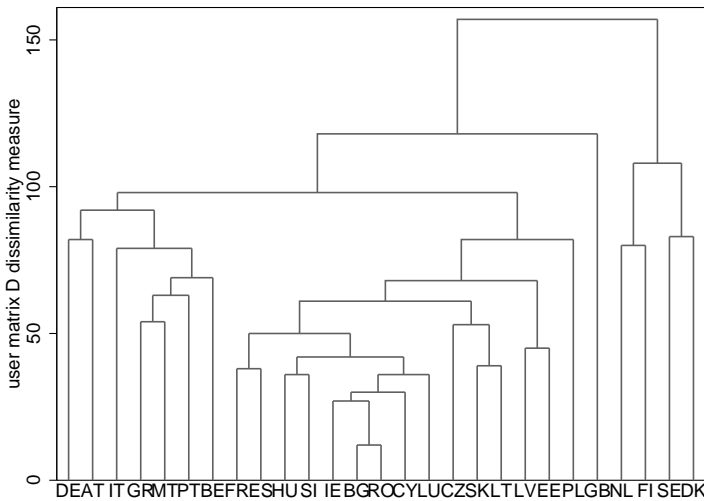
Figure 6. Cluster analysis, complete linkage, 414 obs., binary scale, dissimilarity matrix (Minkovski)

0.945, i.e. it indicates that the picture of the relationships/distances among the member states is in fact very accurate.

Results of the CA lead us to infer that there might be two to three groups of member states which build up a winning coalition in the Council, the most probable core of this coalition being the two groups within the large cluster, as they build together a comfortable qualified majority. Only the large countries, i.e. Germany, France, Spain, and Poland have a position of the veto player within the large cluster, i.e. their votes are needed for the winning coalition to put the proposal through. Considering the voting record, Poland is the country most probably using this power, even it may face the risk that UK is going to replace it in the winning coalition. Comparing to previous period (e.g. Hagemann and de Clerk-Sachsse 2007) we see the distance between the UK and Germany to grow bigger.

By adding the results of the linear methods, FA/PCA and MDS, we come to a picture without clear policy cleavages but with quite probable pattern of behaviour. The chances for spotting obvious policy divide seem to decline with time after the eastern enlargement, as we see an apparent trend in declining of the share of the dissenting votes on the total of votes cast on contested proposals (Figure 1). On the other hand, all methods applied produce results which are largely compatible, the inclusion of Bulgaria and Romania shows as a problem as these countries seem to be outliers, mainly due to very low level of dissent shown in the their voting and due to the fact that they are members of the EU only for app. half of the period followed by this analysis.

7. Discussion

Results of different multidimensional methods applied to the voting records of the EU Council indicate that this data represent an ambiguous type of data for statistical analysis, as was assumed. Even we may find hints of cleavages in the positions of member states and these may be interpreted on the basis of the spatial theory of voting, it is extremely difficult to establish any findings which could be based on clear-cut results of statistical analysis. The reason lies in the distribution of the data, i.e. the information content of the data is very thin as the data are extremely lopsided, the ratio of the negative votes to the number of the individual positions is very small whereas a high percentage of these are votes cast by just one member state. Additional aspect of the distribution of the data, partly resultant from what has been said, is highly uneven distribution of the negative votes of few member states towards all the other members. These attributes of the data have crucial impact on the applicability of most of the traditional multivariate methods. As the article has pointed out, application of the linear methods is clearly problematic, not only because the total variance explained by few factors/components is very low, but particularly because behaviour of some groups of members states—mainly the large countries—is extremely poorly explained, if at all. Positioning of these countries on the graphical outputs of these analyses is then clearly unreliable. The assumption that it is possible to identify few mutually independent dimensions (orthogonal) based on the EU Council voting records seems to be unrealistic, particularly because of the low information content in the data. We may speculate about the policy content of the dimensions which show in the data, or about the ideological reasons for voting behaviour (left/right or pro/anti-integration) identified in some of the literature (e.g. Hosli et al. 2011), but the multidimensional methods do not provide a rigorous positive test.

On the other hand, even the methods applied are based on different assumptions the results are—broadly speaking—complementary and serve as an indication of the general pattern of voting in the EU Council. We may see that the northern countries together with the UK and the Netherlands turn up on all outputs as a distinct—even dispersed—group, while the remaining countries form quite unstructured group—either lumped or dispersed on all pictures as well. The cluster analysis seems to provide at this stage the most robust results, even it is clear that this method is not able to identify multiple dimensions in a same way as the linear methods do, while all these methods suffer from lacking the measure of uncertainty.

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