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Who's Favored by Evaluative Voting? An Experiment Conducted During the 2012 French Presidential Election*

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Abstract

Under evaluative voting, the voter freely grades each candidate on a numerical scale, with the winning candidate being determined by the sum of the grades they receive. This paper compares evaluative voting with the two-round system, reporting on an experiment which used various evaluation scales, conducted during the first round of the 2012 French presidential election. Invitations to participate in the study were extended to around 5,000 voters in three cities, and the experiment attracted 2,340 participants. Basing our argument on the

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ranks, relative scores, and grade profiles of candidates, we show that the two-round system favors "exclusive" candidates, that is candidates who elicit strong feelings, while evaluative rules favor "inclusive" candidates, that is candidates who attract the support of a large span of the electorate. These differences are explained by two complementary reasons: the opportunity for the voter to support several candidates under evaluative voting rules, and the specific pattern of strategic voting under the official, two-round voting rule.

Classification JEL: D72, C93

Keywords: Voting, In Situ Experiment, Evaluative Voting, Approval Voting, Two-round system

Highlights

- The two-round system favors "exclusive" candidates, that is candidates who elicit strong feelings.
- Evaluative rules favor "inclusive" candidates, that is candidates who attract the support of a large span of the electorate.
- One explanation of the differences between the elections wins and rankings between the two-round system and evaluative voting rules is that the opportunity for the voter to support several candidates under evaluative voting rules.
- One explanation of the differences between the elections wins and rankings between the two-round system and evaluative voting rules relies in the specific pattern of strategic voting under the official, two-round voting rule.

A voting rule is supposed to be able to determine the candidate most favored by a community of voters. However, it is a well-established conclusion of social choice theory that voting by itself is mathematically incapable of picking the single and uncontroversial winner of an election (Arrow 1957). For a given set of electoral preferences, different voting rules may elect or favor distinct candidates (Forsythe et al. 1996; Van der Straeten et al. 2010; Baujard and Igersheim 2011a, 2011b). However, little research has thus far been conducted on the kinds of winners, or the different types of rankings, which are induced by different voting rules. This article contributes to this gap in the literature by providing a comparative study of which candidates are favored by different modalities of evaluative voting rules as compared to those favored by the two-round system.

By "evaluative voting," we refer to voting rules in which the voter freely grades each candidate on a pre-defined numerical scale. The same grade may be given to several candidates. The sum of the grades a candidate receives is her score, and the candidate who gets the highest score is elected. Evaluative voting, also called utilitarian voting, or range voting, is historically and conceptually linked to the utilitarian paradigm (Bentham 1822; Dhillon and Mertens 1999; Hillinger 2005). While the principle of additive evaluation is widely used in practice (schools, sports, market research, feeling thermometers, etc.), the idea seems to be absent from the political science literature, and social choice theory has, until recently, paid only limited attention to it as a voting mechanism (see, however, Hillinger 2004a, 2004b; Smaoui 2007; Gaertner and Xu 2012; Núñez and Laslier 2012).

Approval Voting is a particular case of evaluative voting which employs

the minimal scale $\{0, 1\}$; thus, under this rule the voter may simply approve or disapprove each candidate. The score of each candidate is the number of approvals she receives, and the candidate with the largest score is elected. Brams and Fishburn introduced this rule to the academic literature in the late seventies (Brams and Fishburn 1978), and by now it has become a standard voting rule, widely studied by theorists (see notably Brams and Fishburn 2005, Laslier and Sanver 2010).

To our knowledge, none of these evaluative voting rules is currently in use for any national presidential elections (nor indeed for any other official elections). Run-off systems are the most common rules used for direct presidential elections (Blais et al. 1997). In France, since 1962, the presidential elections are direct and the voting rule is the following two-round system: if no candidate receives a majority of votes in the first round of voting, the two highest-scoring candidates proceed to a run-off round. A question thus naturally arises: What would happen if presidential voting was conducted according to an evaluative rule? In this paper, we aim to shed light on the properties of evaluative voting. In particular, we offer new insights in answer to the following questions: Could evaluative voting rules be used for official elections? and, Would different results then be obtained?

