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Voting Advice Applications and the Estimation of Party Positions – A Reliable Tool?

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Introduction¹

The party literature has devised a range of ways to measure party positions. Starting from party family classifications based on social and historic origin (Lipset and Rokkan 1967), the affiliation with transnational federations (Mair and Mudde 1998: 216–217), the range of approaches has been extended with ways of measuring party positions more precisely. These approaches include voter survey-based estimates (van der Eijk and Franklin 1991), evaluations from expert surveys (Castles and Mair 1984; Benoit and Laver 2006), manual (Klingemann et al. 2006; Janda et al. 1995; Helbling and Tresch 2011) and automated content analysis (Laver et al. 2003; Slapin and Proksch 2008), and item response models using roll-call votes (Poole 2005; Clinton et al. 2004). Some of these approaches have been applied not only to the national but also to sub-national levels (Libbrecht et al. 2009; Bräuninger and Debus 2008). Using data from Voting Advice Applications (VAAs) has joined these approaches to estimate party positions in low-dimensional policy spaces (Wagner and Ruusuvirta 2012; Wagschal and König 2015; Gemenis 2013; Louwse and Otjes 2012). What makes VAAs particularly valuable is that they are generated close to an election and include various items with information about parties' declared policy preferences (in some VAAs crosschecked by experts) that are chosen with a view to which issues are important in

¹ We thank the anonymous reviewers and the editor of Swiss Political Science Review for their helpful comments and suggestions on the manuscript. A replication file is available at <http://www.sebastianjaeckle.de/publications.html>. The usual disclaimers apply.

that election. Additionally, VAA-data allows comparing users' policy positions with parties' or candidates' positions directly since they are measured based on the same questions.

The usefulness of VAA-data for the purpose of measuring party positions is of relevance not only for party researchers. Whether VAAs can provide reliable and valid estimates of parties' policy positions is also important for the main purpose of VAAs, which is providing political information and orientation to voters – not least because VAA recommendations may affect the opinions of some people in the electorate (Dumont and Kies 2012; Pianzola 2014; Ladner et al. 2012). There is thus a growing literature interested in how the design of VAAs may affect the recommendations they give to their users (Walgrave et al. 2009; Louwerse and Rosema 2014; Wagner and Ruusuvirta 2012; Garzia and Marschall 2016).

A core element in the VAA design that may affect the quality of the represented party space is the set of included policy items. Estimates of party positions based on VAA-data may be markedly influenced by the selection and the number of issues included in a VAA (Gemenis 2013). Also, the specific items may have been chosen with a priori defined political or ideological dimensions in mind, but it is an open question whether these dimensions emerge from the data. The items may in the end not empirically show the relations to the dimensions that were originally expected (Otjes and Louwerse 2014; Louwerse and Rosema 2014; Gemenis 2013; Germann et al. 2015). It is thus an important question, how much design decisions, particularly regarding the item selection, weigh on the latent party-interrelations inherent to the VAA-data.

The 2017 German Länder election in Lower Saxony marks a special situation in that regard because for these early elections, three VAAs were on offer: the *Wahlswiper*, the *Landeswahlkompass* and the *Niedersachs-O-Mat*. Although they were all designed with the same basic purpose in mind and geared towards the same election, they nevertheless show discernible differences in their design. They differ not only with regard to the number of items, but also regarding the way party stances are measured and the implicit weighting of larger topics resulting from their item selection. We exploit these special circumstances to assess whether differences in (1) the selection, (2) the number and (3) the measurement of items lead to consistent estimates of party interrelations. We also make use of the possibility of taking items from all VAAs (for the parties shared in all of them) to test how the reliability of the positions is affected by random or purposeful topic-wise item removal.

In this research note, we find that the variance between the three VAAs, regarding selection, number, and measurement of the items, does not matter much for the overall structure of the

resulting party positions. The results furthermore suggest that matching VAA-items a priori to certain ideological dimensions, as one of the tested VAAs does, may be problematic. The interpretation of the dimensions and thus the interpretation of the party space may be substantively different from a party space defined by dimensions derived a posteriori after the scaling – even if the obtained relative positioning of the parties is virtually identical for both approaches, as it is the case in our analysis.

Latent Party Policy Spaces in Voting Advice Applications

The starting point for turning visible latent policy spaces inherent to VAAs is the fact that these applications contain data about policy stances on individual items and that these items – especially since we are dealing with programmatic and thus strongly structured content – can be condensed to a small number of dimensions. Two approaches have been pursued in existing research to carve out such dimensions and position parties on them.

Some studies have drawn upon user data generated by VAAs. These contributions first use dimensionality reduction and scaling techniques to find latent dimensions in the user responses regarding a set of VAA-items. Having identified such dimensions, user scores on these dimensions are then averaged by party or ideological supporters to obtain estimates for the parties' positions (Germann et al. 2015: 229–230; Wheatley et al. 2014; Wheatley 2012; see also Louwse and Rosema 2014: 294–295). While additional checks in these studies have been taken as evidence that the possible lack of representativeness of VAA users (Dumont and Kies 2012; Marschall 2011) does not constitute an issue, the problem remains that the positions of parties are equated with average policy positions of party supporters. Also, there is a potential individualistic fallacy at work as the item interrelations on the party level do not necessarily mirror those on the level of citizens.

The approach used in this research note is a more direct one. It uses the information about the policy stances of parties themselves contained in VAAs. These items can be used in scaling procedures that represent the overall pattern of relative party similarities in a low-dimensional space (Gemenis 2013; Louwse and Rosema 2014; Wagschal and König 2014; Otjes and Louwse 2014). The more there is a programmatic bundling of issues and the more parties show clear relations of opposition and commonality – e.g. with those parties taking a progressive orientation on one societal issue also showing a progressive stance on other societal issues – the better this way of extracting a party policy space works. This approach provides party researchers with an easily accessible data source for estimating party positions.

On the other hand, it involves serious methodological challenges, particularly because the data and its quality may be strongly affected by how VAAs register party stances on individual issues.

First, the response scales may differ, some VAAs use binary variables (agree/disagree), whereas others allow for fine-grained categorization, which however also allows more leeway for stating certain policy stances for strategic reasons (Wagner and Ruusuvirta 2012). To obtain an information-rich VAA it is thus possible to use many binary items or instead to use fewer items but with more categories. In any case, one would like the items to be coded accurately. This is not a trivial issue. As Gemenis (2015) has shown, there are several ways in which parties' policy statements can be coded – e.g. by party self-placements or expert codings – and the chosen approach may matter for the quality of these codings. At the same time, VAAs generally do not perform reliability tests on how the parties have been categorized so that we cannot know how accurate they are.

Second, the structure of party positions that emerges from VAA-data has been said to depend on the number and specific selection of items (Gemenis 2013: 280). Carrying this criticism further, one can make the argument that a given selection of items amounts to an implicit weighting of topics or issue domains that these items represent (e.g. education or social policy). However, such topic weights do not necessarily mirror the conditions under which the election took place. The extracted policy space could thus be an artefact based on an implicit weighting of topics that may seem more or less arbitrary as it has not deliberately been envisaged.

Also, as Otjes and Louwers (2014) and Germann et al. (2015) have shown, the items contained in VAAs do not generally seem to scale well on previously conceptualized dimensions when looking at the empirically observed interrelations between them. The picture is thus likely to be more complex. We would not expect that a crisp assignment of items to predefined axes of political conflict works out. Nor is it likely that bundles of items will form dimensions that are neatly orthogonal to one another.

It is ultimately an empirical question whether and how much VAA design parameters affect the party spaces contained in the VAA-data. It might be the case that design-differences have little impact on the party interrelations because the overall information contained in VAAs is enough to constrain them to a robust structure. Considering that parties' programmatic statements are structured, many items might be substituted for one another: e.g. parties

opposed on an environmental dimension are also likely to form a contrast with regard to an economic dimension.

