Election outcomes under different ways to announce preferences: an analysis of the 2015 parliament election in the Austrian federal state of Styria

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Abstract We use preference data from the 2015 parliament election in the Austrian federal state of Styria to analyze different voting rules. An exit poll right after the election collected data on ordinal and cardinal preferences from approximately 1000 actual voters. Our analysis is threefold. First, we determine the hypothetical social outcomes under different voting rules; second, we investigate the stability of the outcomes under those rules. Finally, we provide a categorization of different types of parties and analyze the impact of certain voting rules (Plurality Rule, Plurality Run Off, Hare System, Condorcet Method, Approval Voting, Borda Rule, Evaluative Voting, and Majority Judgment) on the performances of parties in those scenarios.

1 Introduction

Decisions on which party or which person is going to lead a country figure amongst the most important social decisions to be taken. Usually such decisions are made by means of constitutionally determined voting rules. Starting with Arrow's famous impossibility result (Arrow 1963) in the 1950s, a huge literature on the theoretical aspects of voting rules has emerged. However, many results in social choice theory concentrated on the rules' normative aspects, whereas empirical studies were rather limited. This branch in the literature

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gained more relevance under the name "behavioral social choice" in the early 2000s, in particular with Regenwetter et al. (2006). However, the general knowledge of the people of a country on how a voting rule works and what it actually does is rather limited. From a theoretical point of view, social choice theory has spent a lot of effort in analyzing the properties of specific voting rules and comparing them with respect to the voting outcome (see, e.g., Saari 1994; Nurmi 1999; Felsenthal and Nurmi 2016). Probably the best known result in that respect is Arrow's impossibility theorem, proving that no social welfare function satisfies four considerably mild conditions (Arrow 1963). Given this mathematical impossibility of finding an uncontroversial winner, plenty of arguments for and against certain voting rules have been raised in the theoretical discussion (see, e.g., Brams and Fishburn 2002; Munger 2012 or Lagerspetz 2016 for historical treatments). Many examples of individual preference profiles have been suggested that lead to a plethora of different voting outcomes depending on the voting rule that is to be used (Saari 2008). However, do those differences also show up in real-world elections? This paper, based on data from the 2015 parliament election in the Austrian federal state of Styria, tries to shed light on (hypothetical) differences in social outcomes when different voting rules are used.

In particular, in this paper we aim to apply various different and widely discussed voting rules proposed in the relevant literature. To this end, we conducted exit polls in front of several real polling stations during the Styrian parliamentary elections on 31 May 2015. Approximately 1000 voters responded, after they had cast their actual votes, to questions about their preferences in case more than just a single vote for one party was allowed. To keep the questions simple, we focused only on voters' preferences over the parties, but refrained from explaining the particular voting rules and respective seat allocations determined by them in detail. This approach implies that we do not expect voters to behave strategically when stating their preferences. Of course, in a real voting situation under an alternative voting rule this might not be true. Strategic behavior does indeed exist and can be identified in the differences between some voters' top ranked parties in their stated preference rankings and their declared official vote. However, we think that this still gives us the chance to observe differences between voting rules based on different preference information. Note that since votes already had been cast, responses to the questions could not affect the electoral results.

To the best of our knowledge, the number of studies comparable to ours is rather limited. Probably the most relevant field experiments on political elections related to our investigation are those by Laslier and Sanver (2010), Baujard et al. (2014), Laslier and Van der Straeten (2008)[1] on French elections, Roescu (2014) on a Romanian election, Wantchekon (2003) on an election in Benin, and Alòs-Ferrer and Granić (2012) on German elections. In addition, the interesting studies by Popov et al. (2014) and Regenwetter et al. (2007) analyze 15 American Psychological Association (APA) presidential elections each with more than 13,000 cast ballots[2]. Whereas most of the studies of political elections aim at approval voting and simple forms of Evaluative Voting, the APA election studies focus on a wider range of voting rules.[3] In our investigation, we tried—in some sense—to

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[1] See Baujard and Igersheim (2010) for a detailed analysis of field experiments on Approval Voting.

[2] The reader is also referred to the study of the 2006 Public Choice Society presidential election by Brams et al. (2006) with 37 ballots, comparing the Approval Voting outcome of the official election with the outcome under the different voting rules of Plurality Rule, Condorcet Method, Borda Rule, and the Hare System.

[3] This was possible because the APA uses the Hare System in which the voters have to provide a strict ranking of the candidates/parties.

combine the two approaches by extending the analysis of a political election to a wider class of voting rules by allowing for more complex preference information to be revealed.

Regenwetter et al. (2006) argue that many paradoxical situations in relation to voting occur only theoretically, i.e., based on certain assumptions about the distribution of voter preferences, which do not show up in real-world elections. To some extent, our results, based on applying different voting rules to the preference information that we received from the voters during the 2015 Styrian parliamentary elections, confirm that observation. The actual rankings of the parties for most of the applied voting rules are rather similar and changes occur only with respect to certain parties. However, we want to address two issues that go beyond the analysis of Regenwetter et al. (2006) and Baujard et al. (2014): First, by the use of "types" capturing the nature of the parties the observed actual changes can be explained. Baujard et al. (2014) focused on the 2012 French presidential election and hence considered individual candidates (instead of parties). They introduced different types of candidates and showed that the type influenced the candidates' performances under different voting rules. As their experiment was based on voting rules mostly using dichotomous or trichotomous preferences, such as Approval Voting and simple versions of Evaluative Voting, we extend their analysis to full ranking information and evaluations based on a finer scale. Second, even if we do not observe actual changes in the electoral outcome under different voting rules, we can still try to determine whether for some voting rules the outcomes are less stable than for others, i.e., whether we are actually getting "closer" to changing the election's winner. To be able to define such a measure of stability we will introduce a measure based on the necessary number of voters' preferences to be modified to change the social choice.

