Vague Concepts in Survey Questions: A General Problem illustrated with the Left-right Scale*

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Abstract

This study investigates a general problem: Vague concepts in survey questions may trigger differential associations and, thus, impact respondents' answers. If these associations vary systematically with other explanatory variables they may interfere in the empirical relationships we observe. We illustrate this problem relying on a survey of 3467 Germans that were asked probing questions regarding the concepts left and right after placing themselves on the left-right scale. We find that individuals attribute very different meanings to the concepts "left" and "right". This seems to impact measurement values on the left-right scale. In addition, our results provide evidence that associations are systematic in nature, which could contort the effect of certain explanatory variables. Our results indicate that the interpersonal comparability of the left-right scale across individuals is impaired. We discuss various solutions and recommend replacing the left-right scale with a battery of questions about issues with more specific ideological content in future surveys. Generally, our findings underscore the necessity to investigate to what extent "vague" concepts trigger the same or different associations among different individuals that belong to the target population.

Keywords: survey measurement, vague concepts, measurement equivalence, interpretation, association

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1 Introduction

Survey data has become immensely popular in the social sciences and is used across manifold disciplines. Cheap and simple online data collection (Amazon Mechanical Turk, Qualtrics, etc.) will likely increase their popularity. At the same time, there are some fundamental problems with survey data that warrant more attention. One such issue is the problem of "vague" concepts. In our everyday life, we interpret, communicate, and understand the reality around us using a multitude of concepts such as "car", "breakfast", "time" and "friend" (Jaccard and Jacoby 2010: 10ff.). Concepts such as these normally trigger associations in our minds, and logically individuals may have different associations when they are faced with the same concept.[1] When used in surveys, vague concepts may have the effect that individuals "understand the 'same' questions in vastly different ways" (Brady 1985: 271) and lead to interpersonal incomparability (Brady 1985; King et al. 2004). This problem is also called measurement inequivalence, an increasingly recognized problem (e.g. Davidov et al. 2014; Freitag and Bauer 2013).[2]

There is some scattered empirical evidence that different people do associate concepts commonly used in survey questions with different things, and that this affects their answers. Belson (1981: 182) probed respondents about the meaning of the question: "Do you think that children suffer any ill effects from watching programmes with violence in them, other than ordinary Westerns?" and found a "high degree of variability in the interpretation of terms like 'children', 'ill effects', 'violence',- such that respondents who offer identical choice of answer may well have been considering rather different aspects of the matter concerned" (Belson 1981: 182). Clearly, respondents might not only offer identical answer choices but also different ones because of the variance in aspects they consider.[3] The question "Do you think that most people can be trusted and that you can't be careful enough in dealing with people?" (Rosenberg 1956) is widely-used to measure social trust. Uslaner (2002: 74) analyzed "think aloud" responses to this question and revealed a large variability in the associations with "most people".[4] However, the fact that different groups of people associated different things with the concept "most people" could be a serious problem. Sturgis and Smith (2010: 89) find that respondents think of different categories of people going from "unknown others" to "known others" which in turn impacts measurement values of trust. Braun, Behr and Kaczmirek (2012: 10) investigate peoples' associations when answering to the typical attitudinal questions on immigration that contain the concept "immigrants". In their study (only) a third of respondents thought of immigrants in general. Besides, respondents were more likely to consider immigrant groups which are visible in their country. The term "political" is another vague concept and

[1] We prefer to use the term "associations" instead of "interpretation". The latter term seems to carry the connotation that people, confronted with a concept, actively interpret it. The term "associations", in contrast, seems to be more in line with the idea that his might be a rather passive, at times subconscious process.

[2] There might be situations in which researchers are interested in a respondent's subjective perception of reality and not the objective reality that lies behind this perception. For instance, in many cases it might be subjectively perceived dangers that impact behavior rather than the objective probabilities of these dangers. However, the question of whether a measurement instrument aims at measuring subjective interpretations has to be differentiated from the question of whether this measurement instrument leaves room for different interpretations by different respondents i.e. is interpersonally incomparable.

[3] In their seminal work "The Psychology of Survey Response" Tourangeau, Rips and Rasinski (2000: 45) dedicate a whole chapter to the general problem (see chapter 2.4.2) and discuss the study by Belson (1981). Belson (1981) reports that only 8% understood the question as intended. Whereas some respondents associated "children" with "kids eight years old or younger", "others understood children as those 19-20 years old or younger" (Tourangeau, Rips and Rasinski 2000: 45).

[4] See the ANES 2000 pilot study open question on generalized trust. Uslaner (2002) finds that this question fares better than two other questions on fairness and helpfulness of Rosenberg's faith in people scale (Rosenberg 1956).

people often disagree over what it signifies. Some people count few themes as "political" whereas others have a broader interpretation of the political sphere and, importantly, interpretation correlates with respondents' social and political attributes (Fitzgerald 2013: 454). Finally, there is ample evidence that different individuals associate different things with the concept of "democracy" (Bratton 2010; Bratton, Mattes and Gyimah-Boadi 2004; Canache, Mondak and Seligson 2001; Dalton, Sin and Jou 2007).

Our study contributes to the existing literature in several ways. First, the current literature on vague concepts has not provided a systematic study of this problem beyond the study of specific concepts (see the examples above). In this paper, we highlight the generality of this problem, raise awareness among a wider audience and provide a more abstract theoretical framework to address this problem in the future. Importantly, we want to emphasize and illustrate how vague concepts may generate problems in empirical investigations. Second, we investigate the general problem with the relevant concrete example of "left", "right", and the left-right scale. It is a standard question in most large scale comparative surveys and has been used in hundreds if not thousands of studies.[5] Taking the example of the left-right scale we ask whether respondents have different associations with vague concepts, whether differences in associations may result in different measurement values for the question containing these concepts, and whether these differences are systematically related to other variables and may interfere in relationships between these and other variables and the scale of interest. We develop three hypotheses and test these by using appropriate data from the German General Social Survey (ALLBUS 2008). We also suggest that standard methods to test for measurement equivalence such as multigroup-confirmatory-factor-analysis (MGCFA) should be complemented by probing methods (cf. Latcheva 2011). In applying topic models to open-ended answers we illustrate one possible way in which this data could be analyzed in the future.

The paper is structured as follows. In the second section we discuss the problem of vague concepts in a general manner. Then we argue why the left-right scale is a suitable illustration of the problem. The fourth section describes the data and methods and the fifth section presents the results. The paper ends with a discussion of our findings.

2 Theory: Concept's vagueness and potential consequences

The investigated methodological problem is general to the survey response process. Accordingly, in building our theoretical expectations we do not delve into more complex accounts of how political or ideological attitudes are organized in individuals' minds (e.g. Conover and Feldman 1984). Rather we depart from the prominent model of the survey response process as formulated by Tourangeau, Rips and Rasinski (2000). This model comprises four stages: Comprehension, retrieval, judgment and response, with each comprising certain mental processes (Tourangeau, Rips and Rasinski 2000). During the first stage respondents link key terms in a question to other concepts. Such key terms are for example the concepts left and right in the left-right question. Any concept - be it in a normal conversation or in a survey question - comes with a certain degree of vagueness[6], but some are more vague than others (Tourangeau, Rips and Rasinski 2000: 45). Already a simple concept such as "car" may generate different associations among

[5] Google Ngram Viewer seems to indicate that widespread use really picked up in 1970.

[6] Oxford dictionary defines "vague" as adjective describing terms of "uncertain, indefinite, or unclear character or meaning" http://www.oxforddictionaries.com/definition/english/vague.

different people.[7] However, in the social sciences we often query people's attitudes towards much more abstract concepts such as "freedom", "justice", "democracy", "liberal", "conservative", "immigrants", "left" and "right". People may have a wide variety of associations when encountering these abstract and vague concepts.[8]

Vagueness can be defined in terms of the variation of associations: The greater the variance of associations that individuals have within a target population (when being confronted with a concept), the greater a concept's vagueness. Importantly, some respondents may have no associations at all. Variation in the understanding of a concept included in a survey question may result in measurement inequivalence. More precisely, different values on an answer scale might be due to different understandings and not due to true differences on the underlying latent scale (which the researcher wants to measure). Variation in understandings might, in turn, be caused by other variables such as the level of education or the cultural background.

In the following, we consider left and right as used in the left-right scale as an example for vague concepts in the social sciences. The scale is prominent for several reasons. It is a very simple, popular and widely-used scale that is supposed to capture one of the most important concepts in the social sciences, ideology. Due to its simplicity and brevity, it can be easily included in surveys without costing to much time or money. At the same time it's usage has always been accompanied by criticism (see Appendix 6.1 for an overview). As we will show the concepts "left" and "right" are what we call vague concepts in the social sciences. They can, for instance, be associated with ideologies, with specific values, with political positions in different policy fields or with political parties and actors. In surveys, respondents are however just asked to position themselves on a scale ranging from "left" to "right" without any further clarifications.