To test whether the number, the selection (and resulting topic weights), and the measurement level of VAA-items has consequences for the estimation of party positions, we will exploit a special real-world setting. We capitalize on the fact that there were three different VAAs developed for the election to the state parliament in Lower Saxony in October 2017. Drawing on data from them allows us not only to perform a systematic comparison with respect to the resulting party positioning derived from each VAA, but also to pool the information from all three VAAs. Finally, although a different kind of data would be needed to rigorously test how reliable different approaches for coding party policy stances are and whether they matter for the validity of the extracted party spaces, the three examined VAAs can at least give some relevant tentative insights. To the degree that there are overlapping items, i.e. items appearing in all three VAAs, one can check whether there are differences by coding approach.

Description of the Three Examined VAAs

Before turning to the analysis, we briefly describe the construction of the examined VAAs and point to their main differences regarding how they register parties' policy stances.

The *Wahlswiper* (launched 10/03/17) has been designed by the advertising agency MOVACT in cooperation with the regional newspaper *Neue Osnabrücker Zeitung*. Featuring a high usability on handheld devices (possibility of swiping left and right to give response, easy navigation and supplementary videos for each item), it consists of 31 binary items for which the parties themselves were asked to indicate their stances.

The *Landeswahlkompas* (launched 10/02/17) has been designed by the state-funded Landeszentrale für politische Bildung (center for political education in Lower Saxony) in cooperation with the Kieskompas agency and the University of Oldenburg. A set of 30 items was presented to the parties which were asked to provide their positions ranging from completely agree to completely disagree on a five-point scale. The parties had to back their stances with publicly available sources (e.g. manifestos). Experts from the University of Oldenburg checked the parties' answers based on the supplied sources and contacted the parties in case of irreproducible self-classifications. The parties always had the final say as long as they could provide proof for their stance. All items were assigned to one of two predefined dimensions (economic left-right and moral-societal conservative-progressive) and

„the computation of averaged or summated positions on the two dimensions depends on a priori considerations” (Krouwel et al. 2012: 236).

The *Niedersachs-O-Mat* (launched 10/06/17) has been developed by the University of Freiburg and the University of Düsseldorf in cooperation with the Landeszentrale für politische Bildung Baden-Württemberg. Based on a reading of party manifestos and press coverage, 71 items were prepared and presented to parties which were asked to reply with either agreement, disagreement or a neutral stance. Parties furthermore had the possibility to add justifications to their replies. After discarding items that were deemed inadequate for capturing party variation, a final set of 38 items was selected for the *Niedersachs-O-Mat*.

Although the three VAAs were designed for the same election, they involve some important differences which all potentially matter for estimating party positions from their data. Specifically, they differ with regard to the number of items, the response options on these items, the involvement of experts in crosschecking the party responses and the implicit weighting of topics resulting from the selection of issues (for a detailed comparison see Table A1 in the Online Annex).

Taking all three VAAs together, one gets a remarkable data set on party policy differences. Of the 99 items overall, 16 have been identically or almost identically asked in two VAAs, and three are even included in all three VAAs. While this item overlap means a redundancy, it also allows for checking how consistently parties have been categorized on these items (see Table A2 in the Online Annex). The three items that occur in all examined VAAs exhibit almost perfect consistency. However, those items that are present in two of the three VAAs show some discernible discrepancies. In some cases, parties are categorized with contradictory issue stances, suggesting a general fuzziness in trying to determine a party’s stance. This may in part be due to the specific phrases used. For instance, with regard to the driving bans for diesel cars, the *Wahlswiper* talks more specifically about a ban “in particularly affected cities”. For other items, such as rejecting asylum seekers and limiting the rise of rents, the discrepancies cannot be attributed to differences in phrasing. Overall, the *Landeswahlkompass* and the *Niedersachs-O-Mat* show the greatest agreement regarding their overlapping items (with only 3.4% inconsistent party categorizations). Inconsistencies mainly occur between these two VAAs and the *Wahlswiper* – strikingly the only VAA that does not involve expert decisions in the coding process – whose categorizations are thus to be seen with most skepticism. This can be seen as tentative evidence that the iterative process of using party self-statements and letting experts validate them leads to more valid measures.

Further differences come to light when comparing the extent to which the VAAs cover specific issue domains. For this purpose, the items have been coded with topic categories that are neither too specific nor too general. The result is depicted in Table 1. While the topic shares in this table exhibit striking similarities when looking at the broader pattern, there are also a couple of noteworthy differences. In comparison, the Landeswahlkompass is marked by an emphasis on education, whereas the Niedersachs-O-Mat stresses economic, financial and labor market issues but deemphasizes agriculture and environment. The Wahlswiper, in turn, stands out by a stronger emphasis on law and order as well as infrastructure and traffic, but emphasizes societal issues less. There is only one category that is covered little overall by all three VAAs: welfare state and social policy.

Table 1: Topic Shares for the Three Examined VAAs

Topic	Landeswahlkompass	Niedersachs-O-Mat	Wahlswiper
Education	23%	11%	13%
Society and culture	10%	8%	0%
Immigration and integration	7%	8%	13%
Infrastructure and traffic	3%	5%	10%
Law and order	13%	13%	19%
Agriculture and environment	23%	13%	23%
Political system	10%	11%	13%
Economy, finance, labor	10%	26%	6%
Welfare state and social policy	0%	5%	3%

The correlations over the columns in Table 1 suggest only weak relationships between the topic weight profiles. While their magnitude may be affected by the way the items are categorized, the categories have deliberately been chosen broad enough, so that even remotely related items fall into a single category. And yet, the correlations are rather small, with $r = 0.62$ between Landeswahlkompass and Wahlswiper, 0.33 between Niedersachs-O-Mat and Landeswahlkompass, and only 0.14 between Landeswahlkompass and Wahlswiper.

Altogether, the inspection of the data shows that the three VAAs do indeed differ in their design when it comes to representing parties' policy stances and the concrete items on which parties are positioned. While there is a substantial overlap among the items the clear majority of them differ between the three VAAs; and the measurement level differs between binary measures on 31 items, (effectively) binary measures on 38 items, and a 5-point scale on 30 items. In light of these notable design differences, it is conceivable that VAAs designed for the same elections might yield different party spaces when using the VAA data to position

parties in a low-dimensional space. Conversely, if the design differences do not translate into different party spaces this would be good news for scholars who want to use VAA data to estimate party positions. Whether this is the case and how much the party spaces for the three VAAs converge will be examined in the following section.

Checking the Impact of VAA Design on Estimated Party Positions

For probing the consistency of latent party policy spaces of the examined VAAs, we focus on those parties that are represented on the German national level because these can be seen as the politically relevant parties for Lower Saxony as well. These are CDU, SPD, FDP, B90/Die Grünen, Die Linke, and AfD, which account for 97.6% of the votes at the 2017 state election.² Furthermore, the positions of these larger parties can plausibly be validated based on general knowledge of the German case, whereas the positions of very small parties competing in Lower Saxony are very hard to put in context (a crosscheck with all eleven parties included in all three VAAs, showing that the positions of the major parties remain largely the same as in the analysis without the very small parties, can be found in Figure A1 in the Online Annex).

To extract the structure of party positions, the analysis employs multidimensional scaling (MDS). This inductive scaling technique has the advantage that it does not require predefining the dimensions on which parties vary. MDS uses information about the (dis-)similarities between objects and aims to best represent this information in a low-dimensional space (Borg and Groenen 2005). It scales object interrelations instead of item interrelations and can take into account the entire information about the policy items of a VAA without having to bundle them in two dimensions before positioning the objects. This is different from item-oriented scaling approaches, such as Mokken scaling analysis, which has been applied in a number of contributions on VAAs (see e.g. Otjes and Louwse 2014). Mokken scaling, however, is only suitable on the level of micro data stemming from VAA users as reliable estimates generally require more than 200 cases (Straat et al. 2014). In contrast, MDS is commonly used for a small number of cases.

We apply metric MDS, as it imposes more restrictions than ordinal MDS – representing the relations of the intervals of the party similarity data – and, in turn, also exploits a higher level of information in the data, which is justified given the small number of objects. The similarities used in the MDS stem from pairwise party comparisons based on the VAA items.

² Adding the remaining parties in the inductive scaling approach is hardly useful as they would enter with the same weight as the politically important parties even though the former are basically negligible.