Our choice of investigated voting rules was influenced heavily by the rules studied in Baujard et al. (2014) and Regenwetter et al. (2007). The former focused on Approval Voting and different types of Evaluative Voting, the latter used voters' rankings and voting rules based on this sort of preference information such as the Borda Rule. In addition, we considered it to be of interest to include Majority Judgment, a rule which has recently been widely discussed.

We will now briefly explain the set of voting rules used in our study (see Brams and Fishburn 2002 for a detailed survey): Let us first start with voting rules that can be used whenever information about the rankings (or partial information on the rankings) of the parties is provided by the voters. Probably the most widely used and simplest voting rule in political elections is *Plurality Rule* in which each voter can vote for exactly one party.[4] The sequential application of Plurality Rule is used in *Plurality Run Off* and the *Hare System*.[5] The former is a two-round system in which the two parties with the highest plurality score in the first round run against each other in a second round (in case no party has an absolute majority in the first round).[6] The Hare System, in a similar spirit, works by eliminating in each round the party with the lowest plurality score, i.e., with fewest first-place votes, until,

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[4] If Plurality Rule is not used for a single-winner election, then, for the actual seat allocation, various apportionment methods can be used, as discussed e.g. in Balinski and Young (1975).

[5] The Hare System is also called Alternative Vote or Instant-Runoff Rule. In multi-winner elections, it is usually known as Single-Transferable Vote, and used to achieve proportional representation of the parties, i.e., intends at achieving party representation in proportion to the actual voting strength. The Hare System has certain advantages as a method of proportional representation, for instance in ensuring the representation of significant minorities (see Brams and Fishburn 2002).

[6] Plurality Run Off is often used for the election of single winners, such as in the French and Austrian presidential election.

eventually, one party has an absolute majority.[7] In contrast to the previous two rules, the *Borda Rule* uses the full preference ranking of a voter and assigns points to the parties according to their positions in the ranking, starting from zero points for the lowest ranked party up to $n - 1$ points for the top-ranked party (in elections with n parties). The parties are ranked according to their total numbers of points they receive from all voters. Among positional scoring rules, i.e., rules that assign scores to the ranks in the voters' preference orderings, the Borda Rule is considered superior in several respects (but is also vulnerable to manipulation by strategic voting; see, e.g., Saari 1990).

Another rule in which the outcome can be determined from ranking information is the *Condorcet Method*. It is based on Condorcet's concept of pairwise majorities, i.e., the idea of considering a party a better than a party b if the number of voters preferring a over b is larger than the number of voters preferring b over a. The winner of this voting rule, also called Condorcet winner, is the party which defeats every other party in a pairwise majority contest, and a social ranking can be determined accordingly. It is considered to be a benchmark rule founded on certain democratic ideals, which suffers, unfortunately, from the possibility of majority cycles.[8] However, Regenwetter et al. (2006) showed that cycles very much depend on the underlying assumption about the distribution of individual preferences.

Some voting rules use a slightly different form of preference information. They do not request a strict ordering from the voters, but ask them to distribute the parties among certain indifference classes. *Approval Voting* (see Brams and Fishburn 1983), for example, allows voters to assign one vote to (and therefore approve of) more than one party, i.e., there are two indifference classes. The parties are ranked according to the total number of approval votes. In addition, a very interesting voting rule is *Majority Judgment* (see Balinski and Laraki 2011), whereby each voter assigns parties to indifference classes from very positive to very negative. As under Approval Voting, the classes are labelled and have a clear qualitative meaning to the voters. The social ranking is determined according to the median evaluations of the parties (for tie-breaking devices, see Balinski and Laraki 2011).

Finally, we move from ordinal to cardinal preference information and consider two types of *Evaluative Voting*, one allowing voters to place parties along a scale from -20 to $+20$ (in the following called $\pm$ *20 Points Rule*) and one (later called 100 *Points Rule*) allowing each voter to distribute a total of 100 points among the set of parties. In both cases, the social ranking is determined according to the total (or average) number of points the parties receive.

The paper is structured as follows: Sect. 2 introduces the experimental design and summarizes the received data. This data will, in Sect. 3, be used to compare the above mentioned voting rules with each other. Because we do not find huge differences in the voting outcomes across those voting rules, Sect. 4 will introduce a concept to measure how close we are to changing the winner under the various rules. Section 5 focuses on the different parties contesting the election and provides a general classification of the parties. This classification will be used to analyze the general impact of voting rules on different types of parties and then be applied to the voting data. Finally, Sect. 6 concludes the paper.

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[7] For three parties, the two voting rules are equivalent.

[8] The theoretical possibility of Condorcet cycles has been intensively discussed in the literature (see Gehrlein 2006). For a general analysis of the Condorcet Method see Young (1988).