Our investigation is based on experimental data collected in April 2012 during the first round of the French presidential elections. Experiments on voting rules during actual political elections have been taking place in various localities since 2002.[1] Grofman proposed the term *In Situ* experiments to

[1]Approval Voting was tested in France in 2002 (Balinski, Laslier and Van der Straeten 2002; Balinski, Laraki, Laslier and Van der Straeten 2003; Laslier and Van der Straeten 2004, 2008). In 2007, other rules were also tested: EV with grades $\{0, 1, 2\}$ (Baujard and

describe this method, according to which voters are offered an opportunity, at the time and place of a real election, to express how they would have voted under alternative voting rules (Grofman, Dolez and Laurent 2011[2]). On April 22nd, 2012, during the first round of the 2012 presidential elections in France, we tested alternative rules in five voting stations. Invitations to participate were extended to more than 5,000 voters, with 2,340 people eventually taking part. The rules under test were approval voting (henceforth AV), and other variants of evaluative voting (henceforth EV), using the scales $\{0, 1, 2\}$, $\{-1, 0, +1\}$, and $\{0, 1, ..., 20\}$. Henceforth we refer to these voting rules respectively as EV(0,1,2), EV(-1,0,+1), and EV(0,...,20).

The state of the art with respect to previous experiments on AV can be summarized as follows (see Baujard and Igersheim 2010 for more details). (i) Such experiments are feasible, and most voters welcome the idea of experimenting with voting rules. (ii) The principles of AV or EV are easily understood; voters are particularly favorable to EV. (iii) Within the observed political context, AV and EV modify the overall ranking of candidates compared to the official first round voting rule, and might indeed yield different

Igersheim 2007, 2010; Baujard, Igersheim and Senné 2011), majority judgment (Balinski and Laraki 2011), and single transferable vote (Farvaque, Jayet and Ragot 2011). Similar experiments on AV have taken place in Germany (Alós-Ferrer and Granić 2010) and in Benin (Kabre, Laslier and Van der Straeten 2012).

[2]As well as these, two voting experiments were conducted via the Internet during the 2012 French presidential elections. The site `Voteaupluriel.org` was set up under the supervision of Blais, Laslier, and Van der Straeten, following a similar experiment conducted alongside the Canadian elections in 2011 (`threeontariovotes.org`). The site `Votedevaleur.org` was managed by a French association for the promotion of evaluative voting. These Internet events were independent, but partly coordinated with the experiments on which we report in the present paper. Their results are complementary (see Van der Straeten, Laslier and Blais, 2013 and `http://doc.votedevaleur.org/exp2012/compteRenduPreliminaire/web/co/synthese.html`) and we shall occasionally refer to them in this paper.

outcomes.

The 2012 experiment confirms these results and allows us to go further in the comparison of the properties of the variants of evaluative voting and the two-round system. In this paper, we focus in particular on the analysis of their influence with respect to the fate of the candidates: who wins, who loses, and why?

To do so, we here develop two symmetric notions based on the kind of relationship the candidates have with the voters. Candidates who arouse strong feelings, whether positive or negative, among voters, are called "exclusive" candidates; while candidates who are liked by a large number of voters, but not necessarily strongly liked, nor in a way that excludes support for others, are called "inclusive" candidates.

After a quick presentation of the experimental protocol, we first show that these alternative rules favor "inclusive" candidates, while the official French system,*i.e.*, the two-round system, favors "exclusive" candidates. Next, we argue that this property is caused by two factors: a mechanical factor which concerns the greater potential for expression offered by evaluative voting rules; and a behavioral factor which concerns the specific patterns of strategic voting which voters adopt under the two-round system. While the mechanical factor favors inclusive candidates under evaluative voting, the behavioral factor advantages exclusive candidates under the two-round system.

1 Experimental design and adjusted data

Before setting out our analysis it is first necessary to explain the experimental design and the principles upon which the subsequent adjustment of the data was based. Further details regarding the experimental protocol (information on voters, progress, and experimental ballots) and the results (participation and expression rates, raw results, data adjustment techniques) are provided in the Supporting Information.