The dissimilarity matrix is generated using the Cityblock/Manhattan distance measure – so that all items enter in the calculation with equal weight.³

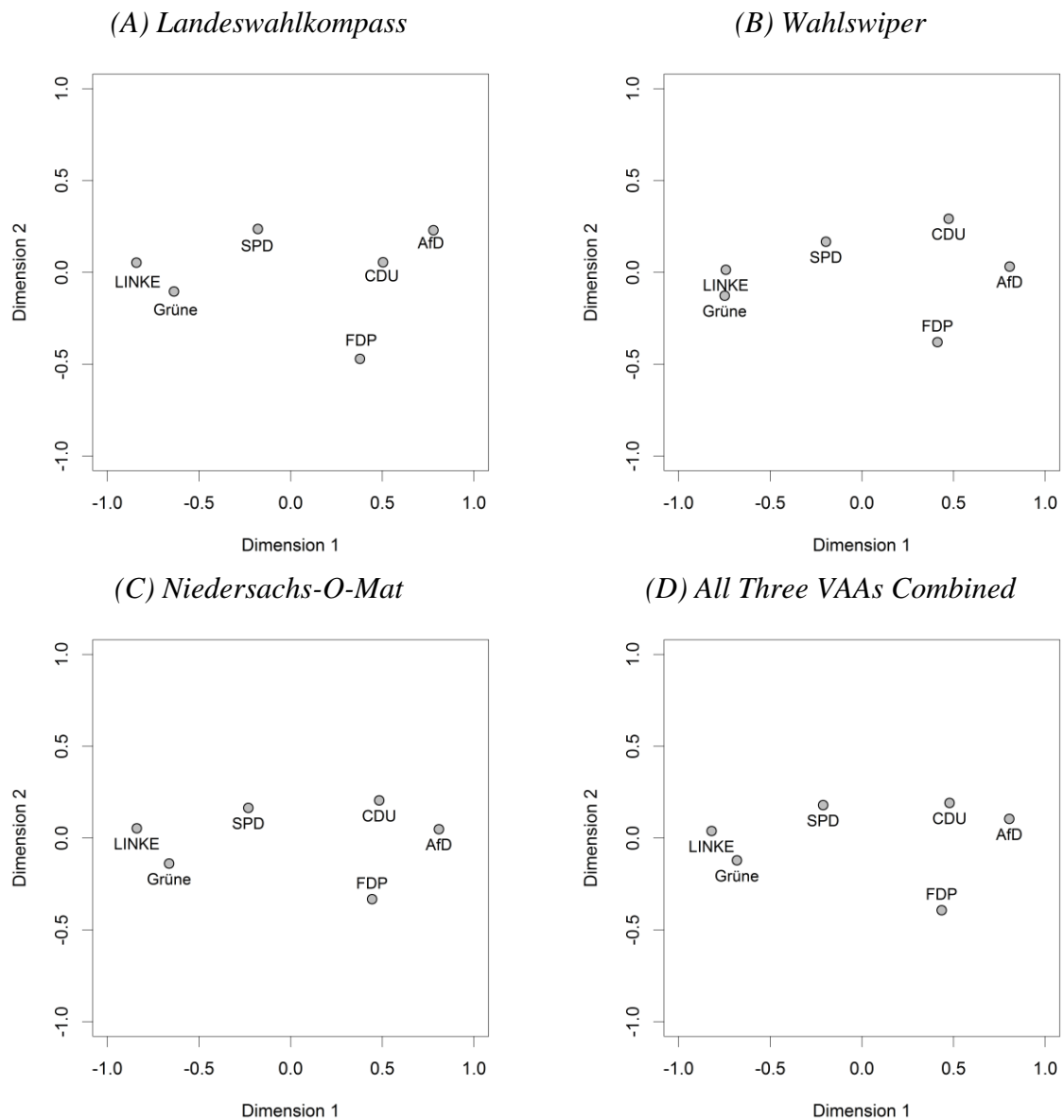
The stress-values for a two-dimensional solution are all sufficiently low, with the highest score of 0.06 for the Wahlswiper. Looking more closely at the stress-values for different numbers of dimensions, it appears that the examined parties can be appropriately represented with two dimensions, whereas the stress for a single dimension would not be acceptable in all three VAAs. A scree test charting the stress-I-values for different numbers of dimensions, points to a three-dimensional solution only for the Wahlswiper. The other two VAAs yield clear elbows at two dimensions (see Figure A2 in the Online Annex).⁴ Due to this fact, for reasons of better interpretability and comparability, the following analysis presents the MDS-produced policy spaces for all three VAAs on two-dimensional maps.

Figure 1 depicts the two-dimensional configurations resulting from the scaling analyses for all three examined VAAs as well as for the pooled data. The solutions for figures 1A-1C have been rotated using the Procrustes procedure to best correspond to the pattern in Figure 1D. While not substantially altering the party interrelations this eases the comparison. The dimensions are extracted in a way so that they capture the greatest part of the variance between the objects. They thus have no inherent substantial meaning and have to be interpreted based on what is known about the positioned objects. We will do this further below but for now focus on what is of primary interest: the consistency between the party spaces obtained from the three different VAAs.

³ As the combined item set from all three VAAs uses different measurement levels, we use Gower's distance (1971) measure for the pooled data, which amounts to a rescaled (and weighted) Manhattan distance (Everitt et al. 2011: 54) and is thus compatible with the results from the individual VAAs.

⁴ For the crosscheck with all 11 parties, the scree tests indicate that adding a third dimension would then be appropriate (see Figure A3 in the Online Annex). The third dimension is primarily needed to distinguish the very small, insignificant parties from all the major ones but the AfD.

Figure 1: Party Policy Spaces Based on the VAAs



Notes: Results from metric MDS. Only relative distances between parties can be interpreted, not their absolute scores. The configurations in charts B to D have been subjected to Procrustes rotation, so that they best correspond to the orientation in chart A. The dimensions do not have a fixed meaning but are merely a product of the statistical procedure.

Even though the three VAAs are based on different design choices, the comparison of the four plots suggests a high degree of consistency. The overall pattern of inter-party relations is very similar. Lin's (1989) concordance measure affirms this visual impression (see Table 2). The measure captures not just the linear covariations between two sets of scores and thus the profile similarities – as does Pearson's correlation coefficient – but also the deviation between the absolute scores. Lin's concordance measure is thus larger the more two score sets conform to a diagonal with a slope of 1. It is suitable for comparing agreement between the dimension scores extracted above because the parties structure has been rotated and stretched through

Procrustes rotation so as to be best comparable. The alignment on the horizontal dimension, which captures clearly the larger part of the variation, is almost identical for all VAAs. On the vertical dimension there is still substantial concordance between Wahlswiper and Niedersachs-O-Mat, whereas Landeswahlkompass has only a poor concordance with the other two VAAs.

Table 2: Concordance Measures Between the Three VAA-Based Policy Spaces

	Dimension 1		Dimension 2	
	Wahlswiper	Niedersachs-O-Mat	Wahlswiper	Niedersachs-O-Mat
Landeswahlkompass	0.994	0.998	0.826	0.856
Wahlswiper		0.996		0.976

Notes: Scores calculated with Lin's (1989) concordance measure.

Comparing the configurations, there are small but noteworthy differences. First, Linke and Grüne are positioned more closely together by the Wahlswiper – which seems substantially less valid in comparison with the other party spaces in Figure 1 as the Linke is better represented with a more extreme position (to the left) compared to the Greens. Second, the vertical alignment of CDU, AfD and FDP differs between configurations. Whereas the Wahlswiper and the Niedersachs-O-Mat locate the CDU and the FDP about equidistant to the AfD, the Landeswahlkompass puts the FDP more than twice as far away from the AfD than from the CDU. This is striking as all three VAAs can claim to cover a broad range of issues for the election. Yet, the differences in the concrete selection of items can apparently lead to diverging relations among some party pairs or triplets (here: CDU, FDP and AfD).⁵ However, the described deviation regarding the AfD does not make a substantial difference insofar as the party is always located at the right extreme in the charts.