2 Experimental design and data

The data for this experimental study was collected on the election day for the Styrian parliament on 31 May 2015. In cooperation with the *Institut fuer Strategieanalysen (ISA)* we developed a design for the experiments that was then applied in the course of an exit poll of voters. Although our original intention was to follow the experimental setup as described in Baujard et al. (2014), in the preparation of the experiment it turned out that the study was faced with huge legal barriers. We discussed our experiments with the administrative office responsible for elections in Styria and legal experts from the Austrian ministry. We were neither allowed to use any information about registered voters or to contact them directly, nor to undertake the survey inside the official voting stations. Hence, the only possibility was to approach the voters outside the voting stations and collect the data with a sort of exit poll. In front of five randomly chosen voting stations, voters were invited randomly to participate in the experiment, after they had cast their official ballot. Professional staff of the ISA provided verbal instructions for the experimental setting, answered possible questions, and handed out a questionnaire[9] to the voters. In an imitation voting booth, the voters then independently and anonymously answered the questionnaire and put it into an imitation ballot box. A total of 955 voters participated in the exit poll and answered questions about their preferences on the running parties. In particular, the survey contained the question requiring a full ranking of the parties running for election, an assignment of parties to pre-defined preference classes (Majority Judgment), their approval preferences and two types of Evaluative Voting information, one based on placing parties on a scale from −20 to +20, the other based on assigning a total of 100 points to the parties. In addition, the survey included two qualitative questions about the voters' voting behavior and a question about how they actually voted in the real election. Given that the voters faced a list of eight parties, of which some were probably unknown to them, we expected a considerable percentage of incomplete answers to our questions. Indeed, roughly one-third of the voters provided incomplete rankings. These shares were larger when looking at the data from their evaluations under Evaluative Voting. However, there are differences in the number of evaluations received by the parties: Whereas the "major" parties usually received evaluations from 70% to 75% of the voters, "smaller" parties only received evaluations of around 60%.

3 Comparing voting rules

In the previous section we explained how the data was collected. Our focus was primarily on data about voters' preferences over political parties. Because the voting rules and possible methods of allocating parliamentary seats are, in general, not known to the voters, we decided to not explain in detail the voting rules applied to the collected preference information. Hence, we do expect voters to have behaved more or less sincerely in stating their preferences. We therefore focus exclusively on using the preference data from the

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[9] All voters received the same questionnaire. An English translation of the questionnaire can be found in the online appendix. Grundner (2017) also provides an analysis of voters' consistency under the different query modes. In general, one can argue that the experimental design did support consistent answers as voters were able to go back and forth in the questionnaire.

survey and do not compare it to the declared official votes.[10] Because some of the voters did not provide complete preference orderings, we applied the weak-order model of Regenwetter et al. (2007) to the ranking information and calculated an average value for a party under Evaluative Voting only over those voters who assigned points to that party.[11] In addition, we investigate only the social rankings derived from the different voting rules and are not concerned with any seat allocation procedure. For such procedures under alternative voting rules, see Emerson (2007) and Alòs-Ferrer and Granić (2012). Table 1 shows the rankings of the parties[12] under different voting rules based on the data from the exit poll.

As we observe, the rankings derived from the nine analyzed voting rules are rather consistent and closely match the real-world election outcome (in terms of the ranking of the parties). Actually, Plurality Rule, Plurality Run Off and the 100 Points Rule provide the same ranking (which matches the ranking according to the declared official votes in our survey) and eight of the nine rules have the same winner and runner-up (see also Fig. 1). Only Majority Judgment deviates more substantially.

This substantial overlap is surprising insofar as the official election result was particularly close between the top three parties. In addition, although the voting rules use quite different preference information to determine the rankings, this seems to have rather little impact on the social choice ranking. For most of the rules, a difference of only one swap between two neighboring parties is observed. For example, using the Borda Rule and, therefore, the full ranking information, a swap between FPÖ and the Greens can be observed compared to the Plurality Rule outcome. As we will see later, this depends on those parties' different types, something of importance when we apply such a voting rule. The use of cardinal preference information, as in ±20 Points, leads to a more significant difference. The possibility of assigning negative points harms the FPÖ and, hence, favors the Greens, KPÖ and NEOS. This is also true for Majority Judgment in which voters can also communicate a negative attitude towards parties. Actually, Majority Judgment is the only voting rule that changes the winner (although only by a small margin). Hence, it seems that the option of making qualitative (and especially negative) statements, as in ±20 Points Rule, and Majority Judgment have the largest impact on the ranking of the FPÖ, which might be caused by the party's "polarizing nature" (see Sect. 5).

Because Table 1 only provides rankings of the parties, we state the precise vote shares underlying those rankings for some of the voting rules in Table 2:

Given the different informational contents of the voting rules, the shares can be very different, even in cases when the respective ranking is the same. Because Plurality Rule is the only voting rule in which a voter can assign just one vote to one party, we would expect

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[10] However, such a comparison is useful if we want to analyze potential strategic behavior in the actual election. Strategic behavior can be observed whenever the top-ranked party in the stated sincere ranking differs from the official vote.

[11] Other preference extension models would of course be possible. See, e.g., Regenwetter et al. (2007) for a discussion of other models to deal with partial rankings.

[12] In the table, and throughout the paper, the parties are abbreviated as follows. SPÖ—Sozialdemokratische Partei Österreichs (Social Democratic Party of Austria); ÖVP—Österreichische Volkspartei (Austrian People's Party); FPÖ—Freiheitliche Partei Österreichs (Freedom Party of Austria); Greens—Die Grünen-Die Grüne Alternative (The Greens-The Green Alternative); KPÖ—Kommunistische Partei Österreichs (Communist Party of Austria); NEOS—Das Neue Österreich und Liberales Forum (The New Austria and Liberal Forum); TS—Team Stronach; Piraten—Piratenpartei Österreichs (Pirate Party of Austria).

On a left-right ideological scale, the parties Greens, KPÖ, SPÖ and Piraten are considered rather left, NEOS central, ÖVP and TS central to centre-right, and FPÖ rightwing. This common perception of the parties is confirmed by the result of a survey which is available from the authors upon request.