Discussing the general problem of vague concepts, we depart from the idea that every vague concept is linked to an exhaustive set of associations that are triggered when a sample of respondents is confronted with this concept in a survey question. Respondents answer "questions on the basis of whatever ideas are at the top of their heads at the moment of answering" (Zaller 1992: 579). When people are asked, "In politics people sometimes talk of 'left' and 'right'. Using this card, where would you place yourself on this scale, where 0 means the left and 10 means the right?" (ESS 2012), they even face two vague concepts within one survey question. "Left" and "right" may mean very different things to different individuals (Bauer-Kaase 2001; Freire and Belchior 2011; Neundorf 2009 2011; Zechmeister 2006). Some people might think of ideologies on an abstract level and even within this group of respondents the ideologies they have in mind might differ. Left might for instance be associated with communism as well as socialism. Another group of people might think of specific values when being confronted with the left-right scale. Again, the values people think of potentially differ within this group. Knutsen (1995) shows that a pluralization of values correlated with left and right has taken place during the last decades. Some might associate right

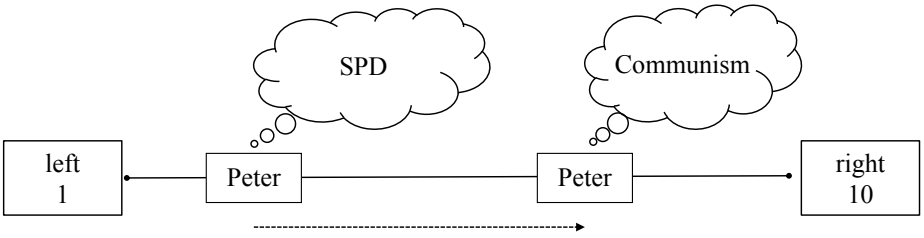
[7] Person A might have a Fiat Punto in mind whereas person B might think of a Hummer which may impact their evaluation of e.g. the impact of cars on the environment. On the one hand different types of cars are relatively concrete real-life objects, on the other hand depending on the question it might matter for my answer whether I think of a Hummer or a Fiat Punto.

[8] It has long been argued that differences between different scale points may be interpreted differently by different respondents. Also quantifiers on response scales such as "totally agree" represent vague concepts (see e.g., Tourangeau, Rips and Rasinski 2000: 47 and King et al. 2004 for discussions and potential solutions). The problem we discuss here is similar in nature, however, we want to emphasize the role played by more abstract concepts such "democracy" or "left". Especially, in cross-cultural and cross-linguistic research the error induced by the latter concepts should be more relevant.

with order while others think of intolerance. Justice as well as freedom might be values typically connected to left. A third group of people might think of political positions on certain issues when asked about their own position on the scale. Since the policy space in Europe is at least two dimensional (Kitschelt 2004; Kitschelt and Hellemans 1990) - comprising an economic and a cultural dimension - the policy fields and issues they think of probably differ to a large extent. Person A might think of economic policies, person B might have social policies in mind and person C might think of ecological topics. Finally a fourth group of people connects the terms left and right with political parties and actors. Regarding the exact position of these actors, people might again differ. Some consider the SPD to be left while others name the PDS (precursor of Die Linke). If we designate the exhaustive set of associations for "left" across all respondents as Ω_{left} = {*SPD, communism, justice*} and the set of associations for "right" as Ω_{right} = {*CDU, conservatism, order*} we can define a concept's vagueness as the size of Ω in the sample population. In our example we could say that the size of Ω_{left} (resp. Ω_{right}) equals 3. Any respondent in the sample associates "left" with one of the three options in Ω_{left}. A concept is more vague if the size of $\Omega_{concept}$ increases. As these formal explanations show, it is likely that people have very different things in mind when they are asked to position themselves on the left-right scale. Accordingly, we hypothesize that *associations respondents have with the concepts left and right strongly vary (H1).*

Given the variation in associations with a vague concept (H1), we assume that there is a causal effect of associations on measurement values. In other words the same individual (e.g. I_{Peter}) would give a different answer to the same survey question when he would have a different association with the concept contained in that survey question (e.g. $\Omega_{I_{Peter},left}$ = {SPD} vs. $\Omega_{I_{Peter},left}$ = {communism}).[9] Depending on the extremity of the meanings attached to the terms left and right, one might tend to position oneself closer to the center of the scale or farther from it (see Figure 1). For instance, if one thinks that left stands for SPD, the social-democratic party, one might possibly position oneself near the tails. However, if one associates left with communism, one will probably position oneself closer to the center or the right tail. Furthermore it might simply depend on whether one associates ideologies, values or concrete policy issues with the left-right scale. For instance, left-wing values like equality have a positive connotation and might therefore lead to a more extreme position. Thus, we hypothesize that *respondents' associations with left and right influence them when placing themselves on the left-right scale (H2).*

Figure 1: Associations (e.g. with "left") and answers: Single individual

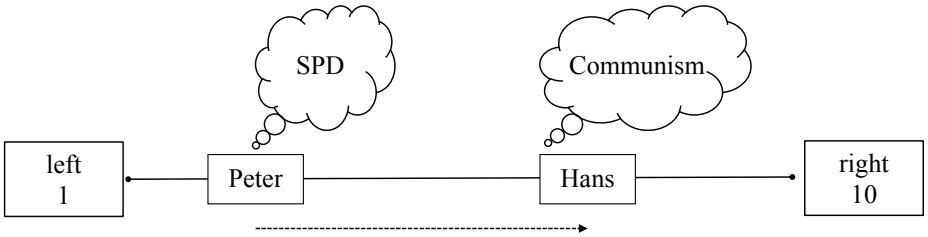


Moving to a two person example illustrates why H1 is so relevant. When we pick two respondents I_{Peter} and I_{Hans} out of the sample it seems highly probable that the two respondents have different associations with a vague concept (e.g. $\Omega_{I_{Peter},left}$ = {SPD} vs. $\Omega_{I_{Hans},left}$ = {communism}). If we compare their self-placement on the left-right scale and find a difference we cannot be sure that the difference is due to

[9] We only illustrate the impact on measurement for different associations with "left". The same problem exists of course exists for "right" which is the other end of the scale.

a difference in associations with the concept "left" or due to a real difference in their political ideology (see Figure 2). In contrast, if the concept would trigger the same association for the two respondents (e.g. $\Omega_{I_{Peter},left}$ = {SPD}; $\Omega_{I_{Hans},left}$ = {SPD}), then we would know that the difference in their scale values is not due to a difference in associations. The latter would be an example of measurement equivalence or interpersonal comparability (at least regarding one concept contained in the question).

Figure 2: Associations (e.g. with "left") and answers: Two individual



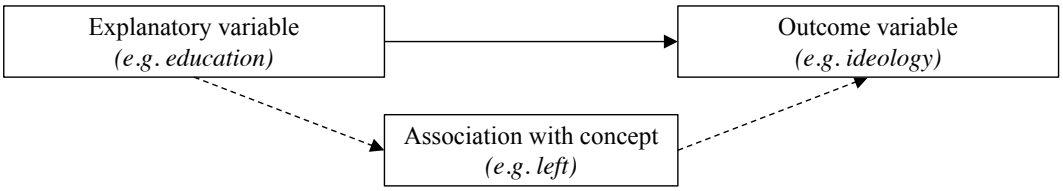
Normally, we compare groups of respondents with each other such as high income respondents vs. low income respondents or highly educated respondents vs. low educated respondents. This case is different from the case with just two respondents. When comparing two (or more) groups with each other it is merely necessary that the groups' draw from the set of associations Ω_{left} = {SPD, communism, justice} is equal on average. In such a case we end up with two groups which have a similar distribution of associations. For instance, in both groups 50% of respondents associate left with "SPD", 25% with "communism" and 25% with "justice". Expressed formally: $\Omega_{G_1,left}$ = {50% SPD, 25% communism, 25% justice} and $\Omega_{G_2,left}$ = {50% SPD, 25% communism, 25% justice}. Subsequently, differences in means on the scale (i.e. in values of the outcome variable) between the two groups are not due to differences in associations because these are equal on average.

Two groups with an equal distribution of associations would be easily attainable if individuals would randomly draw from the overall exhaustive set of associations. This, however, is very unrealistic. It is much more likely that some individuals/groups have associations that are systematically different from those of other individuals/groups. The overall exhaustive set might be Ω_{left} = {SPD, communism, justice}. However, if Group 1's subset is $\Omega_{G_1,left}$ = {SPD, justice} and Group 2's subset $\Omega_{G_2,left}$ = {communism} we would expect that Group 1 has a different average on the left-right scale than Group 2 due to the difference in associations. Importantly, there might be a substantive reason for this systematic difference in associations. For instance, the associations one has could depend on individual characteristics such as education, political interest or political sophistication (Bauer-Kaase 2001; Freire and Belchior 2011; Zechmeister and Corral 2010). Such systematic co-variation is problematic since it can interfere when using the left-right scale as independent or dependent variable. Differences in observed values between groups, e.g. the higher educated vs. the lower educated, might result from measurement inequivalence, rather than true differences on the latent scale one aims to measure.[10]
The following example illustrates this problem. Education is assumed to affect ideology (Dunn 2011). At the same time higher educated people might be able to refer to abstract terms like socialism instead of using phrases like "they want that everybody gets the same" (Campbell et al. 1960: 250-256, Converse 1964: 224-227, Inglehart and Klingemann 1976: 261, Klingemann and Wright 1973: Table 7). Hence, associations

[10] A survey question should ideally trigger the same associations/interpretation across respondents to attain measurement equivalence.

should systematically vary with education (Fuchs and Klingemann 1990: 209). Thus, as depicted in Figure 3 the explanatory variable (education) might affect an outcome variable (ideology) directly but also indirectly over differential associations: The concepts "left" and "right" trigger different associations among individuals that have different levels of education. This should also hold for politically interested and politically sophisticated respondents. They are assumed to be aware of the multidimensionality of the policy space and the complexity of political problems. Therefore they should rather refer to abstract ideologies than to specific policy fields or the position of a specific party. It is also likely that partisans of different parties have different association with left and right which might interfere when investigating the relationship between partisanship and ideology as measured through left-right self-placement (see Inglehart and Klingemann 1976). Overall we assume that respondents' associations with the concepts left and right are systematically related to other characteristics. As a consequence, *observed differences on the left-right scale between groups may not be substantial but rather due to different "interpretation" of the concepts between these groups (H3).*

Figure 3: Interference of question interpretation in observed relationships



To sum up, individuals or groups of individuals may have different associations with a concept. This, in turn, may impact the measurement values for questions that contain this concept. If these associations vary systematically for different groups of individuals (e.g. socio-economic, linguistic or cultural groups), it leads to interpersonal/intergroup incomparability and it interferes when investigating relationships between ideology and other variables. This argument can easily be generalized to different vague concepts that we currently use in our survey questions.[11][12]

3 Data and methods

The data comes from the General Social Survey 2008 in Germany (ALLBUS 2008), comprises 3469 individuals, and was collected through a two stage disproportionate random sample in western Germany (incl. West Berlin) and eastern Germany (incl. East Berlin). The target population comprises all individuals (German and non-German) who resided in private households on the day of the interview and were born before 1 January 1990.[13]

[11] We exclude another problem here: In some populations certain concepts might simply not exist (Fitzgerald et al. 2011: 570). Hence, certain populations may have no associations with a concept at all.