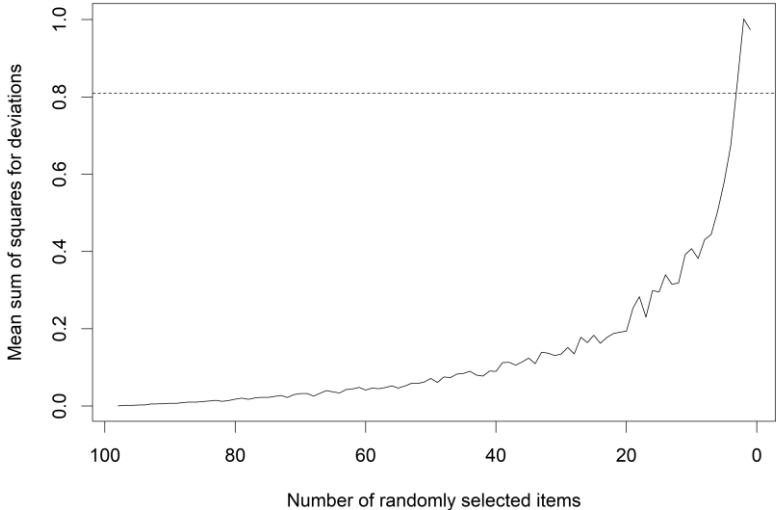
The result for the combined data from all three VAAs in Figure 1D uses the most information and should thus be the most accurate one. The pattern appears to be a blend between the configurations from Landeswahlkompass and Niedersachs-O-Mat but is overall closer to the latter due to the vertical alignment among the right-wing parties.

⁵ Landeswahlkompass contains 14 (of 30) items that position the AfD closer to the CDU than to the FDP. In contrast, this holds true for only 8 of the 38 Niedersachs-O-Mat items. The larger share of the items in question contained in Landeswahlkompass cannot simply be attributed to specific topics.

The large number of items in the combined dataset offers the possibility to further probe the importance of item selection. Specifically, if parties' positions on the VAA-items are indeed strongly structured, constrained by an ideological bundling of policy stances, it is likely that the removal of some items can be compensated with the existence of other issues. If taking a certain stance on law and order consistently goes along with taking a certain stance on immigration, then removal of one of these issues does not necessarily imply a crucial loss of information for the overall party positioning.

To put this assumption to a test and examine at which number of items the extraction of party spaces becomes markedly more unreliable, we randomly sample between 1 and 98 items from all 99 items. This sampling is done 100 times for each sampled number of items. For each run we obtain a configuration and its congruence (sum of squares for coordinate distances) with the configuration for the full item set (after Procrustes rotation). These congruence-values are then averaged for the 100 runs by each number of items sampled. Figure 2 presents the number of sampled items on the x-axis and the corresponding averaged congruence score over 100 runs on the y-axis. The line remains very flat for 98 to about 50 sampled items. Below 40 items, the fluctuations gradually become larger, and a break is discernible at about 20 items. The graph thus suggests that 20 items should be seen as bare minimum.

Figure 2: Sensitivity of Results for the Combined Data to the Number of Included Items

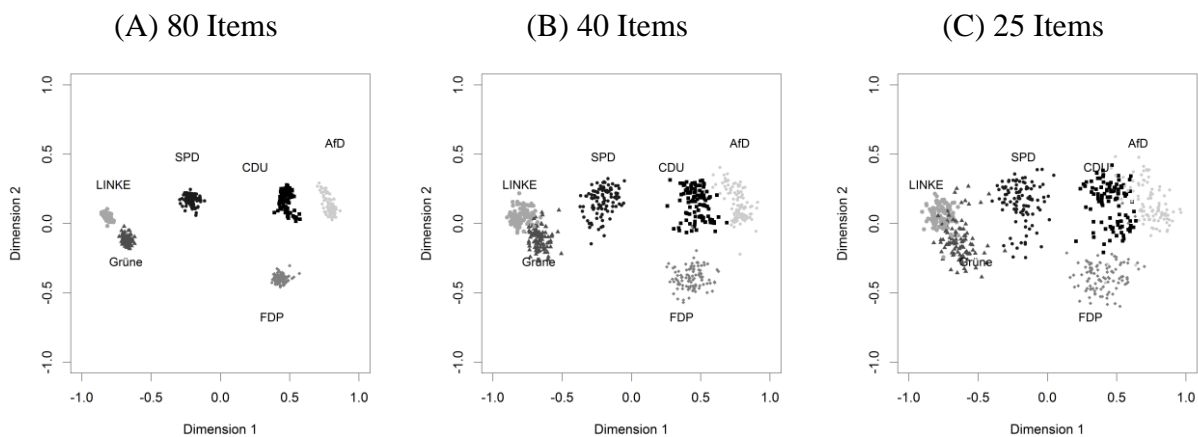


Notes: The horizontal line is based on comparisons of a random distribution of six coordinates (parties) with the configuration in Figure 1D. 1000 such random distributions have been generated and congruence scores for the comparison with said configurations have been calculated for each. The horizontal line represents the 2.5-percent quantile of that distribution of incongruence scores.

We do not know yet, however, how large the depicted sampled deviations from the configuration in Figure 1D are. To get a better grasp of the charted incongruence scores, two further procedures have been performed. First, we have generated 1000 randomly distributed coordinates for six objects (within the bounds -1 to +1 on each dimension) and calculated for each run the congruence scores between these random configurations and the configuration based on the scaling of the combined VAA-data with all 99 items (Figure 1D). The 2.5-percent quantile for the resulting distribution of congruence scores is charted as a horizontal dashed line in Figure 2. In other words, only in 2.5 percent of the random samples, their incongruence with Figure 1D is below about 0.8. This additional information allows for a substantial interpretation of the depicted scores: With about five or less randomly sampled VAA-items, the configuration cannot clearly be distinguished from one generated randomly.

Second, 100 simulation runs for different numbers of sampled items (25, 40, and 80) are depicted in Figure 3. The clouds in the three charts illustrate to what degree the configuration based on the entire data becomes irrecognizable with the removal of items. Whereas the clouds are very dense with 80 items, 40 items still yield easily distinguishable party spheres. With 25, however, the feathering of these clouds becomes quite large – we would not expect to obtain an accurate estimate of party positions based on this number of items.

Figure 3: Comparison Between Simulation Results With 80, 40 and 25 Items in the MDS



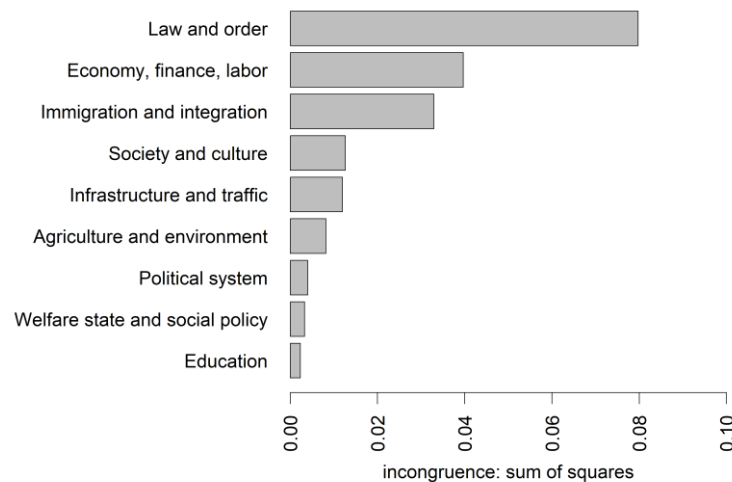
Notes: Data points are based on 100 random samples from the 99 items overall. Scaling as in Figure 1.

As a further robustness check we performed a jackknife procedure with topics instead of individual VAA-items. Thus, for each of the topics that are depicted in Table 1, all items have been dropped from the data, and the deviation (sum of squares) from the configuration with the combined VAA-data consisting of all 99 items has been calculated (see Figure 4). From

the chart alone, one can see that the law and order issue domain has the most unique information, its removal distorts the configuration much more than that of any other topic.

To see how large these distortions are in substantive terms, it is instructive to compare the score in Figure 4 with the incongruence scores that result from the random item removal (Figure 2): removing the law and order topic (15 items) corresponds to randomly removing 45 items – which however still yields results highly similar to those obtained with all 99 issues in the dataset. Removing the topic of immigration and integration (nine items) corresponds to randomly removing twenty issues. These findings suggest that a systematic topic-removal of items can weigh much more heavily than random removal. Still, the results also suggest a high robustness of the latent policy space contained in the VAA-data, even to a gross systematic distortion – at least as long as there are still enough other items to compensate this loss of information.