During the first round of the 2012 French presidential elections, certain voters were invited to take part in our experiment and test two other voting rules, once they had voted in the official ballot. Five voting stations, located in three different cities, were selected to host the experiment: the two voting stations of the village of Louvigny, Normandy; one voting station in the city of Saint-Etienne, Rhône-Alpes; and two voting stations in the city of Strasbourg, Alsace. Among the 5,371 voters registered for these five voting stations,[3] all 4,319 voters who actually showed up for the official elections were invited to join the experiment. Of these, 2,340 agreed to participate. Participants in Saint-Etienne, Louvigny, and Strasbourg tested both approval voting (AV) and evaluative voting (EV) – EV(0,1,2), EV(-1,0,+1), and EV(0,1,...,20), respectively. By the end of the day, each voter had voted three times: once officially with the first round of the two-round plurality vote, a second time with approval voting, and a third time with one of the other variants of evaluative voting. We obtained distinct rankings and scores for the candidates for each of the rules, as displayed in the Supporting

[3]About 85% of the French population over 18 is registered (Rieg 2011).

Information.

We cannot, however, use this raw data to make a direct comparison of the scores and rankings for the different rules. This is for two reasons. Firstly, the experimental protocol did not permit us to set up a control group, since the invitation to participate, on a voluntary and anonymous basis, was extended to all voters who took part in the official election in the voting stations in question. In spite of a relatively high participation rate – an average of 54% of the registered voters who showed up for the official election also cast an experimental vote –, we face a participation bias. Not only are the voters who voted experimentally fewer in number than the official voters, but they also vote differently: the proportion of votes for certain candidates seemed higher (or lower) among the participants of the experiment than among the wider set of voters in the official election. Hence we need to correct for the participation bias in order to compare rankings and scores between the official and the various tested rules. Secondly, the electorate for each of the tested voting stations is different, such that comparisons between the different variants of evaluative voting, as applied to different cities, would not make sense. What is more, this geographical bias means that we cannot interpret the results as holding at the national level. Hence we corrected for the geographical bias in order to compare all rankings together and to allow the experimental results, suitably adjusted, to be meaningful at the national level.

In 2012, we asked participants to answer a questionnaire, reproduced on the ballot, which invited them to reveal their official vote. We obtained 1,294 useful answers to this question – i.e. 55%. We chose to restrict our attention

to these voters' ballots only. For each of them, we know both the voter's official vote and her experimental votes. For instance, we note that 41.11% of the experimental participants declared that they voted for François Hollande, while only 33.16% of the actual voters did so in the official corresponding voting stations – a difference which is due to the participation bias –, and only 28.63% France-wide – a difference which is due to the geographical bias. These differences allow us to compute a weighting for this candidate, or more accurately a weighting for the experimental ballots of the participants who declared they officially voted for him. This can be done for each of the ten candidates. We may thus correct both biases and compute the adjusted data for AV, and for the three variants of EV. All the remaining analyses are based on these adjusted data. An extensive explanation of this treatment is provided in the Supporting Information.

2 Who is favored by which voting rule?

The differences observed between the results according to the voting rules allow us to characterize and categorize the candidates.

2.1 Comparing the ranks of candidates

In 2012, 10 candidates were present in the first round of the election. Table 1 represents adjusted AV results and official results for France. It should be read as follows: the two last columns give the official results of the first round, while the three first columns correspond to AV adjusted results. We here compare the main differences.

For approval voting, there are two ways of describing the number of approvals, either in terms of percentage of voters (% votes), or in terms of percentage of the total number of approvals (% approvals). For instance, according to our adjusted results, F. Hollande is approved by 49.44% of the voters. If one adds the percentages of this column, one obtains 257.94%, *i.e.*, a total larger than 100% since voters on average approve several candidates per ballot (here 2.58). In terms of the percentage of the total number of approvals, the preceding results are normalized to 100%. In this case, F. Hollande obtains 19.17% of the total number of approvals given by all voters to all candidates.