[12] In terms of overall validity it is clear that a survey question should match a researcher's conceptual definition (Sturgis and Smith 2010: 89). The problems of interpersonal incomparability discussed here may, however, render a seemingly valid measure of a scientific concept invalid.

[13] In the first sample stage municipalities (Gemeinden) in western Germany and municipalities in eastern Germany were selected with a probability proportional to their number of adult residents; in the second sample stage individual persons were selected at random from the municipal registers of residents. Targeted individuals who did not have adequate knowledge of German to conduct the interview were treated as systematic unit non-responses. The method of data collection were

The position on the 10-point left-right scale was measured as follows: "Many people use the terms "left" and "right" to denote different political attitudes. Here we have a scale that runs from left to right. When you think of your own political views where would you position yourself on this scale?" Directly after this question respondents were asked two questions (randomized order): "Would you please tell me what you associate with the term "left"?" and "Would you please tell me what you associate with the term "right"?" (Scholz and Zuell 2012, Züll and Scholz 2012, Züll, Scholz and Schmitt 2010: 5). Interviewers were told to note the exact responses. Hence, a probing strategy was employed in which respondents are asked followup questions. This "open-ended" technique is advantageous because by giving respondents a closed-ended question with categories (e.g. ideologies, parties) we would prime them with associations that they might not have had themselves. Since the probing questions were asked directly after the actual left-right question we assume that they really reveal respondents' associations during that question. In standard interviews in which respondents are required to successively answer many questions in limited time, only one association may be immediately available in memory so that respondents answer on the basis of a single "top-of-the-head" consideration (Zaller 1992: 586, Taylor and Fiske). The probing technique above should capture this consideration.[14]

The result is text data that contains respondents' separate answers to the two questions mentioned above. We treat and analyze the raw text data in two different ways. First, we directly analyze the words mentioned by the respondents to examine the frequency with which different words have been used by respondents. Following the standard practice in text mining (Krippendorff 2012), "stopwords" (common words that are generally considered to be non-informative) were not included in our analysis (see Table 4 in appendix for the stopwords). Second, to summarize respondents' answers into broader categories we rely on a topic modeling technique similar to Latent Dirichlet Allocation (Blei, Ng and Jordan 2003) which allows us to discover cluster of words that co-occur in subjects' responses to the question what associations they have with "left" and "right". This family of models considers each response as a distribution of different topics, and each topic as a distribution over words. Given the short length of the text in the responses, we estimate a Sparse Additive Generative (SAGE) model (Eisenstein, Ahmed and Xing 2011), which has been shown to yield more semantically coherent topics than LDA in these situations. The key difference is that SAGE models treat topics as distributions over deviations from a general distribution over words, and therefore prevents overfitting, which can be a problematic issue when many words are rare. We estimated SAGE models with different numbers of topics, using the implementation in the `stm` package for R (Roberts, Stewart and Tingley 2014). Subsequently, we evaluated semantic coherence and exclusiveness independently from each other (4 raters) and concluded that 4 topics is the adequate number. Table 1 lists the top 10 scoring words associated with each topic, ordered by their "lift" (Taddy 2013), which allows us to identify what words are more specific for each individual topic. For both concepts, we find that each topic identifies a theoretically relevant category. Political parties (SPD and greens on the left; CDU, CSU and FDP on the right) and ideologies (communism on the left; national socialism on the right) are associated with both concepts. Left is furthermore linked to social values (equality

personal interviews with standardized questionnaire (CAPI - Computer Assisted Personal Interviewing) (see `http://www.gesis.org/en/allbus/study-profiles/2008/`).

[14] A different approach would be to query their associations before letting them locate themselves on the left-right scale. However, here we want to investigate, how respondents, deal with the left-right scale, and thus we consider this question order to be more adequate for that purpose. Another technique to reveal associations during the answering process could be the think aloud technique. Note, however, that this method comes with certain weaknesses suggested by (Tourangeau, Rips and Rasinski 2000: 44-45).

and social justice) and policy aims (human rights and redistribution), while right is linked to right-wing extremists (nazis and radicals) and xenophobic attitudes (xenophobia and nationalism). For each topic a variable is generated that contains probabilities for each respondent that his or her answer belongs to this topic. Once we have computed the probabilities that each individual associated the concepts of "left" and "right" with each of these 4 different topics, we then test our different hypotheses.

Table 1: Top scoring stems associated with each topic, and English translations (words)

Left topic 1: **Parties** (proportion = .26, average lr-scale value = 5.38) linke, spd, partei, linken, pds, politik, kommunisten, parteien, grünen, punks *the left, spd, party, the left, pds, politics, communists, parties, greens, punks*
Left topic 2: **Ideologies** (proportion = .26, average lr-scale value = 5.36) kommunismus, links, sozialismus, lafontaine, rechts, aber, gysi, linkspartei, richtung, gleichmacherei *communism, left, socialism, lafontaine, right, but, gysi, left party, direction, levelling*
Left topic 3: **Values** (proportion = .24, average lr-scale value = 4.06) soziale, gerechtigkeit, demokratie, soziales, bürger, gleichheit, gleiche, freiheit, rechte, gleichberechtigung *social, justice, democracy, social, citizen, equality, equal, freedom, rights, equal rights*
Left topic 4: **Policies** (proportion = .24, average lr-scale value =4.89) sozial, menschen, leute, ddr, verbinde, kleinen, einstellung, umverteilung, sozialen, vertreten *social, humans, people, ddr, associate, the little, attitude, redistribution, social, represent*
Right topic 1: **Ideologies** (proportion = .27, average lr-scale value = 5.00) konservativ, nationalsozialismus, rechtsradikal, radikal, ordnung, politik, nazi, recht, menschen, konservative *conservative, national socialism, right-wing radicalism, radical, order, politics, nazi, right, people, conservatives*
Right topic 2: **Parties** (proportion = .25, average lr-scale value = 5.26) npd, rechts, cdu, csu, rechten, parteien, leute, aber, verbinde, rechtsradikalen *npd, right, cdu, csu, the right, parties, people, but, associate, right-wing radicalists*
Right topic 3: **Xenophobia** (proportion = .25, average lr-scale value = 4.55) ausländerfeindlichkeit, gewalt, ausländer, demokratie, nationalismus, rechtsradikalismus, diktatur, national, intoleranz, faschismus *xenophobia, violence, foreigners, democracy, nationalism, right-wing radicalism, dictatorship, national, intolerance, fascism*
Right topic 4: **Right-wing extremists** (proportion = .23, average lr-scale value = 4.90) nazis, neonazis, rechtsradikale, rechte, radikale, radikalismus, partei, ausländerfeindlich, reich, nationale *nazis, neonazis, right-wing radicalists, rightists, radicals, radicalism, party, xenophobia, rich, national*

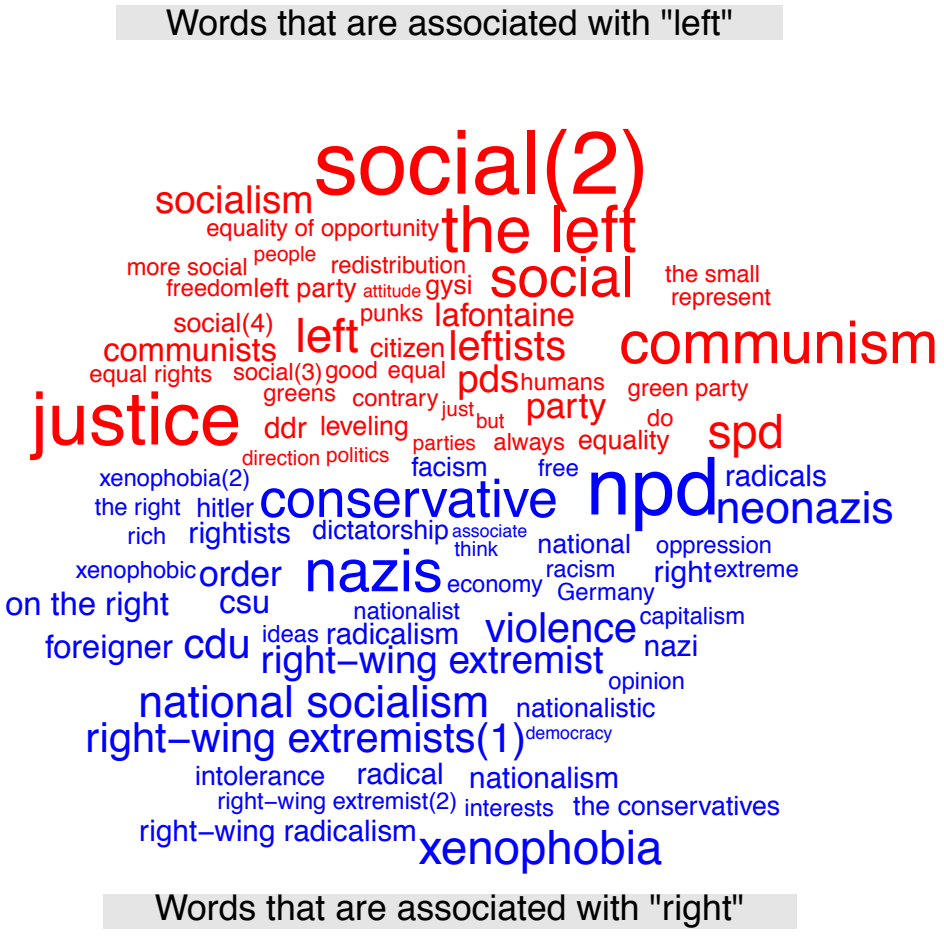
Note: "proportion" indicates the average estimated probability that any given response is assigned to a topic. "average lr-scale value" is the mean position on the left-right scale (from 0 to 10) of individuals whose highest probability belongs to that particular topic.