Figure 4: Incongruence Scores Resulting From Removal of Items by Topics



Notes: Incongruence is based on comparison of the configuration using all 99 items with the configuration that results when removing all items of a given topic from this set.

Inspecting the Dimensionality of Extracted Policy Spaces

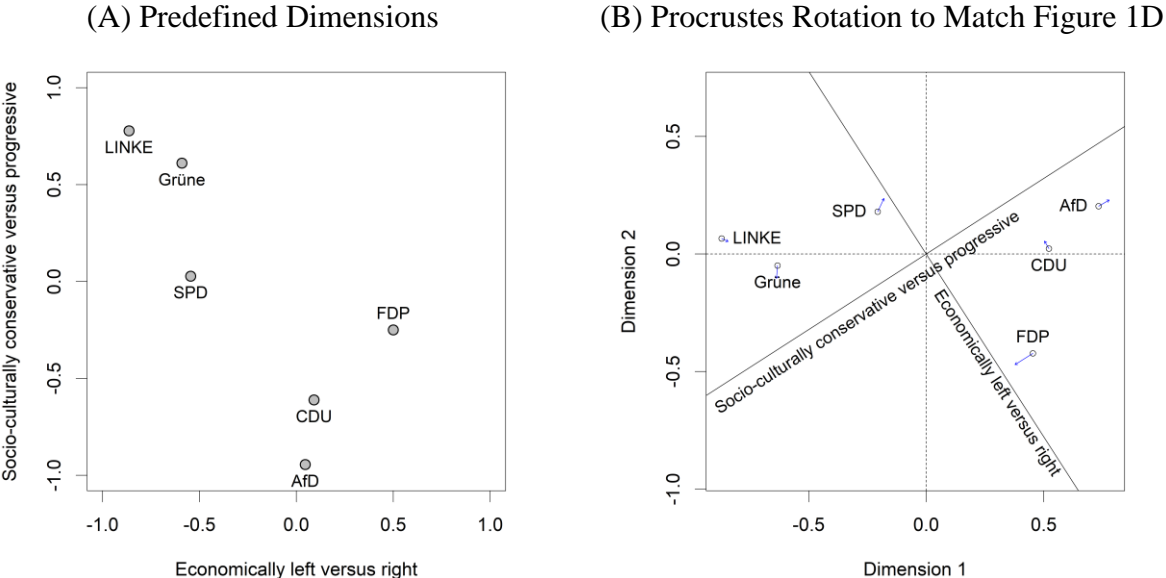
The scaling analysis in the previous section yielded a structure of party positions that exhibits the familiar constellation of the German party system. Knowing the general programmatic stance of these parties, it is possible to make sense of the dimensions in the extracted party policy spaces (Figure 1). The horizontal dimension, which captures the larger share of the variance between the parties, resembles a general left-right dimension with a party ordering

well-known in Germany. The vertical dimension, however, is harder to interpret. It is mainly useful for separating the FDP from the other parties, but this could be for various reasons.

To get a better grasp of the dimensionality, we draw on a two-pronged approach. First, we make use of the fact that the Landeswahlkompass involves a schema for assigning the VAA-items to predefined dimensions – an economic one and a moral-societal one. We use this apriori construction of the scales and examine how the resulting party alignment along these known axes corresponds to the inductive scaling results via MDS. Second, we supplement the MDS analysis with a procedure that determines the degree to which the original items are related to the extracted dimensions (Kruskal and Wish 1978). This so-called property fitting procedure is also best done with data from the Landeswahlkompass due to the higher measurement level of its items (five-point scale). As the dimensionality can be expected to be similar in all three VAAs, the interpretations drawn from this property fitting analysis can be transferred to the other VAA configurations.

Comparing the party positions on the predefined dimensions of the Landeswahlkompass in Figure 5A with the MDS configuration shown in Figure 5B, we get an almost identical pattern. Figure 5B visualizes the rotation needed for optimal congruence of both configurations and contains the point discrepancies (arrows) after rotation. Knowing the meaning of the predefined axes in Figure 5A, these can be used to interpret the inductively won MDS configuration in Figure 5B. An economic policy contrast would then run from the top left to the bottom right while a socio-cultural contrast is marked by the diagonal running from the bottom left to the top right.

Figure 5: Party Positions on the Predefined Axes of the Landeswahlkompass



Does this dimensionality also bear out when assessing how the MDS dimensions are related to the original policy items in the VAA? The results from this property fitting have to be seen with some caution in light of the low number of objects. However, the pattern is rather straightforward as most items are clearly related to the first dimension of the MDS configuration, but unrelated or very weakly related to the second (see Table A3 in the Online Annex). Only few items are explained better by the second than the first dimension (merging districts to decrease costs, legalizing Cannabis, shop opening days on Sundays, and doctors should be able to choose their workplace even though this means fewer doctors in rural regions) and only two of them are clearly more related to the second dimension than to the first (Lower Saxony should keep its seat in the Supervisory Board of Volkswagen and the basic provision with gas, water and electricity should remain in the hands of the state). Taken together, these items have a common programmatic core as they point to the degree to which the state should regulate and intervene in various areas of the economy and the labor market. This is also why the second dimension is most important for positioning the liberal FDP in relation to the other parties. The FDP takes a position that is associated with less state intervention based on the interpretation of the second dimension just described. However, the items associated with the first and more important dimension in the MDS belong to various issue domains. Items of the topics law and order, agriculture and environment, society and culture, and education all load strongly on that first dimension whereas economic issues are comparatively more weakly tied to this dimension and show at least moderate loadings on the second dimension.

This has important implications because it means that the dimensional interpretation of the MDS space is not identical to the one based on the predefined dimensions, even though the overall structure of party relations is almost identical. The first dimension in the MDS configuration bundles various topics – mainly law and order, environment, and education –, but this dimension corresponds to a diagonal running from top left to bottom right in the space with the predefined dimensions (Figure 5A). Therefore, the vertical axis in Figure 5A does not seem to be such a clear-cut social-moral axis marked by a conservative and a liberal pole. On the one hand, the Landeswahlkompass seems to nicely represent the party interrelations for the election. On the other hand, the labeling of the axes seems to oversimplify a more complex picture, and one should thus be careful with a priori assigning items to dimensions based on theoretical considerations.

Discussion

As voting advice applications contain information about party stances on a set of policy items, this data source can be used to extract party policy spaces and estimate party positions. The core element on which this approach draws, the selection of policy items, their number, content, and measurement level, can however be designed differently even for the same election and may affect the resulting party position structure. To test the role of such design differences, we have exploited relevant variation in a real-world setting, at the 2017 German Länder election in Lower Saxony. The three VAAs on offer at this election differed in their number and selection of items, the items' measurement levels, and the implicit weighting of topics based on the chosen items. Despite these differences the party spaces extracted via multidimensional scaling from the three VAAs are overall very consistent.

This finding is not only of interest to party researchers, but it is also important for the primary purpose of VAAs, which is to match voters to parties. An accurate and valid representation of party-interrelations is a prerequisite for giving meaningful comparative recommendations. And the criticism of biases due to the choice of policy items that can be launched against VAA-data as the basis for estimating party positions could also be made with regard to giving recommendations. After all, the voter-party match depends on the specific set of items that is used in a VAA.

Being able to pool information of the three VAAs, we have furthermore exploited the resulting high number of items (in total 99) to probe the sensitivity of the extracted party spaces to the random item removal as well as to the systematic removal of entire issue domains (topics). The results show a satisfactory reliability if about 40 of the entire set of 99 items are randomly sampled. Approaching a number of 20 items, however, the resulting policy spaces begin to lack robustness and a valid party positioning may no longer be possible. It should be noted though, that this finding is based on a random sampling of items – a purposeful selection of different items may well be able to produce meaningful policy spaces with as few as 15 to 20 items. The extracted party space based on the combined item set is also robust to dropping entire topics. Some topics, particularly law and order, however lead to a systematic loss of information that is harder to compensate through remaining items. The overall high consistency can be made plausible in light of parties' policy stances being highly structured. If parties are opposed to one issue they are also very likely to be opposed to other issues. Given redundant information in the data, randomly dropping items will not directly lead to critical information loss. This may, however, be different in other electoral

contexts. In the case of the examined election, a comparatively simple party space emerged, with one main dimension already capturing most of the variation among the parties.