Table 1 Outcomes of different voting rules

Voting rule	1st	2nd	3rd	4th	5th	6th	7th	8th
Plurality Rule	SPÖ	ÖVP	FPÖ	Greens	KPÖ	NEOS	TS	Piraten
Run Off	SPÖ	ÖVP	FPÖ	Greens	KPÖ	NEOS	TS	Piraten
Hare	SPÖ	ÖVP	FPÖ	Greens	NEOS	KPÖ	TS	Piraten
Condorcet Method	SPÖ	ÖVP	Greens	FPÖ	KPÖ	NEOS	TS	Piraten
Approval voting	SPÖ	ÖVP	FPÖ	Greens	NEOS	KPÖ	TS	Piraten
Borda Rule	SPÖ	ÖVP	Greens	FPÖ	NEOS	KPÖ	TS	Piraten
±20 Points	SPÖ	ÖVP	Greens	KPÖ	NEOS	FPÖ	Piraten	TS
100 Points	SPÖ	ÖVP	FPÖ	Greens	KPÖ	NEOS	TS	Piraten
Majority Judgment	ÖVP	SPÖ	Greens	KPÖ	NEOS	Piraten	TS	FPÖ
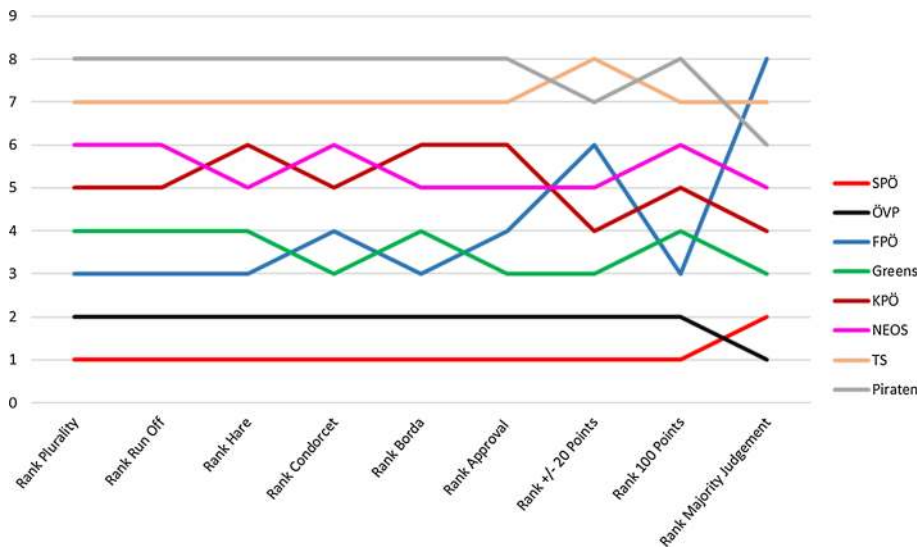
Fig. 1 Comparison of outcomes

Table 2 Comparison of vote shares (%)

	SPÖ	ÖVP	FPÖ	Greens	KPÖ	NEOS	TS	Piraten
Plurality Vote	32.16	26.34	19.24	10.84	4.73	4.5	1.61	0.58
Approval Voting	23.81	21.67	15.71	15.49	8.05	9.63	3.28	2.35
100 Points Rule	26.94	23.9	18.83	13.22	6.61	6.37	2.5	1.63
Borda Rule	18.43	17.75	11.81	14.28	11.31	11.56	8.25	6.62

the relative differences between the vote shares determined in that way to be the largest among the analyzed voting rules. Approval Voting could lead to the same outcome when only the top-ranked party is approved of by each of the voters. However, this is usually not

the case and voters assign one vote to two or more of the political parties. Actually, the average number of parties receiving approvals from a voter in the Styrian election was 2.019. Hence, smaller differences in the vote shares occur, as is shown in Table 2. Under the 100 Points Rule, voters are forced to distribute a predefined number of points (here 100) among the parties. Although, in principle, this could again lead to the same shares as in Plurality Voting, the numbers indicate that the voters do make use of this option to provide more fine-grained preference information. Thus, offering the possibility of submitting more detailed preference information seems to be welcomed by the voters. This might also be true for the Borda Rule, in which a complete ranking of the parties is required. However, certain difficulties in providing a consistent full ordering have been observed.[13] In addition, the Borda Rule is based on pre-defined (linear) scores, which led to points being assigned even to unknown or undesirable parties. Hence, we expect the vote shares to be more similar between parties under the Borda Rule than under other voting rules. Indeed, this is observed in the data (see Table 2). It also indicates one immediate problem, namely how to use those voting rules for parliamentary elections in which a seat allocation is required. A seat allocation according to those vote shares (as done for Plurality Rule with respective apportionment methods) might overrepresent certain unknown and small parties. From a mathematical point of view, the largest vote share of a winning party under Plurality Rule, Approval Voting and any form of Evaluative Voting could always be 100%, whereas for the Borda Rule the maximum would be only $\frac{2}{n}100\%$, where n is the number of parties.[14] However, procedures for determining a seat allocation with more extensive preference information could be used (see, e.g., Emerson 2007; Alòs-Ferrer and Granić (2012)).