As a robustness check and validation tool, we check whether the results are comparable to analyses done using a classical manual coding strategy (See Section 6.2 of the Appendix). In addition, the ALLBUS 2008 comprises different questions querying respondents' socio-demographic characteristics such as gender, education, income, age and other variables such as political interest and party preferences. Table 3 gives an overview of all variables used in the analysis. We apply various methods from simply counting words to estimating simple statistical models to test our hypotheses.

4 Empirical results

Variance in associations with "left" and "right"

Figure 4: Words that are associated with left and right (size $\propto$ word count)



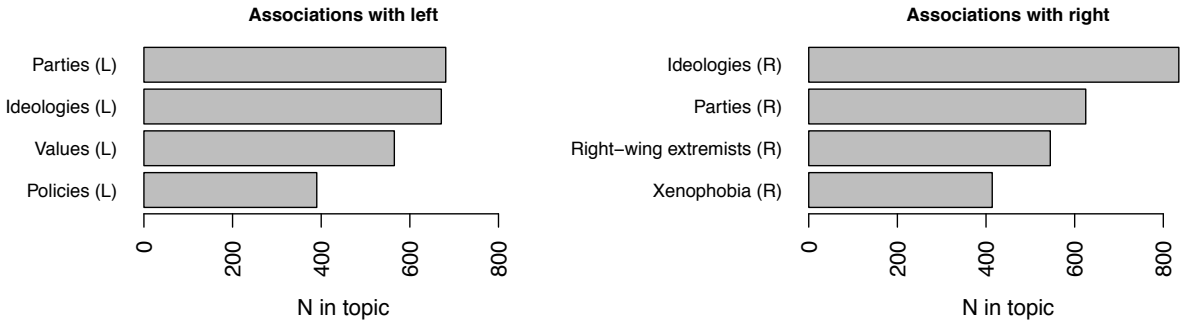
Note: Plot depicts most common words (size proportional to times mentioned) for both left (red) and right (blue). Some words appear several times because the english translation corresponds to several German terms such as xenophobia to Ausländerfeindlichkeit and Fremdenfeindlichkeit.

First, we hypothesized that *there is considerable variation in the associations people have with vague concepts i.e. the concepts left and right (H1).* Importantly, 21% (713) gave no response at all to the probing question for left and 19% (664) gave no response at all to the probing question for right (17% gave no response to both of the probing questions). Scholz and Zuell (2012) analyzed non-respondents in this data set and conclude that non-response is linked to education, political interest and political activities. We assume that respondents would give an answer if they could to please the interviewer. If they don't it means that they do not have any clear associations with the concepts left and right. Of those respondents who gave a response 6% (195) directly indicated that they don't know for left and 5% (177) for right. Hence, the overall share of respondents who do not give an answer regarding their associations lies at 27% for left and 24% for right (and 21% for both probing questions). Those who can't (or do not) answer to both probing questions have a higher average (5.6 compared to 5) and a lower variance (2.4 compared to 3.1) on the left-right scale. Generally, if respondents do not comprehend the key concepts in a question they should not be able to decide what their attitude is (Zaller 1992: 582). The gap between the ability to answer fixed-choice questions but the difficulty to do the same for more open formats was already revealed by Hochschild (1986). Overall, this seems to indicate that the question is too difficult for many respondents.

Figure 4 shows the words that were mentioned more frequently in relation to "left" (in red) and "right" (in blue) (see Figure 14 for the original, in German original). The size of the words is proportional to the times they were mentioned by respondents. It becomes immediately clear that the concepts left and right trigger a wide variety of associations going from ideologies, values to political actors such as the CDU, SPD or NPD to specific groups such as right-wing extremists. Hence, the sets Ω_{left} and Ω_{right} are quite large. At the same time respondents clearly seem to make a difference between the concept left and the concept right.

In Figure 5 we turn from simple word counts to the answers as coded into the four topics with help of the topic model. Each individual gets four probability values indicating the probability of his answer being located in the respective topic. We divide individuals into the four categories, classifying them according to the topic for which they display the highest probability. Figure 5 displays the absolute numbers of individuals sorted into the topic categories. We can see the most answers tend to be located in the topic of political parties for left followed by ideologies, values and policies. For right the most common topic is ideologies followed by parties, right-wing extremists and xenophobia.

Figure 5: Number of respondents in 4 different topics (split for left and right associations)



To sum up, there is considerable variance in what respondents associate with the concepts left and right. This is the case both when analyzing single words but also when coding respondents' answers into broader categories. These results lend support to our first hypothesis (H1).

Associations with "left" and "right" and left-right scale measurement values

There is considerable variation in respondents' associations with left and right. This could become a significant problem if, as we hypothesize, *measurement values on the left-right scale are to some extent dependent on respondents' associations with left and right (H2).* We start by simply comparing means for respondents whose associations belong into one of the most frequent categories. Figure 6 displays the left-right scale means of respondents for categories of associations with left. Figure 7 is the same but for right. We see that there are some significant differences. Respondents whose answers belong to the topics "values" or "policies" have scale values that are lower on average in comparison to respondents whose associations belong to the topics "ideology" or "parties" (see Figure 7).

Figure 6: Left-right scale means for different subsamples of associations with left (dashed = sample mean, bars = 95% Cis)

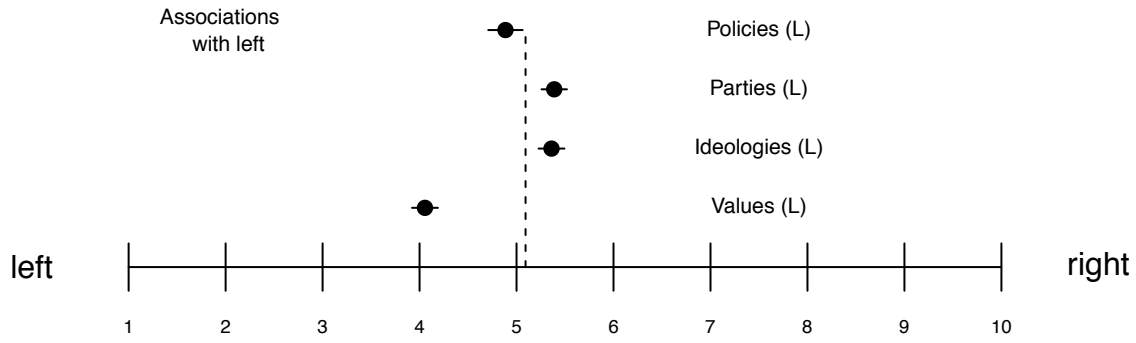
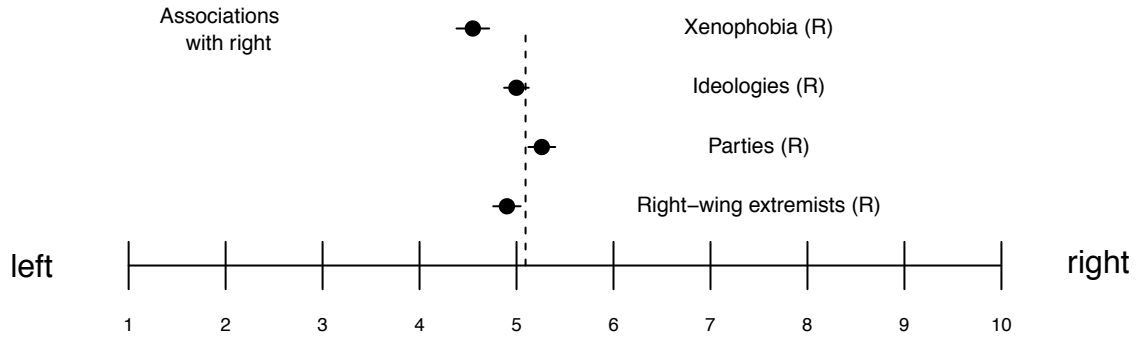