Finally, based on the additional analyses for interpreting the dimensions that have resulted from the inductive scaling, one would caution against using apriori defined dimensions to construct a party space based on VAA-data. Based on the comparison with the dimensions from the inductive scaling, the predefined dimensions seem much less clear-cut than their labels suggest. While having predefined dimensions allows for a visual representation of parties as part of the VAA, which may provide useful information for users, assigning items to one dimension or the other may well be an undue reduction of complexity and ultimately be misleading. Simply positing two political dimensions that are independent from one another may artificially separate these dimensions even when they are actually correlated.

Altogether, the results from the analysis suggest that getting the structure of party positions right forms less of a problem as long as a certain number of relevant items exists. Yet, conveying the dimensionality of the policy spaces at an adequate level of complexity remains a difficult task. A major challenge is thus to spatially present party positions and visualize them to VAA users while supplementing the party space with a clear-cut interpretation of its dimensionality. This amounts to an important trade-off in the design of VAAs: On the one hand, they are supposed to provide citizens easily understandable information about political affairs; on the other hand, they should offer a reliable and valid representation of party positions and their interrelations.

The main purpose of this research note was to test whether VAA-data is suited for measuring party positions and extracting policy spaces. Yet, some of our results can also be transferred to questions regarding the main purpose of VAAs – i.e. matching users to parties. The question of dimensionality can be avoided through the conservative and straightforward approach of calculating overall user-party proximities without assumptions about dimensions and spatial models. When additionally aiming to visualize users' positions in relation to parties in a low dimensional space, the results above suggest – in line with previous research (Otjes and Louwerse 2014; Louwerse and Rosema 2014; Gemenis 2013; Germann et al. 2015) – that using predefined dimensions risks imposing a structure on the data that is not backed by the empirically obtained patterns in the data.

For building valid scales on which to position users it is thus better to employ a form of scale validation that is rooted in the user responses generated for the very election in question and at a point when the VAA design can still be altered (Germann and Mendez 2016). This

however, requires a considerably greater effort while it is uncertain whether only few clear-cut dimensions will emerge at all. Yet, it should be noted that the dimensions one can extract based on user responses are not necessarily the same as those extracted from the parties' own advocated policy stances as contained in the VAA, i.e. before any user responses are collected. This makes representing users and parties in a common space even more difficult. Also, even if clear-cut dimensions do emerge it may be hard to label and communicate them to users as part of a visualization used in a VAA.

This pragmatic aspect does not arise if one leaves the user-level aside and is merely interested in generating party policy spaces based on the policy items contained in a VAA. As the analysis above suggests, this data is indeed suitable for reliably mapping party interrelations and can be used to carefully probe along which dimensions party differences are best described. The inductive scaling used in this research note also underscores that it is ultimately an empirical question what kind of political semantic structures party spaces. Furthermore, party spaces may be malleable and specific to an election and do not have to conform to a simple pattern that we would perhaps prefer.

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Online-Annex

Table A1: Overview of the Three VAAs

	Wahlswiper	Landeswahlkompass	Niedersachs-O-Mat
Number of items	31	30	38
Response options	<ul style="list-style-type: none"> • Yes • No • Skip question 	<ul style="list-style-type: none"> • Strongly agree • Agree • Neutral • Disagree • Strongly disagree • No opinion 	<ul style="list-style-type: none"> • Agree • Neutral • Disagree • Skip question
Included parties	15 Parties: CDU, SPD, Grüne, FDP, Linke, Piraten, FW, AfD, Die PARTEI, Tierschutzpartei, ÖDP, DM, V-Partei ³ , REP*, BdG*	11 Parties: CDU, SPD, Grüne, FDP, Linke, Piraten, FW, AfD, Die Partei, Tierschutzpartei, V-Partei ³	13 Parties: CDU, SPD, Grüne, FDP, Linke, Piraten, FW, AfD, Die PARTEI, Tierschutzpartei, ÖDP, DM, V-Partei ³
Weighting	Weighting assigned only indirectly via „skip question“	No weighting of single questions possible, only of topic areas (e.g. Environment, Education, Economy).	Questions can be marked as important. Marked questions receive double weighting in the evaluation process.
Type of evaluation	<ul style="list-style-type: none"> • Percentage score of compatibility with a party • Detailed analysis of single items, including the parties' stated reasons for their selected response • Link to the websites and election manifestos of parties 	<ul style="list-style-type: none"> • The political “coordinates” of users is displayed in a two-dimensional graph. Economic alignment is measured on the horizontal axis, socio-political alignment varying from conservative to progressive on the vertical axis • Option to receive results for specific topic areas (e.g. Environment, education, economy) • Detailed analysis of single items, including the parties' stated reasons for their selected answer as well as openly accessible statements by parties (e.g. election manifestos) 	<ul style="list-style-type: none"> • Percentage score of compatibility with a party • Detailed analysis of single items, including the parties' stated reasons for their selected response

Procedure of creating the questions / propositions	No information	Development of 30 questions / propositions by a team of academics of the University of Oldenburg	Development of 71 questions / propositions by a team of academics of the University of Freiburg, Braunschweig and Düsseldorf. Election manifestos, party manifestos, press reports, and assessments by regional daily newspapers regarding the relevance of specific themes for the election are taken into account.
Where are positions of parties and their reasons derived from?	Parties respond to directly the 31 questions they are given by the VAA.	Parties respond directly to the 30 questions they are given by the VAA. Subsequently, the team of academics reviews the plausibility of these responses and may ask parties to revise responses. The parties have the final say, however, as long as they justify their choices.	Parties respond directly to the 71 questions they are given by the VAA. Subsequently, the team conducts a statistical analysis to select 38 items that allow to discriminate between the parties' positions the most.
Special features	<ul style="list-style-type: none"> • Also available as mobile app • Intuitive user interface with swipe movements (convenient especially for smartphones) • Short explanatory video for each question / proposition 	<ul style="list-style-type: none"> • Positioning of parties and users in a two-dimensional graph according to ideological alignments 	<ul style="list-style-type: none"> • Special selection process that aims to increase the potential to discriminate between the parties' positions.

Notes: * Republikaner (REP) and Bündnis der Generationen (BdG) were not admitted to the election. They were nevertheless included in the Wahlswiper at first but were then excluded from the evaluation process.

Sources: <https://wahlswiper.de/>; https://www.demokratie.niedersachsen.de/startseite/themen/landtagswahl_niedersachsen/faq-zum-landeswahlkompas-157615.html; <http://www.kandidatomat.de/>;

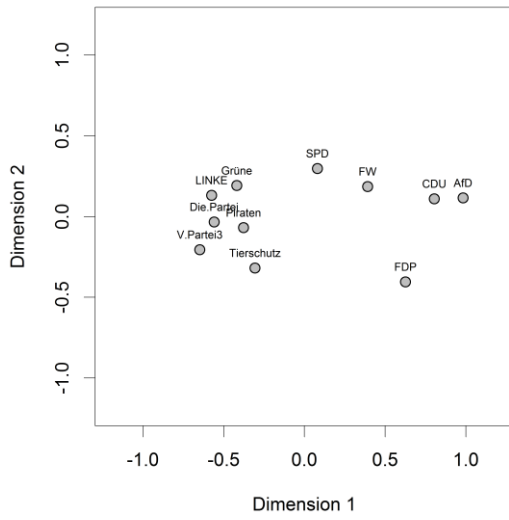
Table A2: Items That are Included in Each of the Three VAAs

