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Appendix: Details of Analysis

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Cleaning and Pre-Processing the Data

Cleaning

The aim of cleaning the raw datasets generated by the EUvox Voting Advice Application is to ensure that our data is not unduly influenced by inputs from users who either fill in the questionnaire very rapidly without paying attention to the items, or complete the questionnaire many times, or are not eligible to vote in the country in question. During the cleaning process, we therefore remove: 1) all observations in which the time taken to complete the thirty issue statements of the VAA was less than 120 seconds; 2) all observations in which the time taken to respond to three or more issue statements was two seconds or less; 3) all observations in which the respondent answered ten successive issue statements in the same way; 4) all observations in which the user completed the questionnaire by smart phone (this is because it may not have been intuitively obvious how to register "no opinion" by smart phone); 5) all observations in which there are fifteen or more "no opinion" responses to issue statements; 6) all observations in which i) an encrypted and anonymised code corresponding to the user IP address, ii) date of birth and iii) gender are all identical to previous observations (this step is to remove potential repeat users). Finally we remove 7) all observations in which the user self-identified with a citizenship other than that of the country in question and 8) all observations in which the user was born in 1996 or afterwards (on the grounds that he/she was too young to vote) or claimed a date of birth prior to 1920 (on the grounds that that the user was probably entering incorrect data).

Pre-processing

The pre-processing of the data is a crucial stage in making our data more representative of the target population. VAA-generated data can be, and usually is, heavily skewed towards certain groups such as young and politically interested individuals. Furthermore, depending on how a VAA is promoted it could also have strong ideological biases (e.g. mostly left–leaning or right–leaning respondents). In practice, the 'un-representativeness' of a VAA dataset will depend on many factors such as the setting in which it is deployed and the degree to which such tools are commonly used during election campaigns.

Here we use the terms 'balancing' or 'calibrating' to refer to the process of making a VAA dataset more 'representative'. To calibrate a VAA dataset there are various post-survey adjustment techniques that could be used, such as raking, a standard procedure in survey research. Raking relies on having reliable estimates of population parameters, such as age, gender and voting intention, which a researcher wants to calibrate. The raking algorithm will then work iteratively with the marginal distributions of the selected variables to return a weighted dataset that best approximates the desired target population distributions. Our post-survey adjustment approach

draws on the logic of raking for generating datasets that can be analysed using techniques that do not allow for weighted observations, such as Mokken Scale Analysis.

The first step in our calibration approach is to be clear about what constitutes the target population. Our target population are voters in EU member states. Note that this population is not the same as the general population. For instance, the voting population tends to be more politically interested and older than the general population. To derive parameter estimates for our target population of voters we rely on the European Social Survey (ESS) from years 2012 or 2014 (for Greece only the year 2010 was available). Weighted distributions using the ESS weights are derived for three balancing variables and their subgroups. The first variable we use is the joint distribution for age by education. Since it is not advisable to have too many cell counts below 5 percent, to make this feasible across all relevant EU member states we dichotomised both variables to estimate the joint distribution: (1) for age, below versus above the median age and (2) for education, degree versus no degree. The marginal distributions for gender and political interest (a dummy variable for low political interest) were also calculated from the ESS for each country. We use the ESS rather than the European Election Study for deriving distribution estimates because the wording of our core variables (especially education and political interest) is identical to the former. Lastly, for voting intention we use the share of the vote that each significant party obtained in the 2014 elections to the European parliament (we define a significant party as one that garnered at least 4% of the vote).[1] Furthermore, since the VAA is a pre-election survey we also include an "undecided" category for calibrating. When checking the distributions for the undecided category we found a large variability between opinion polls not only across countries but within countries. We opted for 20 percent as a reasonable parameter to apply across countries.

Once the desired parameters are established these are supplied to the calibration algorithm which, as with raking, will work iteratively to return a resampled dataset that best approximates the target population parameters. Whether the algorithm converges will be a function of how many balancing variables are selected, how skewed the original dataset is in the first place and the value of a tolerance parameter. In all cases, the mean absolute error between the calibrated dataset and the original is less than 0.015, and in most cases it is less than 0.01.