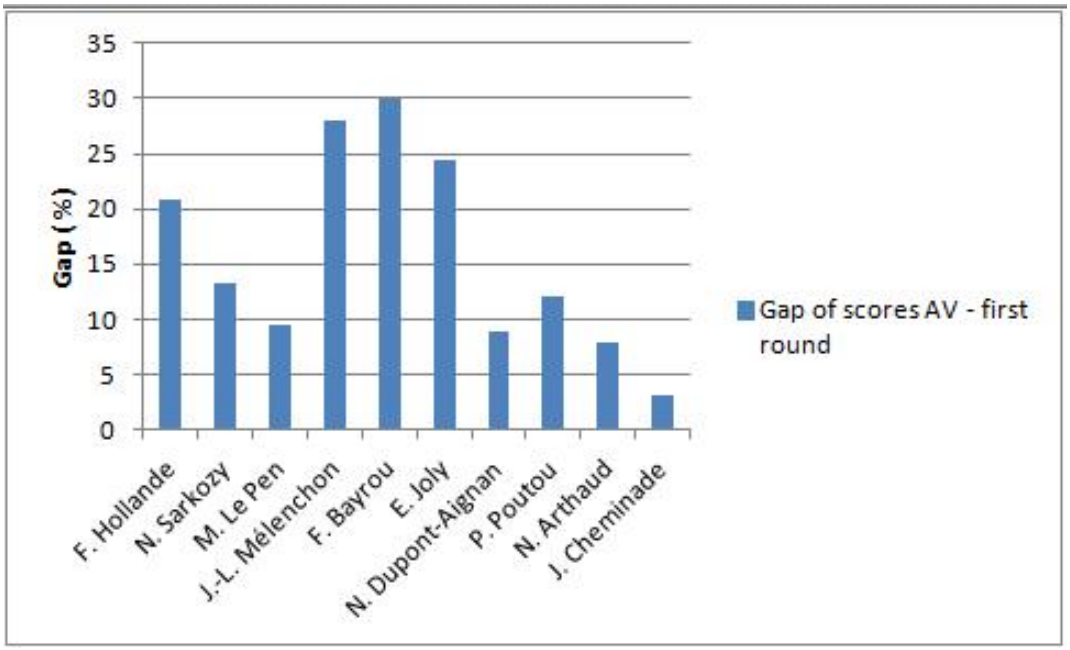
According to Table 1, the rankings of the candidates differ only slightly, and in particular the candidates ranked first and second remain the same. Two inversions appear: the first between M. Le Pen, the candidate of the extreme Right (3^{rd} in the official ballot and 5^{th} for AV), and J.-L. Mélenchon, the candidate of the alternative Left (5^{th} for the official ballot and 3^{rd} according to AV); and the second between two "small" candidates (Ph. Poutou and N. Dupont-Aignan).

Besides the changes in the ranking of candidates, differences between AV and the official results also lie in the relative importance of the scores obtained by all the candidates, as illustrated by Figure 1 which represents the gap of scores between AV and the official rule (in %). Clearly, since voters on average approve several candidates, AV scores are systematically higher

Table 1: AV adjusted results, France 2012

	Approval voting, France			Official voting, France	
	% Votes	% Approvals	Ranking	% Votes	Ranking
F. Hollande	49.44%	19.17%	1	28.63%	1
N. Sarkozy	40.47%	15.69%	2	27.18%	2
M. Le Pen	27.43%	10.63%	5	17.90%	3
J.-L. Mélenchon	39.07%	15.15%	4	11.10%	4
F. Bayrou	39.20%	15.20%	3	9.13%	5
E. Joly	26.69%	10.35%	6	2.31%	6
N. Dupont-Aignan	10.69%	4.14%	8	1.79%	7
Ph. Poutou	13.28%	5.15%	7	1.15%	8
N. Arthaud	8.35%	3.24%	9	0.56%	9
J. Cheminade	3.32%	1.29%	10	0.25%	10
Total	257.94%	100%		100%	

Figure 1: Gaps of scores between AV and official results, France 2012



than official ones, so these gaps are systematically positive. But we observe that F. Hollande, the final winner of the official election, obtains a much higher approval score than N. Sarkozy, the outgoing president, while their official scores are rather similar. Further, F. Bayrou, a centrist candidate and presumably the Condorcet winner in 2007 and 2012,[4] and J.-L. Mélenchon, the leader of the alternative Left, obtain comparable approval scores, which are completely discordant with the official results and bring them close to N. Sarkozy. E. Joly, the Green candidate, generally ignored by the official method, is now comparable to M. Le Pen, the candidate of the extreme Right, who on the contrary gains relatively fewer votes as we pass from official voting to AV.