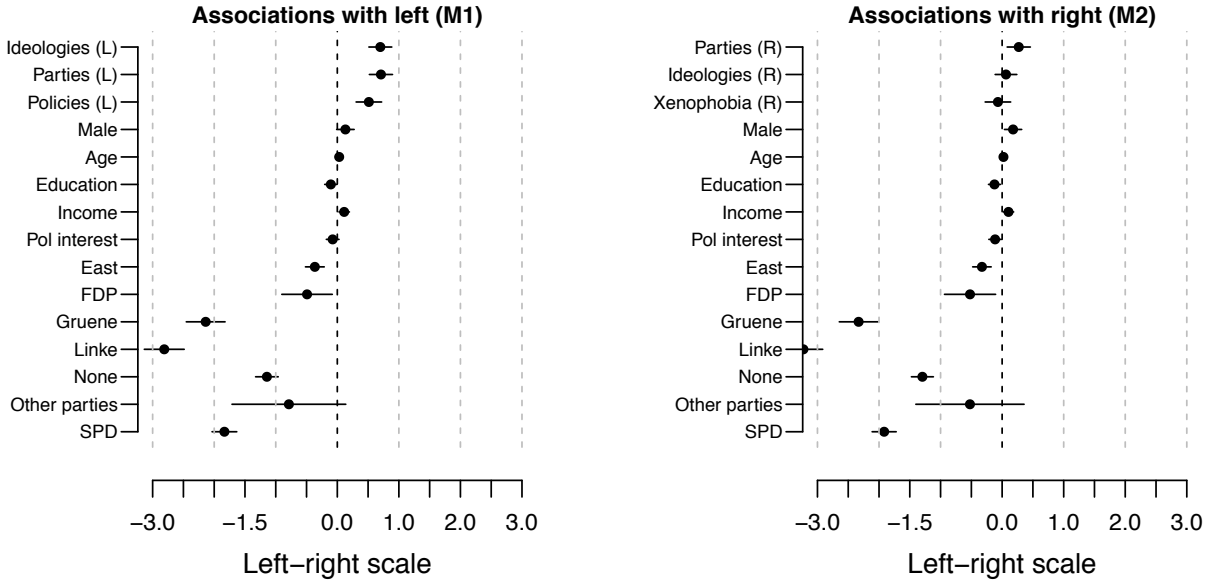
Figure 7: Left-right scale means for different subsamples of associations with right (dashed = sample mean, bars = 95% Cis)



Eventually, we are interested in whether these mean differences are robust when controlling for different co-variates that might influence both associations and ideology. For instance, support for a left wing

party may affect both the associations one has with the concept "left" in the left-right scale as well as the self-location on the left-right scale. We estimate two regression models in which the four topics of associations are introduced as a categorical variable (baseline is "values" for both categories). Model 1 in Figure 8 displays the results for categories of associations with left and Model 2 the results for categories of associations with right (see Table 5 for results). We control for gender (male), age, education, income, political interest, region of interview (east vs. west) and party preference (baseline = no preference). The results in Figure 8 show that associations do matter. Despite controlling for possible confounders that might influence both associations as well as ideology such as party preferences, associations do play a role of their own.

Figure 8: Linear regression of left-right scale measurement values on topics of associations



Note: Each line indicates a 95% confidence interval, dots the coefficient of two different regressions of left-right self-placement on topic categories controlling for covariates. Both associations (= topics) and party preference have been introduced as categorical variables (baseline: values (left) /right-wing extremists (right) and cdu).

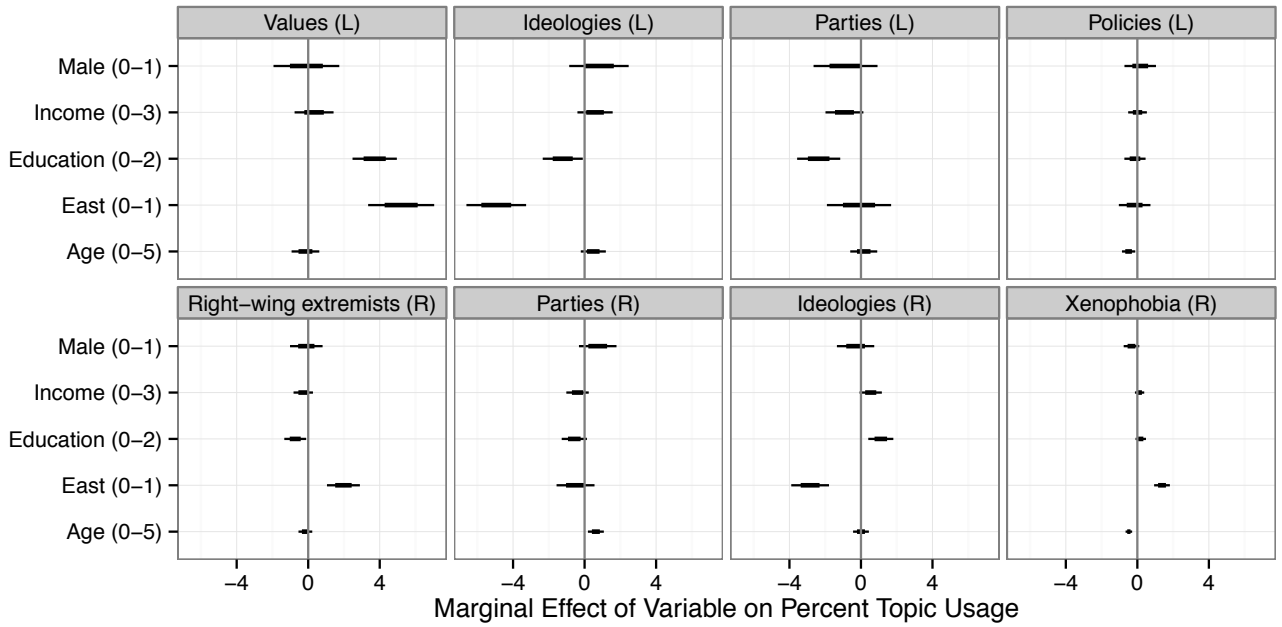
In additional models (see Table 6 and Table 7 in the appendix) we test the impact of left (or right) associations while holding the associations with the other scale point constant. We re-estimate Model 1 and Model 2 in the respective 8 sub samples, one model for each of the 4 topics that the other scale endpoint might be categorized into. We find effects on self-placement even when holding constant associations with the other scale endpoint. Since we did not conduct a randomized experiment we can not ultimately speak of a causal effect.[15] However, given that we controlled for the most important determinants of ideology which, in turn, should also be the main factors influencing the interpretation of the concepts left and

[15] We considered designing a survey experiment that would allow for priming respondents with associations and measuring the causal effect of these primes on left-right self-placement. We refrained from doing so for two reasons: First, by priming respondents with associations, respondents get artificial associations, i.e. associations that they did not have themselves. For instance, someone who might normally associate the term left with the SPD might suddenly end up associating it with the value equality. Second, such a priming experiment would artificially inflate the number of people that have any associations with the concepts at all. Hence, by using such an approach one generates an artificial and potentially unrealistic sample from which one can only derive distorted conclusions.

right, we are fairly confident that associations really do affect left-right self-placement. In other words, the data do give support to H2 that *measurement values on the left-right scale are influenced by peoples' associations with left and right.*

Systematic relationship with socio-demographics and interference in relationships

Figure 9: Systematic relationship between associations with left and right and sociodemographic characteristics of respondents



Note: Each line indicates a 95% confidence interval (and 66% confidence interval in darker color) for the coefficient of eight different regressions of topic usage (in a scale from 0 to 100) at the respondent level on seven individual-level characteristics. The line on the bottom right corner, for example, shows that individual a one-category change in age is associated with around one percentage point increase in the probability that the individual associated "right" with political parties.

In a third step we hypothesize that *the variation in associations people have with the concepts left and right (that we found above) is systematically related to respondents' characteristics, more specifically education (H3).*

We test our third hypothesis expanding our analysis in the previous section. First, we run eight different regressions of "topic usage" (the estimated probabilities for each individual, rescaled to a 0 to 100 scale) on five different sociodemographic variables of interest. Following the literature the main factor that should influence question interpretation is education. In contrast, we would expect that variables such as gender or age matter less or not at all. Our results provide evidence for this hypothesis. We find that higher educated respondents tend to associate "left" more often with values and less so with parties (see Figure 9). Interestingly, political culture, here operationalized as dummy that differentiates between East and West German respondents is another factor that matters. Respondents from Eastern Germany tend to associate left more with values and less so with ideologies or parties. Similarly, the higher educated tend to associate right more with ideologies and less so with parties although the effects are less strong. Respondents from Eastern Germany clearly associate right with xenophobia or right-wing

extremists rather than ideologies.
Second, we investigate whether associations interfere when estimating the effects of education on ideology. Both theory and empirical research suggest that there is a link (Ekehammar, Nilsson and Sidanius 1987; Gabennesch 1972; Gerber et al. 2010; Kaiser and Lilly 1975; McClintock and Turner 1962; Morton, Tyran and Wengström 2011; Weil 1985). Research also shows that education is linked to the ability of forming consistent ideological beliefs (Converse 1964) and to response behavior and question interpretation in general (Tourangeau, Rips and Rasinski 2000: 47-48).
We showed that respondents of differing educational levels differ systematically with regard to their associations with left and right (see Figure 9). In a further step, we estimated six models in total for left and right (the sample comprises respondents that gave answers to the probing questions): Two bi-variate models, two models where we add the categorical topic variable as control and two models where we let the categorical topic variable interact with education. Table 2 displays the results. For associations with left we find that adding them to the equation decreases the coefficient. In other words, the education-ideology relationship is weaker in topic subsamples. Besides, education interacts with the topic "policies" i.e. in this subsample the negative relationship between education and ideology is stronger. For right the picture is somewhat different. Controlling for associations only slightly reduces the coefficient. However, when adding interactions we see that the negative relationship between education and ideology is stronger among those that associate right with xenophobia or ideologies.
This last analysis indicates that associations might very well interfere when we investigate the relationships between substantive variables (e.g. education and ideology). Importantly, our analysis is rather conservative because the four topics we found in the data are broad summaries of respondents' associations. For instance, the topic "ideologies" for left comprises communism but also something less radical such as socialism. In other words, by summarizing the associational data into these 4 rather broad topics (for left and right) we are losing within-topic variation, that might matter when it comes to interference in relationships between ideology and other covariates such as education.