4 Differences in outcomes

In the previous section we saw that for the actual data from the Styrian parliamentary elections, the differences in outcomes among the voting rules is rather minor. However, the question arises whether for some voting rules the outcomes are less stable than for others, i.e. whether we are actually getting "closer" to changing the election's winner. Obviously, for every voting rule a switching point exists between the two highest-ranked parties at which we move from party a being the winner to party b being the winner.[15] For example, using Plurality Rule the current difference between the winning party (SPÖ) and the runner up (ÖVP) is about 5.82 percentage points. Hence, one has a clear intuition about how this margin can be closed so that a swap occurs between first- and second-ranked party. A possibility for measuring such a "distance" from changing the winning party is to count the number of voters necessary to yield such a swap. The smaller this number, the closer is the current social choice winner to being changed and the less stable is the outcome.

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[13] Problems arose especially when parties were little known. Whereas with Approval Voting and Evaluative Voting, the option of not approving or assigning zero points to unknown parties is available to voters, for the Borda Rule this is not the case.

[14] Actually, whereas the difference between the first and second ranked party under Plurality Rule, Approval Voting and Evaluative Voting could, theoretically, be at most 100 percentage points, for the Borda Rule this can only be $\frac{n-2}{(n-1)n}100$ percentage points.

[15] See, e.g., Saari (1994) for a geometric approach that uses this concept in the analysis of voting rules and elections.

Let us give an example by considering the following preference profile with five voters and four alternatives in Table 3:

Party a is both the Plurality Rule winner and the Borda winner. But, given the preference profile, how "far" are we from changing the winning outcome? Using Plurality Rule, we see that to change the winner from a to some other party, we need to change the preferences of at least two voters. For example, if we change the rankings of voters 1 and 2 to P_1' and P_2', the new winning party is b. Turning to the Borda Rule, the preference profile leads to a winning over b by 12:11 points, i.e., under the Borda Rule a receives a total of 12 points while b receives 11 points. Let voter 1 change her preference to P_1''. Then b gains one point whereas a looses three points, making b the new Borda winner. Thus, using the Borda Rule, only one changed preference is needed to change the winner. However, preference profiles are possible in which the group size necessary to change the Borda winner is larger than that required to change the Plurality winner. Consider the profile in Table 4:

The original Plurality winner is party a. To make b the winner, we need to change the preference order of one voter (say voter 1) from P_1 to P_1'. Looking at the Borda Rule, originally a wins over b by 18:9 points. If, however, we change the rankings of voters 1 and 2 to P_1'' and P_2'', then the new Borda winner is b. Hence, in this example the number of voters necessary to change the Plurality winner is smaller than that required to change the Borda winner. Now, let us take the minimum group size necessary to change the winning outcome as an indicator of the stability of an election result under a specific voting rule, i.e., of how close we are to changing the outcome with a particular voting rule at a specific preference profile. Table 5 provides the necessary group sizes for the Styrian parliamentary elections.

The data shows that, although we do not observe huge changes in the voting outcomes for different voting rules, we do indeed get closer to changing the winner as we move from Plurality to either the Borda Rule or the 100 Points Rule. In particular, for Plurality Rule 26 voters need to change their rankings in such a way that the currently second ranked party (ÖVP) will be on top. Using the Borda Rule or 100 Points Rule, we see that only 12 voters would be necessary to reach that goal. Because not enough rankings are available in the survey data in which the SPÖ is top ranked and the ÖVP is bottom ranked (and therefore a maximum point difference can be achieved), the actual number of voters needed to change the winner under the Borda Rule is 16. For the 100 Points Rule, it is the case that the necessary number of maximal individual changes can be realized with the evaluations in the survey. This confirms that the two alternative voting rules actually provide outcomes that are closer to the plane separating first and second place. Hence, although we do not observe different outcomes, it is clear that certain voting rules are substantially closer to producing a different electoral outcome.

5 Types of parties

In their study of the French presidential election, Baujard et al. (2014) analyzed the individual candidates that stood for election on the basis of their relationships with the voters, i.e., whether or not they evoke strong feelings among voters. In particular, they introduced the concepts of *exclusive* and *inclusive* candidates. Exclusive candidates, as they state, induce strong views, whether they are positive or negative. On the other hand, inclusive candidates usually are considered acceptable by many voters, with rather strong

Table 3 Preference profile of 5 voters

P_1	P_2	P_3	P_4	P_5	P_1'	P_2'	P_1''
a	a	a	a	b	b	b	b
b	b	b	b	c	a	a	c
c	c	c	c	d	c	c	d
d	d	d	d	a	d	d	a

Table 4 Preference profile of 7 voters

P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_1'	P_1''	P_2''
a	a	a	a	b	b	b	b	b	b
c	c	c	c	a	a	a	a	c	c
d	d	d	d	d	d	d	c	d	d
b	b	b	b	c	c	c	d	a	a

Table 5 Distance first and second rank

	Plurality	Borda	100 points
Necessary # of voters to change top ranks	26	12	12
Actually needed # of voters to change top ranks	26	16	12

support by a large proportion of society. In our study, as we have more detailed preference information, we want to extend this classification of candidates to four categories, viz. popular, unpopular, medium and polarizing.

- A popular party is one which has strong support from a specific segment of society, and is seen positively (i.e., ranked highly or evaluated positively) by a large proportion of society.
- An unpopular party is one which has (rather limited) strong support from only a small group and is seen negatively (i.e., ranked low or evaluated negatively) by a large proportion of society.[16]
- A medium party is one which is acceptable (i.e., middle-ranked or evaluated in an average way) to a large proportion of society and induces strong (positive or negative) views in only small groups.
- A polarizing party is one which induces strong views (i.e., ranked either highly or very low, respectively, evaluated either strongly positive or strongly negative) in both a positive and negative way. Such a party gets both strong support from a certain, significantly large, part of society as well as strong negative support from another, significantly large, proportion of society.