Item	Share of non-uniform responses			
	A-B	A-C	B-C	Average
Should diesel cars be banned in cities that are particularly polluted?		18,2%		18,2%
Should it be allowed to hunt wolves in Lower Saxony?	0,0%	0,0%	0,0%	0,0%
Should Gorleben be excluded in the national searching for a permanent nuclear waste depository?			0,0%	0,0%
Should new highways like the A20, A33 North or the A39 be built?			13,6%	13,6%
Should there be nature reserve areas in the river mouth of Elbe and Weser?		9,1%		9,1%
Should police custody be extended up to 18 months for persons who are likely to threaten public safety?			0,0%	0,0%
Should cannabis be legalised within the scope of pilot projects?		9,1%		9,1%
Should there be more video surveillance of public streets and space?	0,0%	4,5%	4,5%	3,0%
Should Lower Saxony hire more policemen?			13,6%	13,6%
Should the voting age for elections on the Länder level (federate state level) be lowered to 16 years?	0,0%	0,0%	0,0%	0,0%
Should politicians represent Lower Saxony by serving on Volkswagen's board of directors?		9,1%		9,1%
Should Lower Saxony sell its shares of VW?			18,2%	18,2%
Should Lower Saxony deport reject asylum seekers more consistently?			22,7%	22,7%
Should the Mietpreisbremse (literally "rental price brake") be abandoned in Lower Saxony?			9,1%	9,1%
Lower Saxony should not reintroduce tuition fees	4,5%			4,5%
Lower Saxony's government should only support those agricultural holdings which manage their farmland organically	9,1%			9,1%
There should be a ban on "fracking" in Lower Saxony.	0,0%			0,0%
Stores should be permitted to open on Sundays as well.	9,1%			9,1%
Police forces should carry a personal marker (collar number) for identification	4,5%			4,5%
Average	3,4%	7,1%	8,2%	

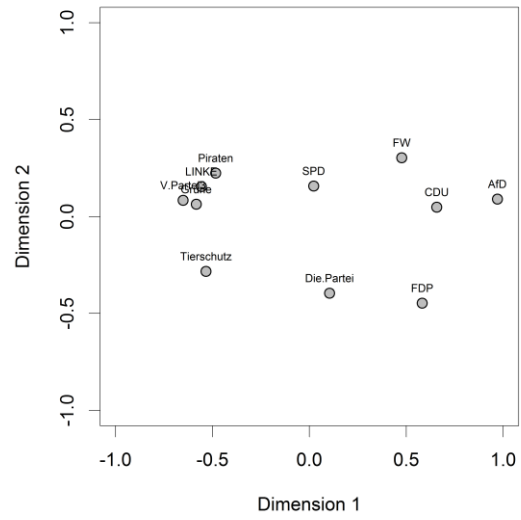
Notes: A = Landeshwahlkompass, B = Niedersachs-O-Mat, C = Wahlswiper. Phrasing of items adopted from Wahlswiper. Diverging positive or negative direction of the phrasing of the questions were taken into account. To make responses between the VAAs comparable, responses by the Landeshwahlkompass were transformed into 1 or 0 if they were in the categories "agree" and "strongly agree" or "disagree" and "strongly disagree", respectively (the original data of the remaining two VAAs is coded in that way, too). Missing values and neutral responses were coded as middle category (0.5).

Figure A1: Configurations With all Eleven Parties Contained in all Three VAAs

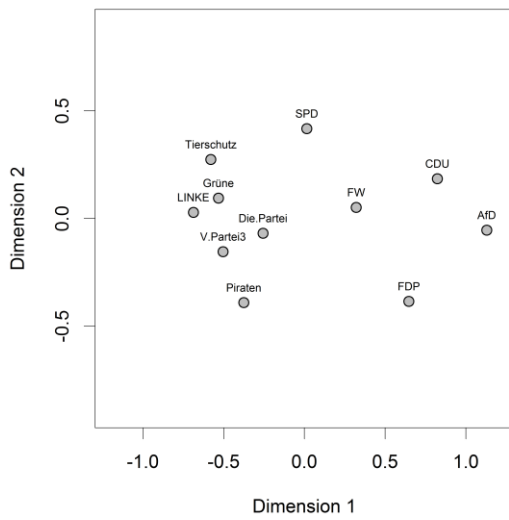
(A) Landeswahlkompass



(B) Wahlswiper



(C) Niedersachs-O-Mat



(D) Combined

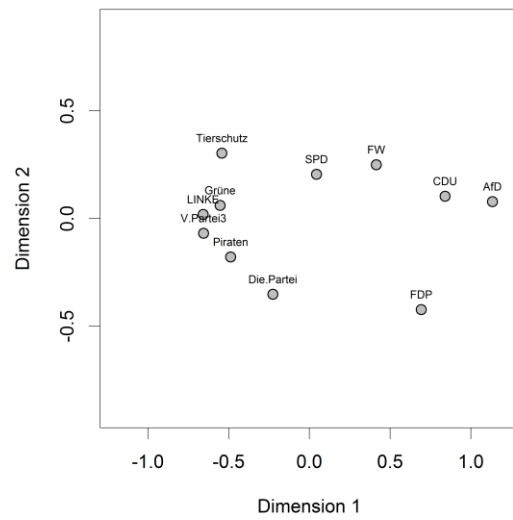
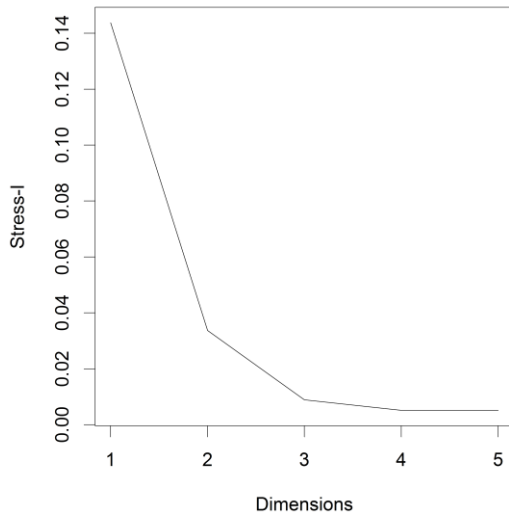
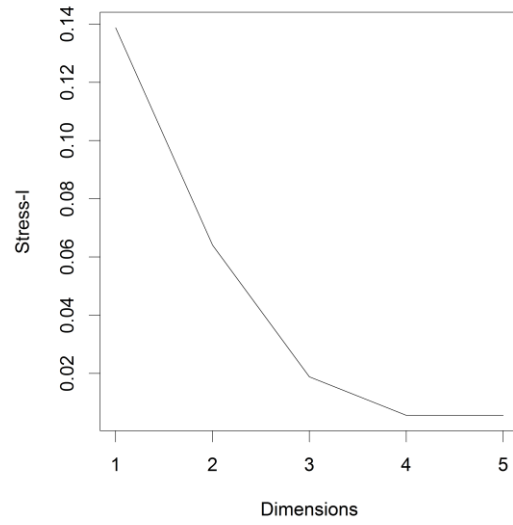