In most EUvox cases the calibration algorithm converged without need for further pre-processing. However, when a country dataset fails to converge satisfactorily, which we define as less than 500 samples, we add two further steps. We first use standard raking with a truncated upper limit of 8. The raked fractional weights are rounded to the nearest integer and each respective observation is replicated a number of times corresponding to its (integer) weight. We then run the calibration algorithm on the new dataframe to return a balanced, resampled dataset. We used this replicate weights approach in eight of the EUvox cases. The size of the datasets at various stages of cleaning and pre-processing (from the raw datasets to the calibrated datasets), as well as whether replication weights were used, are shown in Table 1 (below). The right-hand column in Table 1 shows the number of unique observations in the calibrated datasets, which is lower than the total number of observations in the eight cases in which replication was used.

[1]Due to insufficient observations we were unable to include two parties that did manage to secure 4% of the vote: the Movement for Rights and Freedoms (DPS) in Bulgaria and the Party of the Hungarian Community (SMK-MKP) in Slovakia. However, both these parties represent national minorities (the Turkish and Hungarian communities respectively) and attract voters from a variety of ideological standpoints. Since the logic behind matching by party support was to make our sample *ideologically* representative of the voting population, we do not see this as problematic.

TABLE 1: Number of observations

Country	Raw dataset	Clean dataset	Replicated?	Calibrated dataset	Unique observations
Austria	11,170	6,860	No	666	666
Bulgaria	7,544	5,937	Yes	1,185	495
Cyprus	5,345	3,395	Yes	780	356
Czech Republic	29,131	22,954	No	1,362	1,362
Denmark	138,991	90,056	No	17,711	17,711
England	131,040	80,137	No	8,931	8,931
Estonia	18,646	15,750	No	1,383	1,383
Finland	8,422	6,574	No	558	558
France	9,144	6,352	No	920	920
Germany	10,027	6,378	Yes	1,490	813
Greece	65,918	47,566	No	1,990	1,990
Hungary	7,306	5,967	Yes	788	262
Ireland	10,089	5,677	Yes	1,329	522
Italy	38,342	26,950	No	837	837
Poland	76,467	59,479	No	3,076	3,076
Portugal	56,980	41,927	No	1,880	1,880
Romania	9,890	7,956	Yes	2,030	817
Slovakia	7,496	5,835	Yes	1,197	499
Slovenia	4,173	2,664	Yes	689	332
Spain	295,495	169,538	No	4,414	4,414

Mokken Scale Analysis

Mokken Scale Analysis (MSA) is a psychometric method of data reduction that belongs to Item Response Theory. It is used to generate unidimensional scales of hierarchically ordered items. These scales are known as Mokken Scales, named after the Dutch political scientist, Rob Mokken, who invented them (Mokken 1971). For each scale, MSA generates a value H (also known as Loevinger's H) that is a measure of the consistency of the items in a given scale, as well as values H_j that measure the normed covariance between each item score and the rest score. A group of items is said to form a Mokken Scale if all H_j of each item satisfy $H_j >$ c, where $c \geq 0.3$ and if all the items in the Scale satisfy the monotone homogeneity model (see below).

In this paper we use the R package Mokken to determine whether these criteria are satisfied. The items used are user responses to the issue statements in EUvox, with a value of 4 assigned to the item if the user response is "completely agree", 3 if the response is "agree", 2—"neither agree nor disagree", 1—"disagree" and 0—"completely disagree". "No opinion" responses are treated as missing values. However, because items may point in opposite directions on the same ideological dimension, we also add dummy items with the hierarchy of the values reversed (i.e. with 0 representing "completely agree" and 4 representing "completely disagree").