In brief, and as shown in Figure 1, some candidates seem to benefit from the move from a two-round system to AV (F. Hollande, J.-L. Mélenchon, F. Bayrou, E. Joly), while others seem either to lose or to remain relatively stable (N. Sarkozy, M. Le Pen). One should note further that for some "small" candidates – characterized by the fact that they are little known, or viewed negatively by voters (these candidates are ranked 7^{th} to 10^{th} under AV and official voting) –, the move is relatively neutral: under both methods, their rankings remain bad and their scores low.

These trends are confirmed, and even strengthened, for the three variants of EV. Table 2 represents the evaluative scores and should be read as follows. The columns "Ave." show the average grades. For instance, F. Hollande obtains an average of 0.14 for EV(-1,0,1), which is equal to the total sum of

[4]On this issue, see Baujard and Igersheim 2007, and Van der Straeten, Laslier and Blais 2012.

Table 2: Average scores, adjusted results for France

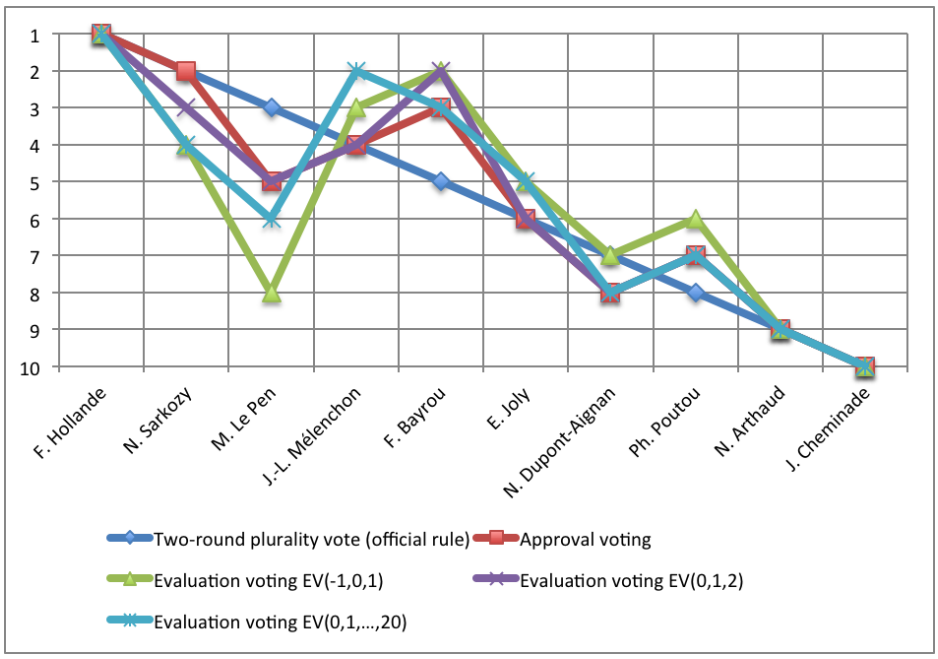
Scale	Official	AV(0,1)		EV(-1,0,1)		EV(0,1,2)		EV(0,...,20)	
	Rank	Ave.	Rank	Ave.	Rank	Ave.	Rank	Ave.	Rank
F. Hollande	1	.19	1	+.14	1	.94	1	9.70	1
N. Sarkozy	2	.16	2	–.11	4	.85	3	7.74	4
M. Le Pen	3	.11	5	–.35	8	.68	5	4.98	6
J.-L. Mélenchon	4	.15	4	+.06	3	.78	4	8.22	2
F. Bayrou	5	.15	3	+.11	2	.92	2	8.22	3
E. Joly	6	.10	6	–.17	5	.46	6	6.84	5
N. Dupont-Aignan	7	.04	8	–.34	7	.32	8	3.69	8
Ph. Poutou	8	.05	7	–.29	6	.33	7	4.28	7
N. Arthaud	9	.03	9	–.40	9	.26	9	3.67	9
J. Cheminade	10	.01	10	–.50	10	.12	10	2.35	10

grades participants attributed to him, divided by the number of participants.