Figure A2: Scree Plots

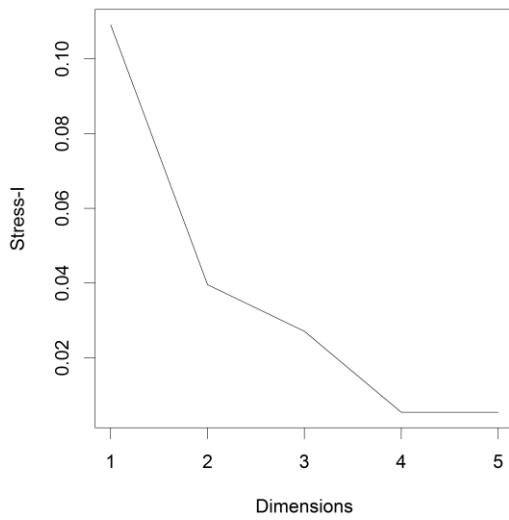
(A) Landeswahlkompass



(B) Wahlswiper



(C) Niedersachs-O-Mat



(D) All Three VAAs Combined

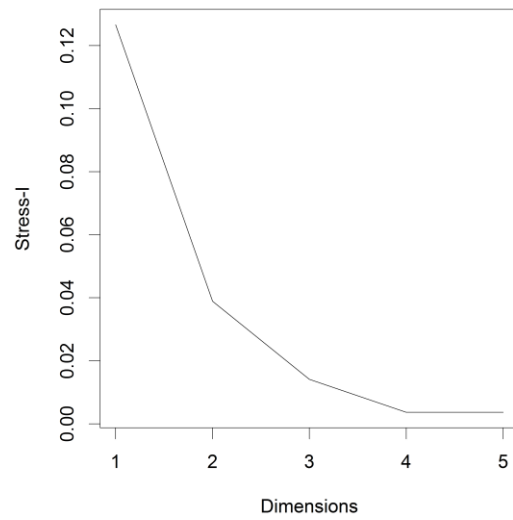
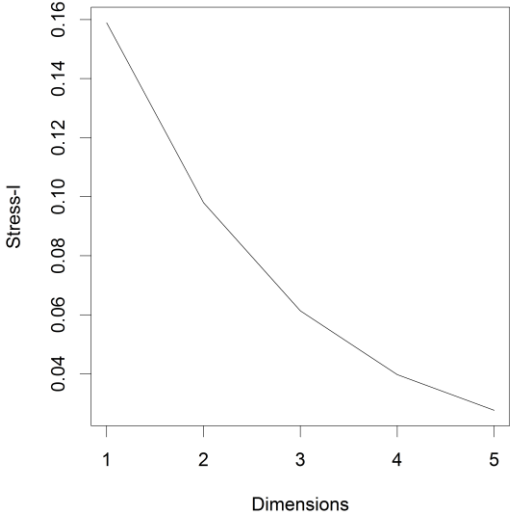
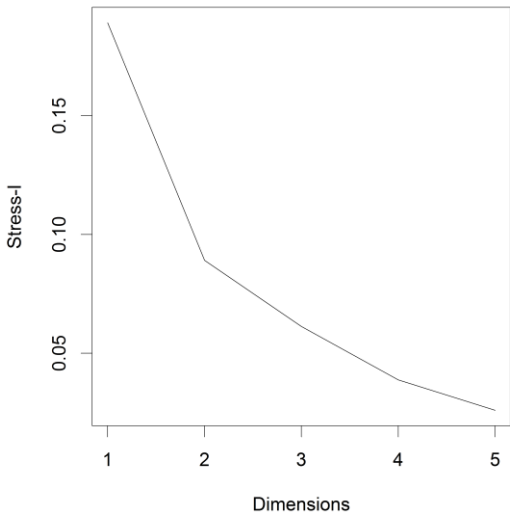


Figure A3: Scree Plots for the Data Used for Figure A1 (Including all Eleven Parties)

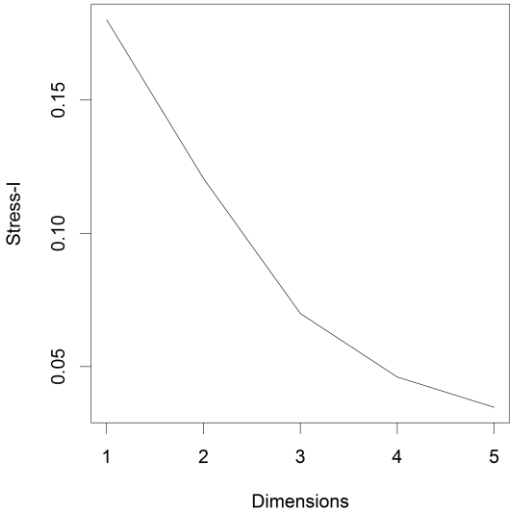
(A) Landewahlkompass



(B) Wahlswiper



(C) Niedersachs-O-Mat



(D) All Three VAAs Combined

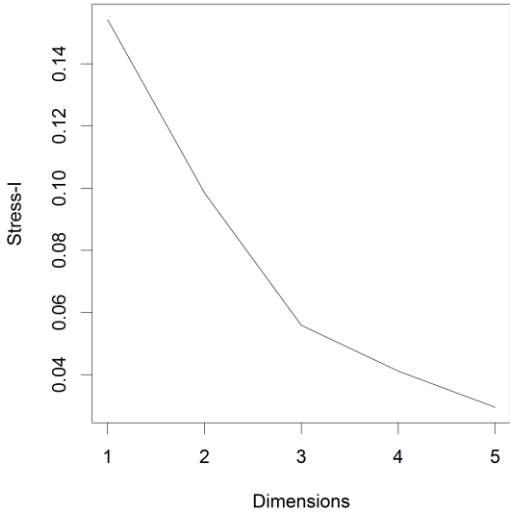


Table A3: Results From Property Fitting Based on Landeswahlkompass

Item	R ²	Slope	Topic	D1	D2
Police forces should carry a personal marker (collar number) for identification.	0.98	-0.17	Law and order	0.98	0.17
All coal power stations in Lower Saxony should be shut down within the next 10 years.	0.96	-0.02	Agriculture and environment	0.98	0.02
Lower Saxony should fight left-wing extremism much stronger as it did in the past.	0.93	-0.07	Society and culture	0.96	0.07
Staying down a year in school should be repealed.	0.98	-0.27	Education	0.96	0.26
Foreigners who are suspected of committing a severe crime in Germany should be deported.	0.95	-0.23	Immigration and integration	0.95	0.22
The further development of comprehensive schools in Lower Saxony should be stopped.	0.90	-0.08	Education	0.95	0.08
In order to avoid discrimination, Lower Saxony should use gender-neutral language.	0.87	0.06	Society and culture	0.93	0.05
Delinquent asylum seekers should in any case be deported.	0.91	0.21	Immigration and integration	0.93	0.20
Children should spend more time with their parents than being supervised at school in the afternoon.	0.91	0.30	Education	0.91	0.27
Syllabi at schools should focus more on natural sciences and mathematics than on subjects such as arts or social studies.	0.85	-0.18	Education	0.91	0.17
Research for military purposes should be allowed at Universities in Lower Saxony.	0.89	-0.30	Education	0.91	0.28
For the protection of the economy no further protective areas for animals and plants (fauna and flora habitats) should be designated.	0.95	0.43	Agriculture and environment	0.89	0.39
There should be more video surveillance in public space.	0.91	0.42	Law and order	0.88	0.37
There should be a general ban on “fracking” in Lower Saxony.	0.77	0.08	Agriculture and environment	0.87	0.07
In order to better identify criminals, the police should be allowed to collect more private data.	0.80	0.22	Law and order	0.87	0.19
Hunting wolves should be allowed in Lower Saxony.	0.75	-0.17	Agriculture and environment	0.85	0.15
Lower Saxony’s government should only support agricultural holdings which manage their farmland organically.	0.83	-0.38	Agriculture and environment	0.85	0.32
There should be stricter stipulations for industrial livestock farming, even if this leads to rising prizes.	0.91	-0.58	Agriculture and environment	0.83	0.48
Islamic holidays should be acknowledged as official holidays in Lower Saxony too.	0.60	-0.13	Society and culture	0.77	0.10
The voting age for elections on the Länder level (federate state level) should be lowered to 16 years.	0.74	0.55	Political system	0.75	0.41
Cars which use Diesel should be banned in cities that are particularly polluted to improve air quality.	0.51	0.23	Agriculture and environment	0.69	0.16
Lower Saxony should not reintroduce tuition fees.	0.60	-0.53	Education	0.69	0.36
Lower Saxony should place more responsibility for the implementation of large-scale infrastructure projects on private companies.	0.78	-1.00	Economy, finance, labor	0.63	0.63
Cannabis should be legalized.	0.89	1.18	Internal security	0.61	0.72
In order to save costs, communities should still be merged in the future.	0.89	1.18	Political system	0.61	0.72
In all schools in Lower Saxony Islamic religious education should be offered.	0.52	0.73	Education	0.58	0.42
Stores should in general be permitted to open on Sundays.	0.83	-1.67	Economy, finance, labor	0.47	0.79
Physicians should be allowed to choose where they wish to work, even if this means that there are fewer doctors in rural regions.	0.86	-1.74	Economy, finance, labor	0.47	0.81
Lower Saxony should keep a seat in Volkswagen’s supervisory committee	0.85	-3.03	Political system	0.29	0.88
The basic service with gas, water, and electricity should exclusively be under public authority.	0.62	-2.60	Infrastructure and traffic	0.28	0.74

Notes: Results from regression item scores on the dimension scores over parties as cases. The last two columns contain the standardized regression coefficients (betas) from this analysis. Own translation of items from Landeswahlkompass.