To constitute a scale in MSA a) each variable V_j that belongs to the scale must covary with the total score of the other variables belonging to it (the rest score) with a normed covariance (or item scalability coefficient) H_j that is more than a certain lower bound c, and b) the scale must satisfy

the monotonicity requirement that as the value along the latent variable (as measured by the mean item score of the scale) changes, so the probability of a corresponding unidirectional change in each item of the scale changes accordingly and in the direction expected (Sijtsma and Molenaar 2002). In our case the variables V_j are the responses of users to the VAA issue statements and the corresponding dummy items.

For the quasi-inductive part of the analysis (see main manuscript), we carry out the following procedure. First, following Emons et al. and Sijtsma and van der Ark, we run what is known as an automated item selection procedure (AISP) in R (using the R package "mokken") on all the items V_j and all reversed (dummy) items $Vrev_j$, gradually increasing the lower bound c in increments of 0.05 for the coefficients H_j (Emons, Sijtsma, and Pedersen 2012; Sijtsma and Van der Ark 2017). In AISP we use a genetic algorithm that first identifies the longest scale that satisfies $H_j > c$ for all j in the scale by experimenting with all possible combinations of items and then begins the process again by identifying scales out of the remaining items (Straat, Van der Ark, and Sijtsma 2013). For very low values of c, we expect to find just two scales, with the second of these simply containing the same items as the first, but reversed. As we increase c we expect to see these scales break up into several separate scales that contain items that are substantively rather similar. Finally, as c increases further still, we expect the new scales to shrink and fragment further into idiosyncratic scales consisting of pairs of items. However, we stop the process when we reach the second stage (i.e. shortly after the single overarching scales have split into several distinct scales) providing c has reached a minimum threshold of 0.3. We then discard those scales that are merely the reverse of another scale and check that all items H_j in each scale satisfy the monotonicity criterion. To check whether the scales generated satisfy the monotone homogeneity model, we use the function *summary(check.monotonicity)* in the Mokken package. This function generates Diagnostic Crit ("crit") values to measure the number of violations to the model. We determine this criterion to be met if the "crit" value for each item is not greater than 80, as values more than 80 indicate serious violations of monotonicity (Sijtsma and Molenaar 2002). We remove all items that do not satisfy this condition and look for other items to replace them that satisfy both the monotonicity criterion and the requirement that $H_j > c$. Next, we remove all ambiguous items from each scale, i.e. those that satisfy $H_j > c$ for more than one scale. Once again, if we remove items we look for viable substitutes that satisfy all conditions. The items that still remain in each scale are deemed to constitute a particular ideological dimension. A scale is considered weak if Loevinger's $H \geq 0.3$, of medium strength if $H \geq 0.4$, and strong if $H \geq 0.5$ (Mokken 1971). For the purposes of this analysis, only scales that contain three or more items are considered.

Note that in those cases in which we replicate or "weight" observations (see above), "crit" violations may also be replicated disproportionately. For this reason, we use the "crit" values that are generated from the subset of unique observations.

Results of Mokken Scale Analysis

The aim of this section is to provide in more detail the results of the analysis that is cited in the main manuscript. In Table 2, we present the overall H coefficients we observe when we apply MSA to the *a priori* defined Cul, Eco and EU scales, omitting Eco7 and EU7 (for the reasoning behind this, see the main manuscript). The number in brackets after each coefficient represents the number of items that would form a scale that satisfies $H_j > 0.3$ for all items.

In Tables 3-31, we present the detailed results of applying Mokken Scale Analysis (MSA) *a posteriori* to the EUvox datasets (after pre-processing, see above). To this end, we present the