5 Discussion and conclusion

This study investigate three research questions: Do different people associate different things with vague concepts? If yes, does this affect their measurement values? If so, are these associations systematically different for different groups of people and may as a consequence interfere in relationships between variables? We seek answers to these questions and rely on the example of the left-right scale.
Our results replicate the finding that many respondents do not have any associations with left or right at all or don't give any response (Scholz and Zuell 2012). For those who do, we find considerable variation in the associations with the concepts left and right (H1). Besides, measurement values on the left-right scale are related to respondents' associations with these concepts (H2). Finally, associations with the concepts left and right are systematically related to respondents' education and whether they live in East or West Germany. In addition, concept interpretation seems to interfere into the empirical relationship between education and ideology (H3).
Generally, these findings put into question the left-right scale as a measure of ideology. Although more research is needed, we are convinced that the left-right scale question presents serious disadvantages. We suggest three possible ways to cope with these disadvantages. One solution is to rely on more specific

Table 2: The effect of education on left-right self-placement and interaction with associations

	Dependent variable:					
	Left-right scale					
	(1)	(2)	(3)	(4)	(5)	(6)
Education	−0.30***	−0.20***	−0.14	−0.31***	−0.28***	−0.11
	(0.05)	(0.05)	(0.10)	(0.05)	(0.05)	(0.10)
Ideologies (L)		1.26***	1.29***			
		(0.10)	(0.16)			
Parties (L)		1.27***	1.31***			
		(0.10)	(0.16)			
Policies (L)		0.81***	1.07***			
		(0.11)	(0.19)			
Education * Ideologies (L)			−0.01			
			(0.13)			
Education * Parties (L)			−0.03			
			(0.13)			
Education * Policies (L)			−0.26*			
			(0.15)			
Parties (R)					0.35***	0.49***
					(0.11)	(0.16)
Ideologies (R)					0.14	0.34**
					(0.10)	(0.15)
Xenophobia (R)					−0.29**	−0.01
					(0.12)	(0.19)
Education * Parties (R)						−0.17
						(0.14)
Education * Ideologies (R)						−0.22*
						(0.13)
Education * Xenophobia (R)						−0.29*
						(0.16)
Constant	5.24***	4.28***	4.21***	5.25***	5.15***	5.00***
	(0.06)	(0.09)	(0.13)	(0.06)	(0.09)	(0.12)
Observations	2,196	2,196	2,196	2,287	2,287	2,287
R^2	0.02	0.10	0.11	0.02	0.03	0.03
Adjusted R^2	0.02	0.10	0.10	0.02	0.03	0.03

Note: *p<0.1; **p<0.05; ***p<0.01; Estimation using OLS; Dependent variable: Left-right scale;

questions and to construct an ideological index based on their aggregation, perhaps in combination with more advanced scaling techniques such as item-response theory models (see e.g. Bafumi and Herron 2010; Jessee 2009). This technique has become increasingly common in the literature on American politics (see e.g. Bafumi and Herron 2010; Jessee 2009), but to our knowledge it hasn't been applied in comparative studies. This approach presents three important advantages. First, it minimizes the differences in associations across individuals by asking attitudes towards specific issues (e.g. income redistribution, immigration, social programs, same-sex marriage, etc.). Some of these questions still contain vague concepts, but this vagueness is more limited in scope. Second, the aggregation of multiple items increases the precision of the estimated positions and it also allows us to estimate the uncertainty of these estimates, which can be particularly informative for individuals who give incoherent answers. Finally, if parties' and legislators' responses to these same questions are available, it allows researchers to locate political actors and individuals on the same ideological scale, which can be useful in many political science applications. Another possible solution would be the usage of measures based on behavior that can be observed unobtrusively (Barberá 2013; Bonica 2013; Kosinski, Stillwell and Graepel 2013). For example, Bonica (2013) shows that individual contributions to candidates to the U.S. Congress can be scaled to estimate ideological positions for legislators and donors that replicate existing measures based on roll-call votes.

Barberá (2013) finds that, under similar assumptions, the structure of social media networks can also be highly informative about individuals' ideology, with the advantage that this method can be applied in any country. These approaches of course require the availability of contributions records or social media profiles that can be matched to survey respondents, but this is likely to be increasingly common as more and more surveys are conducted within online panels. And, in comparison to self-reported measures, they have the advantage of inducing social desirability biases to a lesser extent. Finally, when these alternative approaches are not possible, either because researchers are working with secondary data or for budget constraint reasons, we argue that they should make their assumptions explicit and discuss in the analysis to what extent interpersonal incomparability of the left-right scale presents a danger or not to the validity of their results.

The problem described and investigated in this paper also applies to other concepts such as "democracy", "conservative", "liberal" and "immigrants". Although vague concepts and resulting differential associations are just one of many problems in survey measurement we think it is an important one that was largely underestimated to this date. Bad measurement i.e. systematically biased measurement may badly affect causal inference. Generally, when we ask respondents to give a number they'll give us a number. However, as survey researchers we have to make sure that the concepts we use in our questions trigger homogenous associations across members of the target population. In comparative research the discussed problems should be aggravated since target populations may easily comprise thousands of individuals across different countries. If the target population is not thought to have homogenous associations with a certain concept we probably should not use this concept. Rather than trying to explain it (e.g., by "left" we mean...) in the survey question we might as well use more concrete questions (e.g., are you in favor of paying more taxes to...).

Future research should extend into different directions. First, the problems we pointed to are normally stronger in cross-national or cross-cultural data. Analyzing data from only one country can be seen as a conservative strategy, however, our claims should be further analyzed and tested with cross-national data. Second, we used relatively recently developed topic models/algorithms to analyze and break down the responses to the open-ended questions. Our approach yields good results and we contribute to a growing literature that relies on topic modeling techniques to examine open-ended answers (Roberts et al. 2014). However, more research is necessary in order to understand what methods fare best with what kind of text data and open-ended questions. Finally, the concepts left and right are just two examples for vague concepts and the research conducted in this study should be extended to other "vague" concepts that are regularly used in survey questions in the social sciences.

6 Appendix

6.1 History and usage of the left-right scale

The two concepts, left and right, are used as description of the political space measured by a scale contrasting liberal or progressive with conservative political positions. They originate from the seating arrangement in the French Parliament (Fuhse 2004; Raschke 1998). Right after the French Revolution the Members of Parliament started to sit next to each other according to their ideological position: the conservatives sat on the right side, the progressives sat on the left side. This is how we began to associate these two simple adjectives of spatial positions and directions with political ideologies. From the very start, distinguishing between left and right has thus been a means to reduce the complexity of the political space, "which serves primarily to provide an orientation function for individuals and a communications function for the political system" (Fuchs and Klingemann 1990: 205).

The first step towards measuring ideologies on a one-dimensional scale was made by the economist Hotelling (1929) who analyzed effects of the distance between the relevant market actors on the market price of a good. Taking up this concept of a spatial market, Downs (1957) developed the idea of a one-dimensional political market in which the whole spectrum of political preferences is "[...] ordered from left to right in a manner agreed upon by all voters" (Downs 1957: 115). His political spatial market ranged from 0 to 100, covering the degree to which percentage the government should intervene in economic affairs which made his model the first to be based on a liberal-conservative scale, ranging from left to right. The liberal-conservative scale is the Anglo-American counterpart to the Western European left-right scale and they are theoretically very similar (and practically often treated as the same) (see Fuchs and Klingemann 1990: 204, Huber 1989: 601, Inglehart and Klingemann 1976: 244, Neundorf 2011: 233, Poole and Rosenthal 2007, Stokes 1963: 368).

In current social science research the left-right scale is widely used to measure respondents' ideology as well as to position political actors and parties.[16] The response scales used in these publications differ widely. While some use three- to eleven-point scales, others forgo a neutral middle point and apply scales with an even number of scale points. Even though the vast majority of these articles trusts in the explanatory power of the scale, we are, of course, not the first social scientists to be suspicious of the left-right scale. There are a number of studies mainly focusing on the variance of interpretations of this scale (Bauer-Kaase 2001; Conover and Feldman 1981; Corbetta, Cavazza and Roccato 2009; Freire 2006; Freire and Belchior 2011; Fuchs and Klingemann 1990; Inglehart and Klingemann 1976; Jahn 2011; Klingemann 1972 1979; Knutsen 1995; Neundorf 2009 2011; Piurko, Schwartz and Davidov 2011; Rudi 2010; Schmitt and van der Eijk 2009; Vries, Hakhverdian and Lancee 2013; Zechmeister 2006). With the exception of Corbetta, Cavazza and Roccato (2009) and - to some extent - Rudi (2010), all of them report difficulties with the scale. Schmitt and van der Eijk (2009), Jahn (2011) and Vries, Hakhverdian and Lancee (2013) for example show that the issue preferences or policy orientations associated with left and right differ across countries and within countries over time. Differences in the party polarization might be one explanation for different interpretations across countries (Freire 2006). Regarding differences within a country, Freire and Belchior (2011) find that the interpretations of Portuguese citizens concerning left and right lack clarity and structure. Zechmeister (2006) comes to the same conclusion for Mexico and

[16] Importantly, however, our results also matter for questions that ask respondents' to locate others (such as parties) on the left-right scale.