The comparison of rankings is illustrated in Figure 2. For this figure, each candidate's ranking is presented on the vertical axis, according to the five voting rules, from 1 (first position at the top) to 10 (last position at the bottom). Candidates are displayed on the horizontal axis according to their ranking in the official first-round election, from left (the front runner is F. Hollande, the new president) to right (the candidate in last position is J. Cheminade, a little-known candidate mainly inspired by populist ideas). Hence the representative curve of official ranking is a decreasing line. Variations around this line illustrate the effect of changing the rule as regards the results of national elections, for given voters' preferences. Candidates whose tested rankings are above the line can be considered as advantaged by the tested rules, and conversely.

As can be seen from Table 2 and Figure 2, the winner remains the same

Figure 2: Comparisons of rankings according to different rules



for each variant of EV, as do the last and the penultimate candidates. But that is where the commonalities end. The other candidates have different rankings according to the voting rules, sometimes being improved, sometimes decreased. While N. Sarkozy and M. Le Pen appear to be disadvantaged by AV *vis-à-vis* the two-round system, EV sharpens this effect. Their positions are systematically worse with approval ranking than with the official two-round ranking, and even worse with EV rankings. Indeed, N. Sarkozy remains second with AV, but goes down to the third and fourth positions with EV. The extreme-right candidate M. Le Pen, who is ranked third according to the official rule, drops to fifth position with AV and with EV(0,1,2), to sixth position with EV(0,...,20), and eighth position with EV(-1,0,1). With EV(-1,0,1), a voting rule which seems particularly disadvantageous for her, M.

Le Pen falls to the level of the small candidates. Conversely, going from official voting to AV is advantageous for candidates such as J.-L. Mélenchon, F. Bayrou, or E. Joly. The same remark holds symmetrically for them: their positions are systematically better or equal in moving from the official two-round to AV, and from AV to EV. The fact that E. Joly's, F. Bayrou's, and J.-L. Mélenchon's rankings increase significantly with the experimental votes mean that they benefit from an important degree of voter adherence – something which, at first sight, the official rule fails to capture. For instance, more than 39 % of voters are likely to approve F. Bayrou and J.-L. Mélenchon, and almost 27% E. Joly. By contrast, their official scores do not exceed 10%, 12%, and 3% respectively. Finally, four candidates who come last under all the tested rules as well as the official rule can definitely be considered as small (N. Arthaud, J. Cheminade, N. Dupont-Aignan, Ph. Poutou).

The AV and EV results provide a basis on which we may pursue our reflections on the properties of the various voting rules. It has been stressed that the rankings and scores of the candidates are very different as between the official rule and the four tested rules; yet while certain scales may strengthen the gaps, the different evaluative rules that we tested do generate similar trends. Evaluative voting rules seem to advantage some candidates and to disadvantage others. In the rest of this section, we attempt to identify the types of candidates these rules favor (or, respectively, disfavor).

2.2 Comparing the relative approval scores of candidates

Let us investigate the nature of the candidates using the AV adjusted data (we shall turn to the EV data in the next subsection).