TABLE 2: Overview of MSA outputs when applied to pre-defined scales

Country	**H coefficient (no. items Hj>0.3)**		
	EU	Eco. left/right	TAN/GAL
Austria	0.521(6)	0.237(1)	0.227(0)
Bulgaria	0.228(1)	0.205(0)	0.075(0)
Cyprus	0.192(1)	0.221(0)	0.168(0)
Czech R	0.284(3)	0.218(0)	0.147(0)
Denmark	0.364(5)	0.364(5)	0.222(1)
England	0.528(6)	0.414(6)	0.285(3)
Estonia	0.233(2)	0.163(0)	0.153(0)
Finland	0.376(5)	0.349(6)	0.279(3)
France	0.448(6)	0.368(4)	0.244(1)
Germany	0.388(5)	0.199(0)	0.214(0)
Greece	0.237(2)	0.222(0)	0.196(0)
Hungary	0.244(3)	0.027(0)	0.219(1)
Ireland	0.237(2)	0.201(0)	0.240(0)
Italy	0.291(3)	0.210(0)	0.235(1)
Poland	0.242(1)	0.143(0)	0.117(0)
Portugal	0.188(0)	0.262(2)	0.193(0)
Romania	0.113(0)	0.168(0)	0.126(0)
Slovakia	0.184(1)	0.256(2)	0.174(0)
Slovenia	0.200(0)	0.399(6)	0.222(2)
Spain	0.213(0)	0.331(4)	0.358(6)

outputs of MSA applied first to the twenty-one generic items from each of nineteen country-specific datasets (we exclude Romania, for which no coherent scale could be identified) and then to these items plus AD1 (Islam) and/or AD2 (Environment) in cases in which one or both of these additional items are included in the questionnaire. The tables show the values of Loevenger's H for each scale in each dataset (at the bottom of each table), as well as the values of H_j and the "crit" values for each item in each scale. In cases in which an asterisk (*) appears after the "crit" value, this refers to the "crit" values that are generated from the subset of unique observations (see above). It also indicates with a "+" or a "-" the direction each item points with respect to its dimension. The dimensions identified are assigned the labels Dim1 and (where relevant) Dim2. Items that do not belong to any scale are ommitted from the Tables.

TABLE 3: Mokken Scale Analysis: Austria, 21 items

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1			0.614	0	+
EU2			0.406	19	+
EU3			0.512	1	+
EU4			0.465	5	-
EU5			0.414	10	-
EU6			0.600	0	+
EU7			0.419	19	-
Eco1	0.343	0			+
Eco3	0.369	0			+
Eco5	0.342	1			+
Cul1			0.422	29	+
H	0.351		0.482		

TABLE 4: Mokken Scale Analysis: Austria, including AD1

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1			0.602	0	+
EU2			0.390	48	+
EU3			0.514	5	+
EU4			0.445	0	-
EU5			0.417	21	-
EU6			0.589	0	+
EU7			0.405	0	-
Eco1	0.343	0			+
Eco3	0.369	0			+
Eco5	0.342	1			+
Cul1			0.457	6	+
AD1			0.449	4	+
H	0.351		0.473		

Note: AD2 not present.

TABLE 5: Mokken Scale Analysis: Bulgaria

Item No.	Dim1 Hj	Dim1 "crit"	Direction (+/-)
EU1	0.354	0*	+
EU2	0.314	0*	+
EU3	0.356	16*	+
EU4	0.351	0*	-
EU6	0.412	0*	+
H	0.359		

Note: AD1 and AD2 present but do not belong to the scale.

TABLE 6: Mokken Scale Analysis: Cyprus

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1	0.452	42			-
EU3			0.419	14*	+
EU4	0.352	68			+
EU6	0.421	5			-
EU7	0.363	45			+
Eco1	0.328	26			+
Eco6	0.336	67			+
Eco7	0.327	69			+
Cul3	0.412	57			+
Cul5			0.458	2*	-
Cul6			0.364	49*	-
H	0.376		0.418		

Note: Neither AD1 nor AD2 present.

TABLE 7: Mokken Scale Analysis: Czech Republic, 21 items

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1			0.483	0	+
EU2			0.441	0	+
EU3			0.390	8	+
EU6			0.524	21	+
Eco2	0.312	0			+
Eco3	0.401	0			+
Eco6	0.375	0			+
H	0.364		0.461		

Note: AD1 present but does not belong to the scale.