Comparing our classification with the categorization in Baujard et al. (2014), one observes that polarizing parties can be seen as exclusive, popular parties as inclusive and unpopular parties as small. The medium type can be seen as relevant only for more detailed preference information as available in our study. Given this classification, we can provide two

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[16] An unpopular party could also be seen as a small or rather unknown party. Voters often assign exclusively low ranks especially to parties which they do not know well.
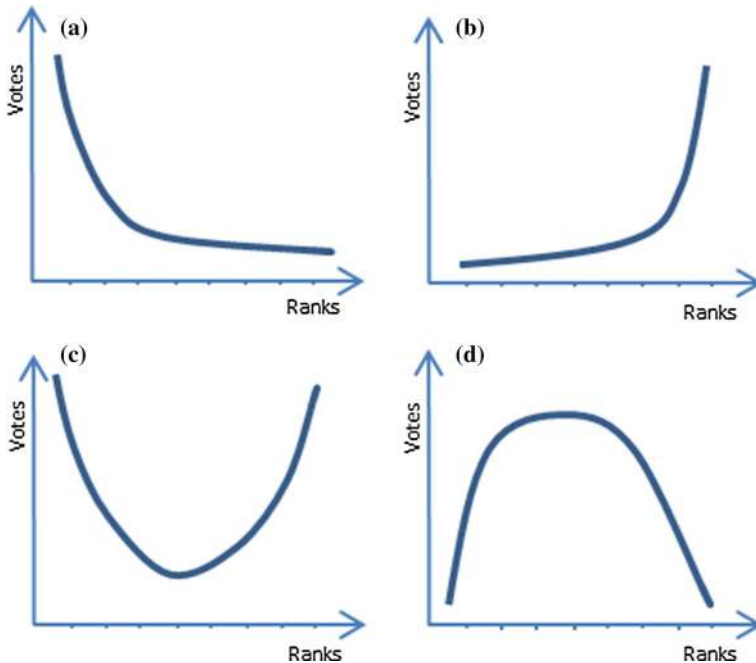
Fig. 2 Distributions of votes of different types of parties. **a** Popular candidate, **b** unpopular candidate, **c** polarizing candidate, **d** medium candidate

illuminating graphical representations of the four types. The first, given in Fig. 2, is based on the distributions of ranks that the respective parties receive.

Secondly, we can use a different graphical representation by comparing the shares of high ranks with those of low ranks. This is done in Fig. 3, where the vertical axis measures the share of voters that ranks a party either first or second and the horizontal axis measures the share of voters that ranks a party either seventh or eighth. Drawing 25%-lines on both axes indicates the region wherein a party receives more than a proportional share.[17] Now, each of the four areas represents one type of party. The lower right area indicates popular parties which receive many high ranks and few low ranks. The opposite occurs in the upper left area, which includes the unpopular parties. Medium parties fall into the lower left area, whereas polarizing parties can be found in the upper right area.

Given the usual structure of voting rules, it seems clear that popular parties will be successful under almost all voting rules, whether they take into account only top ranks, the complete ranking or cardinal preference information. The opposite can be said about unpopular parties. More interesting are the other two types of parties. Polarizing parties that do well in voting rules focusing on top ranks might, however, be disadvantaged when the full ranking or cardinal preference information becomes relevant. On the other hand, medium parties usually benefit from voting rules that take into account more than just the top rank of a voter's preference.

Let us now apply this classification to the data from the Styrian parliamentary elections. Figure 3 classifies SPÖ and ÖVP as clearly popular parties and the Greens as a party on the edge of medium and popular. Does this classification reflect the perceptions of the voters in Styria?

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[17] A party whose ranks are distributed equally would lie exactly at the intersection of those 25% lines.
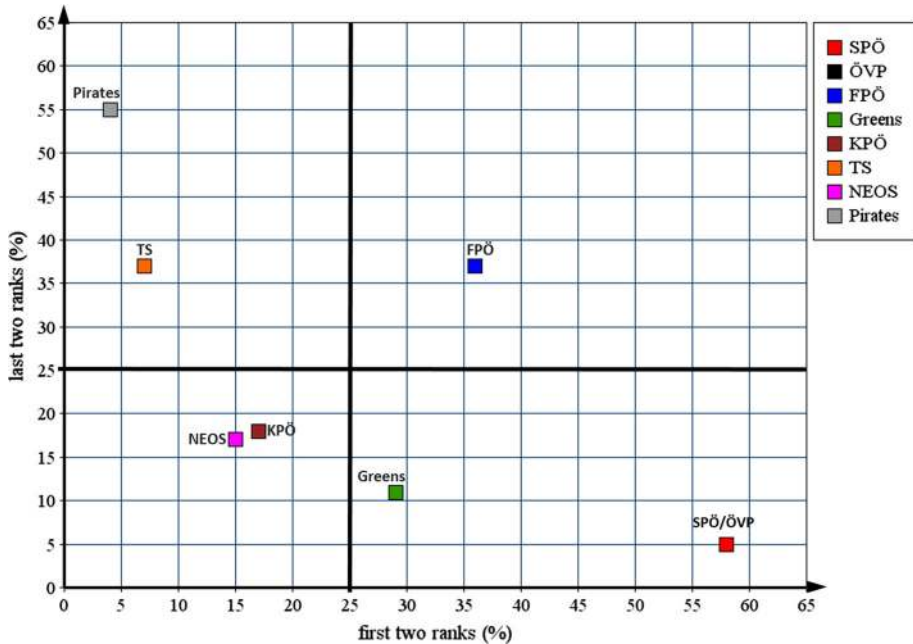
Fig. 3 Types of parties—ordinal information