Argentina. Regarding Germany, Neundorf (2009 2011) concludes that there has been a considerable increase in the diversity of understandings of left and right over time that is the concepts lost clarity and became more and more vague. The study of Weber (2011) uses another approach by assessing the measurement equivalence using two different wordings of the question within one survey. According to her results, group means of self-placement on the scale are comparable among different countries, while relationships to other variables are not. We build our study on these former analyses dealing with potential problems of the left-right scale.

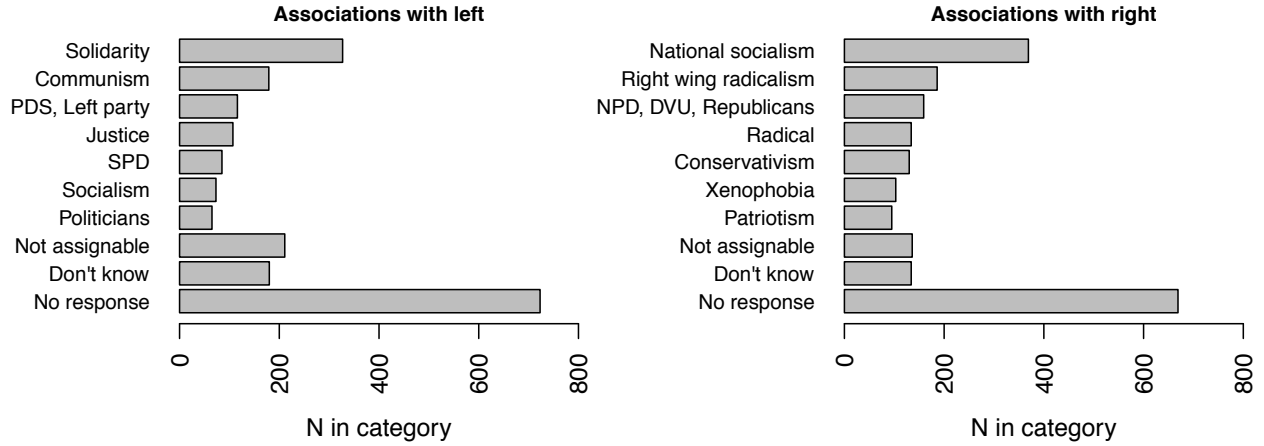
6.2 Validation using the dictionary by Züll, Scholz and Schmitt (2010)

We relied on topic models to analyze respondents' answers. A different approach would have consisted on employing the the dictionary (based on manual coding) developed by Züll, Scholz and Schmitt (2010) to automatically code respondents' answers into different categories based on the their answers. This dictionary currently comprises a total of 7814 phrases, full words or parts of words and can be applied to any raw text data containing associations with left and right. It was developed with the aim of allowing cross-time and cross-country comparisons of interpretations of the left-right scale. Their general scheme draws on earlier similar work by Fuchs and Klingemann (1989 1990) and Bauer-Kaase (2001) and comprises eight broad categories into which respondents' answers can be coded: Ideologies, general social values, specific social values, social change (comprising forms, characteristics and means of social change), social groups, political actors, concrete aspects and affective evaluations (Züll and Scholz 2012: 7-16). However, prior to coding answers into these eight categories, answers are coded into the 270 categories that are derived from an empirical "atheoretical" coding stage. In other words respondents' answers are coded into about 270 subcategories into which answers or parts of respondents' answers are sorted (see Züll and Scholz 2012: p.7-16 for the subcategories).
Any categorizing of open responses into fewer dimensions be it manually or automatically lumps together respondents. Generally, the fewer the lumping categories the higher the variance within the categories. As a consequence, groups a blurred, as is their distinctiveness and as a consequence there impact of their distinctiveness on e.g. left-right self-placement. While we prefer a model driven approach that avoids human error, we want to ensure that the general conclusions of our empirical analysis are not largely due to our approach of categorizing data with the topic models. Therefore we carry out additional analyses using the dictionary. In particular, besides using the topic model we also analyzed respondents' answers after they have been coded into the 270 different categories included in the left-right dictionary devised by Züll and Scholz (2012).[17]

Figure 10 displays absolute numbers of respondents in the most common categories for both left and right. Most respondents associate left with either values (solidarity, justice), ideologies (communism, socialism), parties (left party, SPD) or some political figure (politicians). The picture for right is similar with many people mentioning ideologies or values (national socialism, right wing radicalism, conservatism, patriotism), parties (NPD, DVU, republicans) but then also descriptions such as xenophobic or radical. Importantly, Figure 10 only displays the 10 most frequent categories.

[17] Coding was done on the raw text data prior to deleting stopwords.

Figure 10: Most common categories of associations as coded with the dictionary



In addition we compare means for respondents whose associations belong into one of the most frequent categories. Figure 11 displays the left-right scale means of those respondents whose answers were in the 11 most mentioned subcategories for left. Figure 12 is the same but for right. The sample mean is indicated by the dashed line. Just as for our previous categorization into 4 topics throughout the study we can see here that left-right measurement values differ for groups of respondents who answers have been coded into categories using the dictionary. Groups that associate left with values such as equality, justice or solidarity display measurement values that lean to the left. In contrast, groups that associate left with real socialism, with radicals or with communism display measurement values that lean to the right. Groups that associated right with national socialism, xenophobia or violence display measurement values that lean to the left. Importantly, these associations are highly consistent with our findings when we employ the four categories discovered by our topic model. In sum, these additional analyses confirm our main conclusions, namely that there is considerable variation in the associations and that this variation may impact measurement values.

Figure 11: Left-right scale means for 11 most common categories of associations with left (dashed = sample mean)

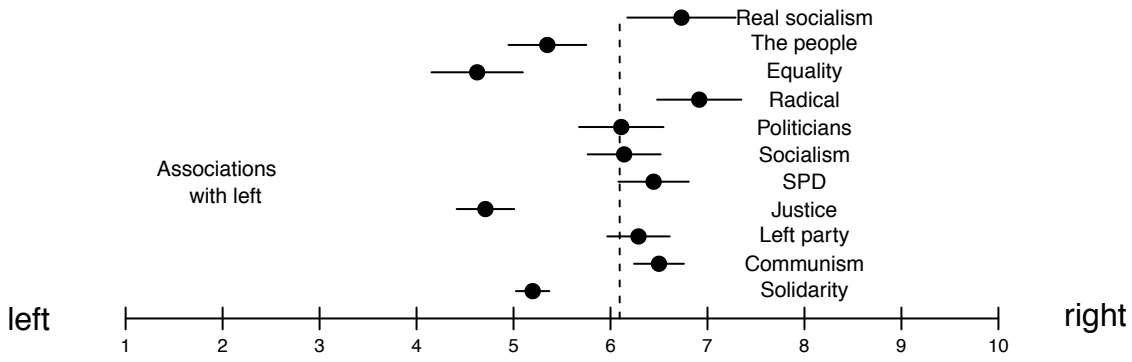


Figure 12: Left-right scale means for 11 most common categories of associations with right (dashed = sample mean)

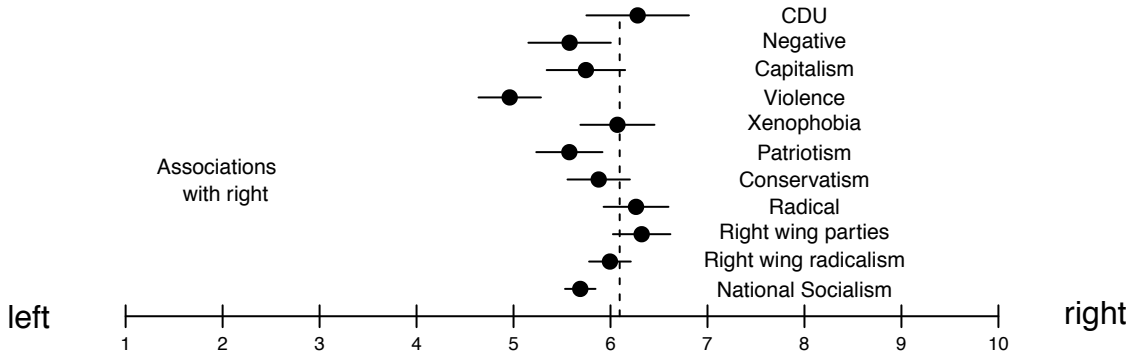


Figure 13: Question wording in Allbus 2008 (see Scholz and Zuell 2012: 1420)

Many people use the terms "left" and "right" when they want to describe different political views.

⇨ *INT.: Please display scale 28 and leave displayed until question F031.*

Here we have a scale which runs from left to right. Thinking of your own political views, where would you place these on this scale?
Please select one of the boxes and name the letter indicated beneath it.

Left **Right**

❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
F	A	M	O	G	Z	E	Y	I	P

Could you tell me what you associate with the term "left"?

⇨ *INT.: Record the response given precisely!*

And could you tell me what you associate with the term "right"?