TABLE 8: Mokken Scale Analysis: Denmark

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1			0.435	0	+
EU2			0.404	0	+
EU3			0.402	20	+
EU4			0.334	0	-
EU6			0.506	0	+
Eco1	0.407	68			+
Eco2	0.473	0			+
Eco3	0.398	31			+
Eco4	0.348	30			-
Eco5	0.459	23			+
H	0.416		0.417		

TABLE 9: Mokken Scale Analysis: Denmark, including AD1

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1			0.379	0	+
EU2			0.370	26	+
EU3			0.465	0	+
EU6			0.465	4	+
Eco1	0.407	68			+
Eco2	0.473	0			+
Eco3	0.398	31			+
Eco4	0.348	30			-
Eco5	0.459	23			+
Cul1			0.387	0	+
AD1			0.402	0	+
H	0.411		0.417		

Note: AD2 not present.

TABLE 10: Mokken Scale Analysis: England (1-dimensional solution)

Item No.	Dim1 Hj	Dim1 "crit"	Direction (+/-)
EU1	0.464	15	+
EU2	0.392	72	+
EU3	0.500	40	+
EU5	0.436	29	-
EU6	0.490	41	+
Eco2	0.430	47	+
Eco3	0.346	60	+
Eco4	0.401	43	-
Eco5	0.384	20	+
Eco6	0.335	50	+
Cul1	0.476	25	+
Cul4	0.329	70	-
Cul5	0.384	62	-
H	0.414		

TABLE 11: Mokken Scale Analysis: England (1-dimensional solution), including AD1

Item No.	Dim1 Hj	Dim1 "crit"	Direction (+/-)
EU1	0.464	48	+
EU2	0.398	56	+
EU3	0.513	35	+
EU5	0.438	30	-
EU6	0.501	46	+
Eco2	0.433	40	+
Eco3	0.347	79	+
Eco4	0.399	48	-
Eco5	0.382	57	+
Eco6	0.331	69	+
Cul1	0.498	24	+
Cul4	0.333	73	-
Cul5	0.400	43	-
AD1	0.467	40	+
H	0.423		

Note: AD2 not present.

TABLE 12: Mokken Scale Analysis: England (2-dimensional solution)

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1			0.541	0	+
EU2			0.469	55	+
EU3			0.598	0	+
EU5			0.464	4	-
EU6			0.589	0	+
Eco2	0.520	0			+
Eco3	0.470	0			+
Eco5	0.480	0			+
Cul1			0.543	0	+
Cul5			0.457	4	-
H	0.491		0.523		

TABLE 13: Mokken Scale Analysis: England (2-dimensional solution), including AD1

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1			0.526	0	+
EU2			0.466	53	+
EU3			0.604	0	+
EU5			0.462	37	-
EU6			0.593	0	+
Eco2	0.520	0			+
Eco3	0.470	0			+
Eco5	0.480	0			+
Cul1			0.571	-3	+
Cul5			0.475	9	-
AD1			0.548	22	+
H	0.491		0.531		

Note: AD2 not present.

TABLE 14: Mokken Scale Analysis. Estonia

Item No.	Dim1 Hj	Dim1 "crit"	Direction (+/-)
EU1	0.472	13	+
EU2	0.343	28	+
EU4	0.312	18	-
EU6	0.464	11	+
EU7	0.320	55	-
H	0.379		

Note: AD2 present but does not belong to the scale.

TABLE 15: Mokken Scale Analysis. Finland: 21 Items

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1			0.470	0	+
EU2			0.366	33	+
EU3			0.448	1	+
EU6			0.461	0	+
Eco1	0.350	46			+
Eco2	0.368	11			+
Eco3	0.308	35			+
Eco4	0.308	24			-
Eco5	0.398	8			+
Eco6	0.363	19			+
Cul1			0.362	21	+
Cul5			0.374	38	-
Cul6			0.310	38	-
H	0.349		0.402		

Note: AD2 present, but does not belong to either scale.