Historically, SPÖ and ÖVP have been the dominating parties with huge popular support and
well-established organizations in Styria's local communities. The Greens represent a moderate
vision that does not create strong views by most of the voters, but many of its ideas do at least
seem acceptable. Team Stronach and the Pirate Party are classified as unpopular (or small)
parties. That classification reflects the development of the two parties over the previous years.
Whereas Team Stronach had ongoing leadership problems, the Pirate Party was represented in
the local parliament of Styria's capital where, however, they were not successful in keeping
their seat in the 2017 election. Both parties represent minority issues and, hence, many voters
seem to consider them to be of little relevance on the political landscape. Two of the parties,
NEOS and KPÖ, are classified as medium. The NEOS is a relatively new party that succeeded in
gaining seats in the Austrian parliament in the latest elections. However, its support base is
located in the western parts of Austria and bigger cities. With its rather liberal views, both on
social and economic issues, it has difficulty attracting votes in more conservative regions like
Styria. On the other hand, the KPÖ, i.e., the communist party, has a very long tradition in Styria.
Its focus lies almost exclusively on social issues, in particular housing, with rather small
emphasis on communist ideals. Both parties, therefore, do not create strong views, neither in a
positive nor in a negative way. Finally, Fig. 3 indicates the FPÖ as a polarizing party. Over the
past 30 years, the FPÖ was mostly in opposition, both on a national and regional level. One of its
major issues was immigration and its negative impact on Austria and its regions. That position
led to rather strong views by the voters. On the one hand, a considerable share of the population
strongly supports the views of the FPÖ, on the other hand, a large share of the population also
strongly opposes its views. Occasional demonstrations for and against issues represented by the
FPÖ underline those strong views.

   Does this, however, tell us something about the parties' ranking under different voting
rules? That is, can we draw—in practice—similar conclusions about the performance of a
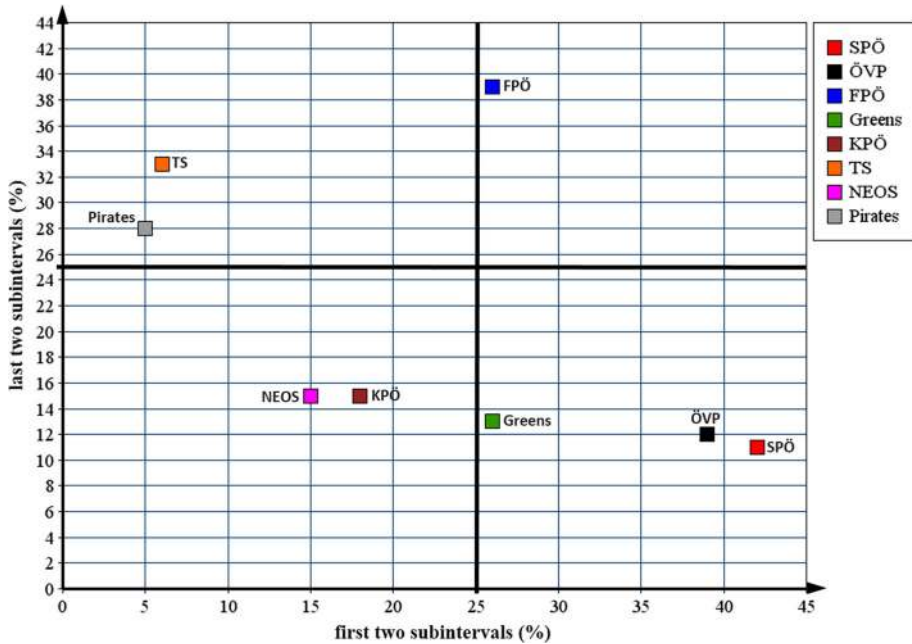
Fig. 4 Types of parties—cardinal information

party under different voting rules than we did in a theoretical way before? If we compare the Plurality outcome with the Borda outcome (see Table 2), we do indeed see that the polarizing party (FPÖ) looses in relation to the slightly popular party of the Greens and only ranks ahead of the medium parties NEOS and KPÖ by a small margin.

Another interesting question is whether an opportunity to state more fine-grained preferences, i.e., allowing for cardinal instead of ordinal preference information, as in the ± 20 Points Rule, would change the picture and therefore the categorization of the parties. We divided the scale from −20 to +20 into nine subintervals and compared the frequencies with which a party ranks among the top two subintervals versus being among the bottom two subintervals. What can be observed in Fig. 4 is a slight shift of the Pirate Party, Team Stronach and the Greens towards the area of medium parties. In some sense, this is not surprising, as both, rather unknown parties and parties that do not create strong feelings, might get close to zero points from a large share of the voters. In addition, a polarizing party may fall even deeper into the upper right area. In the case of the FPÖ, it can be seen that voters have expressed quite strong negative opinions about the party.