⇨ *INT.: Record the response given precisely!*

Table 3: Summary statistics

variable	n	mean	sd	min	max	range
Education	3406	0.83	0.77	0	2	2
Age	3457	1.88	1.21	0	5	5
East	3469	0.31	0.46	0	1	1
Male	3469	0.49	0.5	0	1	1
Political interest	3467	1.06	0.74	0	2	2
Income	3075	0.77	0.88	0	3	3
T1: Values (L)	2307	0.24	0.2	0	1	1
T2: Ideologies (L)	2307	0.26	0.18	0	1	1
T3: Parties (L)	2307	0.26	0.19	0	1	1
T4: Policies (L)	2307	0.24	0.09	0	1	1
T1: Right-wing extremists (R)	2419	0.23	0.1	0	1	1
T2: Parties (R)	2419	0.25	0.11	0	1	1
T3: Ideologies (R)	2419	0.27	0.11	0	1	1
T4: Xenophobia (R)	2419	0.25	0.05	0	0	0
Party preferences	3287	none = 1532, cdu = 755, spd = 612, gruene = 140, linke = 144, fdp = 82, other.parties = 22				
Topic assignment (L)	2307	1 = 565, 2 = 671, 3 = 681, 4 = 390				
Topic assignment (R)	2419	1 = 545, 2 = 625, 3 = 835, 4 = 414				

Table 4: Words deleted from the original text body

aber, alle, allem, allen, aller, alles, als, also, am, an, ander, andere, anderem, anderen, anderer, anderes, anderm, andern, anderr, anders, auch, auf, aus, bei, bin, bis, bist, da, damit, dann, der, den, des, dem, die, das, dass, derselbe, derselben, denselben, desselben, demselben, dieselbe, dieselben, dasselbe, dazu, dein, deine, deinem, deinen, deiner, deines, denn, derer, dessen, dich, dir, du, dies, diese, diesem, diesen, dieser, dieses, doch, dort, durch, eher, ein, eine, einem, einen, einer, eines, einig, einige, einigem, einigen, einiger, einiges, einmal, er, ihn, ihm, es, etwas, euer, eure, eurem, euren, eurer, eures, für, gegen, gewesen, hab, habe, haben, hat, hatte, hatten, hier, hin, hinter, ich, mich, mir, ihr, ihre, ihrem, ihren, ihrer, ihres, euch, im, in, indem, ins, ist, jede, jedem, jeden, jeder, jedes, jene, jenem, jenen, jener, jenes, jetzt, kann, kein, keine, keinem, keinen, keiner, keines, können, könnte, machen, man, manche, manchem, manchen, mancher, manches, mehr, mein, meine, meinem, meinen, meiner, meines, mit, muss, musste, nach, nicht, nichts, noch, nun, nur, ob, oder, ohne, sehr, sein, seine, seinem, seinen, seiner, seines, selbst, sich, sie, ihnen, sind, so, solche, solchem, solchen, solcher, solches, soll, sollte, sondern, sonst, über, um, und, uns, unse, unsem, unsen, unser, unses, unter, viel, vom, von, vor, während, war, waren, warst, was, weg, weil, weiter, welche, welchem, welchen, welcher, welches, weniger, wenn, werde, werden, wie, wieder, will, wir, wird, wirst, wo, wollen, wollte, würde, würden, zu, zum, zur, zwar, zwischen

Figure 14: Words that are associated with left and right (size ∝ wordcount)

Table 5: Linear regression of left-right scale measurement values on topics of associations

	Dependent variable:	
	Left-right scale	
	(1)	(2)
Ideologies (L)	0.70***	
	(0.09)	
Parties (L)	0.71***	
	(0.10)	
Policies (L)	0.51***	
	(0.11)	
Parties (R)		0.27***
		(0.10)
Ideologies (R)		0.06
		(0.09)
Xenophobia (R)		−0.07
		(0.11)
Male	0.13*	0.18**
	(0.07)	(0.07)
Age	0.03	0.02
	(0.03)	(0.03)
Education	−0.11**	−0.12**
	(0.05)	(0.05)
Income	0.11***	0.10**
	(0.04)	(0.04)
Pol interest	−0.08	−0.11**
	(0.05)	(0.05)
East	−0.36***	−0.33***
	(0.08)	(0.08)
FDP	−0.49**	−0.52**
	(0.21)	(0.21)
Gruene	−2.14***	−2.33***
	(0.16)	(0.16)
Linke	−2.81***	−3.23***
	(0.17)	(0.16)
None	−1.14***	−1.30***
	(0.09)	(0.09)
Other parties	−0.79*	−0.52
	(0.47)	(0.45)
SPD	−1.83***	−1.92***
	(0.10)	(0.10)
Constant	5.70***	6.27***
	(0.15)	(0.14)
Observations	1,943	2,002
R^2	0.32	0.31
Adjusted R^2	0.32	0.30

Note: *p<0.1; **p<0.05; ***p<0.01; Estimation using OLS; Dependent variable: Left-right scale;

Table 6: Linear regression of left-right scale measurement values on topics of associations (controlling for associations with right)

	Dependent variable:			
	Left-right scale			
	Subsample: Right-wing extremists (R)	Subsample: Parties (R)	Subsample: Ideologies (R)	Subsample: Xenophobia (R)
	(1)	(2)	(3)	(4)
Ideologies (L)	0.85***	0.16	0.90***	0.64***
	(0.23)	(0.24)	(0.15)	(0.22)
Parties (L)	0.75***	0.33	0.93***	0.33
	(0.21)	(0.22)	(0.17)	(0.26)
Policies (L)	0.40*	0.16	0.59***	0.28
	(0.24)	(0.28)	(0.18)	(0.23)
Male	0.10	0.07	0.10	0.37**
	(0.16)	(0.16)	(0.13)	(0.17)
Age	0.01	−0.01	0.09*	−0.04
	(0.07)	(0.07)	(0.05)	(0.07)
Education	−0.04	−0.23**	−0.03	−0.14
	(0.11)	(0.11)	(0.09)	(0.13)
Income	0.04	0.23**	0.10	0.11
	(0.11)	(0.09)	(0.07)	(0.10)
Pol interest	0.05	−0.07	−0.08	−0.21
	(0.12)	(0.11)	(0.09)	(0.13)
East	−0.51***	−0.27	−0.17	−0.18
	(0.17)	(0.17)	(0.14)	(0.18)
FDP	−0.39	−0.54	−0.60*	−0.11
	(0.44)	(0.51)	(0.34)	(0.48)
Gruene	−2.01***	−2.17***	−2.24***	−2.24***
	(0.44)	(0.37)	(0.24)	(0.39)
Linke	−2.53***	−3.03***	−3.08***	−2.88***
	(0.35)	(0.37)	(0.30)	(0.36)
None	−0.77***	−1.33***	−1.40***	−1.24***
	(0.20)	(0.19)	(0.17)	(0.25)
Other parties	2.91**	−1.58**	−2.47***	
	(1.44)	(0.69)	(0.84)	
SPD	−1.38***	−1.87***	−2.23***	−1.58***
	(0.23)	(0.21)	(0.18)	(0.26)
Constant	5.19***	6.32***	5.60***	5.80***
	(0.34)	(0.34)	(0.27)	(0.36)
Observations	370	443	618	307
R^2	0.31	0.32	0.39	0.38
Adjusted R^2	0.28	0.30	0.37	0.35

Note: *p<0.1; **p<0.05; ***p<0.01; Estimation using OLS; Dependent variable: Left-right scale;

Table 7: Linear regression of left-right scale measurement values on topics of associations (controlling for associations with left)

	Dependent variable:			
	Left-right scale			
	Subsample: Values (L)	Subsample: Ideologies (L)	Subsample: Parties (L)	Subsample: Policies (L)
	(1)	(2)	(3)	(4)
Parties (R)	0.57**	−0.04	0.29*	0.33
	(0.22)	(0.21)	(0.17)	(0.27)
Ideologies (R)	0.04	0.14	0.31	0.18
	(0.18)	(0.18)	(0.19)	(0.23)
Xenophobia (R)	0.05	−0.02	−0.26	0.04
	(0.20)	(0.22)	(0.26)	(0.26)
Male	0.16	0.22	−0.04	0.28
	(0.14)	(0.15)	(0.15)	(0.19)
Age	−0.12*	0.08	0.04	0.08
	(0.06)	(0.06)	(0.06)	(0.08)
Education	−0.01	−0.12	−0.07	−0.33***
	(0.10)	(0.10)	(0.11)	(0.12)
Income	0.11	0.10	0.12	0.18
	(0.08)	(0.09)	(0.09)	(0.11)
Pol interest	−0.14	0.01	−0.02	−0.26*
	(0.10)	(0.11)	(0.10)	(0.14)
East	−0.13	−0.19	−0.29*	−0.54***
	(0.15)	(0.17)	(0.15)	(0.20)
FDP	−0.19	−0.55*	−0.56	−0.19
	(0.63)	(0.33)	(0.43)	(0.50)
Gruene	−2.52***	−1.98***	−2.21***	−1.91***
	(0.30)	(0.32)	(0.41)	(0.36)
Linke	−3.14***	−2.75***	−3.33***	−2.34***
	(0.28)	(0.48)	(0.41)	(0.40)
None	−1.55***	−1.42***	−0.91***	−1.13***
	(0.24)	(0.18)	(0.17)	(0.25)
Other parties	−2.59*	−1.27*	−1.39	−1.01
	(1.34)	(0.75)	(1.49)	(0.87)
SPD	−1.98***	−1.85***	−1.88***	−1.77***
	(0.25)	(0.18)	(0.22)	(0.27)
Constant	5.98***	6.15***	6.08***	6.18***
	(0.32)	(0.28)	(0.27)	(0.36)
Observations	437	505	503	293
R^2	0.31	0.28	0.26	0.33
Adjusted R^2	0.29	0.26	0.24	0.30

Note: *p<0.1; **p<0.05; ***p<0.01; Estimation using OLS; Dependent variable: Left-right scale;

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