TABLE 16: Mokken Scale Analysis: France, 20 items (excluding Eco1)

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1			0.534	3	+
EU3			0.442	17	+
EU4			0.347	18	-
EU5			0.425	26	-
EU6			0.531	0	+
Eco2	0.443	12			+
Eco3	0.413	23			+
Eco5	0.435	24			+
Eco6	0.393	42			+
Cul1			0.417	55	+
Cul5			0.357	9	-
H	0.421		0.439		

TABLE 17: Mokken Scale Analysis: France, including AD1

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1			0.533	0	+
EU3			0.446	0	+
EU4			0.326	14	-
EU5			0.421	0	-
EU6			0.532	0	+
Eco2	0.443	12			+
Eco3	0.413	23			+
Eco5	0.435	24			+
Eco6	0.393	42			+
Cul1			0.465	0	+
Cul5			0.381	11	-
AD1			0.461	0	+
H	0.421		0.446		

Note: AD2 not present.

TABLE 18: Mokken Scale Analysis: Germany

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1			0.497	21	+
EU3			0.473	13	+
EU6			0.507	0	+
Eco1	0.352	13			+
Eco3	0.334	54			+
Eco6	0.323	39			+
Cul1			0.429	32	+
Cul5			0.304	80	-
H	0.337		0.438		

Note: AD2 present but does not belong to either scale.

TABLE 19: Mokken Scale Analysis: Greece, 21 items

Item No.	Dim1 Hj	Dim1 "crit"	Direction (+/-)
EU1	0.442	11	-
EU4	0.327	35	+
EU6	0.433	0	-
EU7	0.367	26	+
Eco1	0.345	33	+
Eco6	0.351	31	+
Eco7	0.325	46	+
Cul3	0.417	8	+
H	0.378		

TABLE 20: Mokken Scale Analysis: Greece, including AD1

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1	0.442	0			-
EU3			0.300	16	+
EU4	0.327	35			+
EU6	0.433	0			-
EU7	0.367	26			+
Eco1	0.345	33			+
Eco6	0.351	31			+
Eco7	0.325	46			+
Cul3	0.417	8			+
Cul5			0.379	9	-
AD1			0.387	0	+
H	0.378		0.358		

Note: AD2 not present.

TABLE 21: Mokken Scale Analysis: Hungary

Item No.	Dim1 Hj	Dim1 "crit"	Direction (+/-)
EU1	0.357	0*	+
EU2	0.320	0*	+
EU3	0.339	0*	+
EU4	0.437	0*	-
EU6	0.459	0*	+
Eco1	0.322	0*	-
Eco3	0.326	0*	-
Eco7	0.382	0*	-
Cul5	0.457	0*	-
Cul7	0.331	0*	-
H	0.374		

Note: AD1 and AD2 present but do not belong to the scale.

TABLE 22: Mokken Scale Analysis: Ireland

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1	0.488	19			+
EU2	0.322	8			+
EU6	0.510	0			+
Eco7	0.352	46			+
Cul5			0.435	39	+
Cul6			0.480	0	-
Cul7			0.335	12	-
H	0.418		0.417		

Note: AD2 present but does not belong to any of the scales.

TABLE 23: Mokken Scale Analysis: Italy, 21 items

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1			0.499	0	+
EU3			0.397	28	+
EU4			0.327	26	-
EU6			0.489	-2	+
Eco1	0.317	0			+
Eco2	0.331	9			+
Eco5	0.333	16			+
Cul1			0.335	9	+
H	0.327		0.414		

TABLE 24: Mokken Scale Analysis: Italy, including AD1 and AD2

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1			0.421	9	+
EU3			0.397	0	+
EU6			0.442	40	+
Eco1	0.317	0			+
Eco2	0.331	9			+
Eco5	0.333	16			+
Cul1			0.418	11	+
Cul5			0.310	19	-
AD1			0.455	0	+
H	0.327		0.406		

TABLE 25: Mokken Scale Analysis: Poland

Item No.	Dim1 Hj	Dim1 "crit"	Direction (+/-)
EU1	0.311	22	+
EU4	0.341	28	-
EU6	0.373	30	+
Cul5	0.404	0	-
Cul6	0.367	28	-
H	0.360		

Note: AD2 present but does not belong to either scale.