Using the previous approach, there does, however, also exist the option of comparing not only the top two ranks with the bottom two ranks, but also the possibility of creating a sequence for each party by comparing the share of the top ranks with the share of the bottom ranks, the share of the top two ranks with the share of the bottom two ranks, and so on. Values have to be adjusted for the potentially larger shares when using more ranks.[18] Hence, for each party we observe a sequence of points in the picture that has a particular

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[18] If, e.g., the votes for a party are distributed equally over the different ranks, the party receives only half as many top ranks as top two ranks (the same holds for the ranks at the bottom). Hence, we adjust for this potential difference by dividing the observed values by the number of top ranks we consider. Given that we have eight parties, we receive 4 different values depending on whether we consider only the number of top
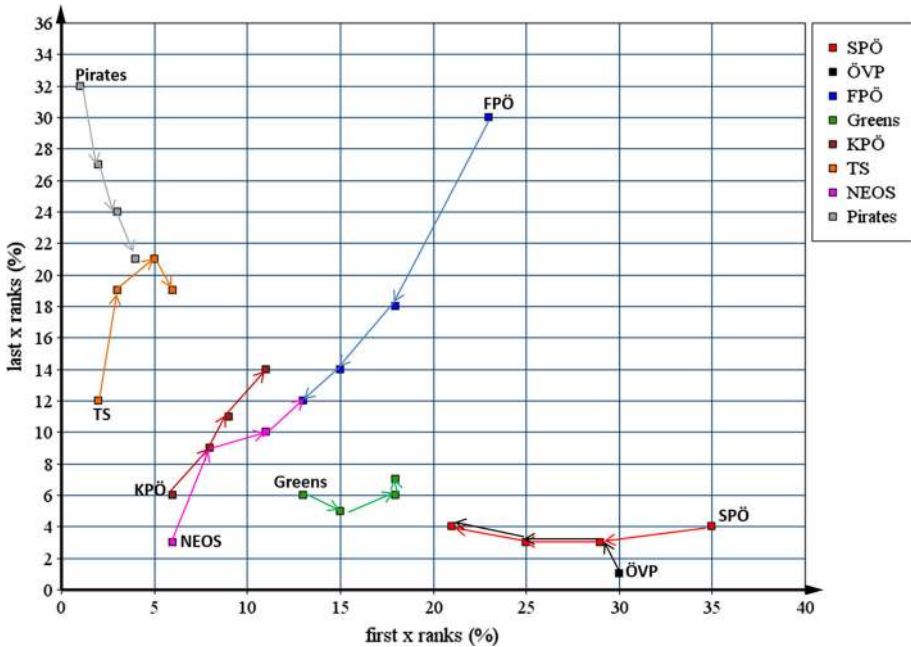
Fig. 5 Types of parties—sequences

meaning with respect to the types of parties defined above. The respective sequences for the different parties under ranking information are presented in Fig. 5.

The interesting additional insight from this picture can be seen in whether a party moves inwards or outwards, i.e., towards the origin or away from the origin. An inward move indicates a larger share of extreme ranks, an outward move a larger share of medium ranks. A strongly polarizing party will therefore be on the 45-degree line moving inwards (which is approximately the case for the FPÖ). Medium parties should also be on the 45-degree line, but moving outwards (which is close to what we observe for KPÖ and NEOS). Unpopular (or small) parties will move vertically (as is the case for TS and Piraten) and, finally, popular parties move horizontally (what is observed for SPÖ, ÖVP and the Greens). The picture also shows the difference between the Greens and the more popular SPÖ and ÖVP parties. Whereas the Greens do get some positive support, they are lacking the strong positive support that the other two popular parties actually receive. Hence, the Greens move outwards rather than inwards.

6 Conclusion

Based on exit polling data, in this paper we have analyzed the 2015 parliamentary election in the Austrian federal state of Styria in various ways. Although a theoretical analysis of the different voting rules usually suggests that no unambiguous method of aggregating

Footnote 18 continued

ranks, top two ranks, top three ranks and top four ranks. For a party whose votes are equally distributed over all ranks, this would lead to all four points being exactly at the intersection of the lines at 12.5%.

voters' preferences is possible, i.e., that in many voting situations the outcome very much depends on the voting rule in use (see, e.g., Saari 2008), the analysis of the experimental data does not strongly support this view. Comparing the election outcomes for different voting rules, which are based on different preference information, our results in general confirm previous studies of real elections that showed rather minor differences between the outcomes under different voting rules. However, such differences might show up in other, for instance even more heterogeneous, empirical environments. Second, we were interested in whether, under alternative voting rules such as the Borda Rule or Evaluative Voting, the outcomes are closer to the switching point at which the winner would change, i.e., whether the outcomes become less stable. To investigate this possibility we introduced a measure of distance based on the minimal number of voter preferences needed to be modified such that the winner would actually change. Again, we were able to confirm previous (theoretical) results as for the election data at hand it is indeed the case that social choice outcomes under the Borda Rule and Evaluative Voting are less stable than under other voting rules considered.

Finally, we tried to illuminate the relationship between voting outcomes under different voting rules and party "types" defined on the basis of the intensity of feelings induced among the voters. Following the existing literature, we introduced and extended a categorization of parties based on the relation between voters' top and bottom rankings (evaluations). In particular, a popular party has strong support from a specific segment of society, and is seen positively (i.e., ranked highly or evaluated positively) by a large proportion of society; an unpopular party has strong support from only a small group and is seen negatively (i.e., ranked low or evaluated negatively) by a large proportion of society; a medium party is accepted (i.e., middle-ranked or evaluated in an average way) by a large proportion of society and induces strong views in only small groups; finally, a polarizing party induces strong views in both a positive and negative way. Our results confirm the hypothesis that polarizing parties are harmed and their medium counterparts are favored by voting rules using more fine-grained preference information.

Of course, this field study left various other interesting questions unanswered. In particular, we were not concerned with strategic behavior, i.e., voters' statements about political preferences aimed at manipulating electoral outcomes in their favor. This would require data on actual voting behavior under different voting rules as well as on information on voters' sincere preferences, which is not jointly available in this study. Answering this question is left for future research.

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