TABLE 26: Mokken Scale Analysis: Portugal

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
Eco1	0.311	0			+
Eco2	0.385	0			+
Eco5	0.306	16			+
Eco6	0.345	0			+
Cul5			0.417	24	+
Cul6			0.374	8	+
Cul7			0.319	18	+
H	0.337		0.371		

Note: Neither AD1 nor AD2 present.

TABLE 27: Mokken Scale Analysis: Slovakia, 21 items

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
Eco1	0.312	58			+
Eco2	0.326	65			+
Eco3	0.403	61			+
Eco6	0.403	67			+
Cul5			0.572	0	-
Cul6			0.519	0	-
Cul7			0.477	25	-
H	0.362		0.524		

Note: AD1 present but does not belong to either scale.

TABLE 28: Mokken Scale Analysis: Slovenia, 21 Items

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1	0.333	17*			-
EU6	0.345	23*			-
Eco1	0.377	0*			+
Eco2	0.385	13*			+
Eco3	0.341	0*			+
Eco4	0.372	0*			-
Eco5	0.385	0*			+
Eco6	0.369	0*			+
Cul5			0.556	0	-
Cul6			0.538	34	-
Cul7			0.426	22	-
H	0.365		0.505		

TABLE 29: Mokken Scale Analysis: Slovenia, including AD1

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1	0.333	17*			-
EU6	0.345	23*			-
Eco1	0.377	0*			+
Eco2	0.385	13*			+
Eco3	0.341	0*			+
Eco4	0.372	0*			-
Eco5	0.385	0*			+
Eco6	0.369	0*			+
Cul1			0.334	12*	+
Cul5			0.485	0*	-
Cul6			0.416	0*	-
Cul7			0.313	0*	-
AD1			0.330	0*	+
H	0.365		0.378		

Note: AD2 not present.

TABLE 30: Mokken Scale Analysis: Spain, 21 items

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1	0.487	4			+
EU2	0.316	39			+
EU6	0.462	0			+
Eco1			0.360	42	+
Eco2			0.344	63	+
Eco5			0.384	34	+
Eco6			0.380	53	+
Cul1			0.342	38	+
Cul2			0.330	68	+
Cul3			0.480	3	+
Cul5			0.398	17	-
Cul6			0.448	10	-
Cul7			0.322	31	-
H	0.421		0.378		

TABLE 31: Mokken Scale Analysis: Spain, including AD1 and AD2

Item No.	Dim1 Hj	Dim1 "crit"	Dim2 Hj	Dim2 "crit"	Direction (+/-)
EU1	0.487	4			+
EU2	0.316	39			+
EU6	0.462	0			+
Eco1			0.352	39	+
Eco2			0.335	27	+
Eco5			0.372	32	+
Eco6			0.369	25	+
Cul1			0.367	12	+
Cul2			0.328	22	+
Cul3			0.475	2	+
Cul5			0.404	18	-
Cul6			0.438	12	-
Cul7			0.317	41	-
AD1			0.335	39	+
H	0.421		0.371		

REFERENCES

Emons, Wilco HM, Klaas Sijtsma, and Susanne S Pedersen. 2012. "Dimensionality of the Hospital Anxiety and Depression Scale (HADS) in cardiac patients: comparison of Mokken scale analysis and factor analysis." *Assessment* 19 (3): 337–353.

Mokken, Robert Jan. 1971. *A Theory and Procedure of Scale Analysis: With applications in political research.* Vol. 1. Walter de Gruyter.

Sijtsma, Klaas, and Ivo W Molenaar. 2002. *Introduction to Nonparametric Item Response Theory.* Vol. 5. Sage.

Sijtsma, Klaas, and L Andries Van der Ark. 2017. "A tutorial on how to do a Mokken scale analysis on your test and questionnaire data." *British Journal of Mathematical and Statistical Psychology* 70 (1): 137–158.

Straat, J Hendrik, L Andries Van der Ark, and Klaas Sijtsma. 2013. "Comparing Optimization Algorithms for Item Selection in Mokken scale Analysis." *Journal of Classification* 30 (1): 75.