Figure 3 is based on the columns % of approvals (for AV) and % votes (for official voting) of Table 1. It should be noted that point-wise comparison is not meaningful here since the "% approvals" represents a percentage relative to the total number of approvals, while the "% votes" corresponds to a percentage relative to voters. But it remains interesting to compare the general aspect of these curves. It should be stressed in particular that they intersect with each other just once. Tables 3a and 3b represent two other statistics based on our AV adjusted data with respect to voters' official vote. Table 3a provides the average number of approvals according to the voters' official vote. For instance, the voters who declared an official vote in favor of F. Hollande gave on average 2.77 approvals per ballot.[5] Table 3b, meanwhile, describes the extent to which a candidate is approved by voters who did not vote for him/her officially; it shows the percentage of voters who gave an approval to a candidate from among those who did not give them their official vote. Here we see that only 19% of voters who did not officially vote for N. Sarkozy gave him an approval, while 31% did so for J.-L. Mélenchon.

Three characteristics of the official voting method vis-à-vis AV emerge from Figure 3 and Tables 3a and 3b.

Firstly, the official voting method tends to systematically overestimate

[5]The number of voters who declared an official vote in favor of a candidate but who did not give him/her an approval is close to zero.

Figure 3: Comparison of approval voting and official scores for a common scale of 100%, France

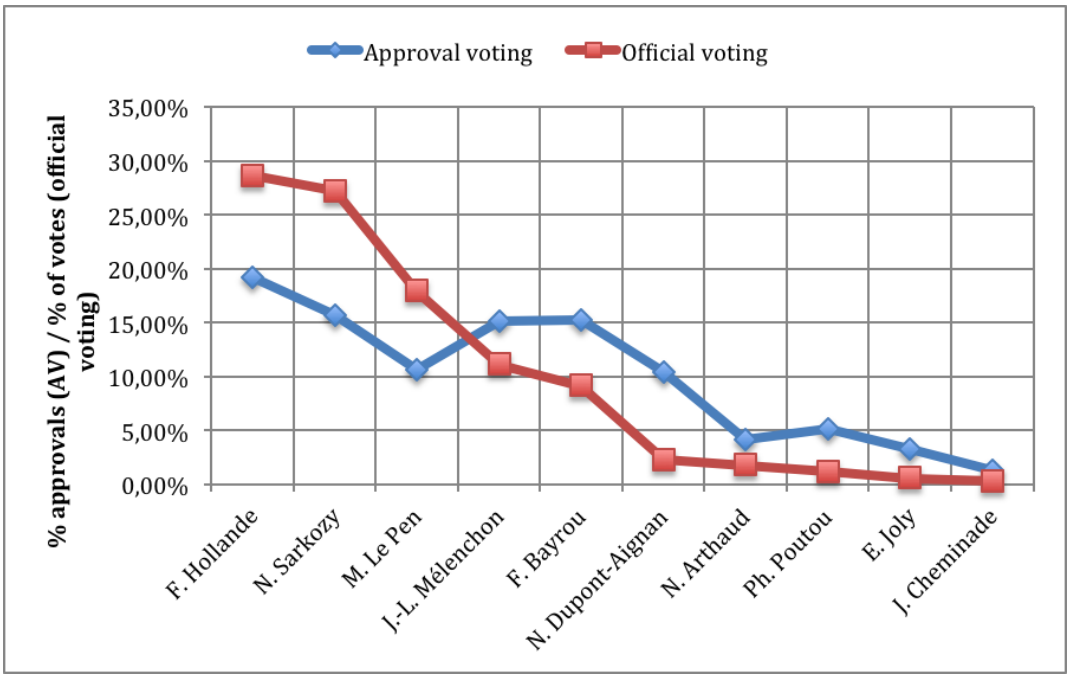


Table 3: Correspondences between approvals and official (non-) votes by candidate

(a) Average number of approvals assigned by the candidate's official voters

F. Hollande	2.77
N. Sarkozy	2.07
M. Le Pen	2.41
J.-L. Mélenchon	3.30
F. Bayrou	2.52
E. Joly	3.27
N. Dupont-Aignan	3.13
Ph. Poutou	3.23
N. Arthaud	3.00
J. Cheminade	3.40

(b) Number of official non-voters who assigned an approval to the candidate (%)

F. Hollande	30 %
N. Sarkozy	19 %
M. Le Pen	12 %
J.-L. Mélenchon	31 %
F. Bayrou	33 %
E. Joly	25 %
N. Dupont-Aignan	9 %
Ph. Poutou	12 %
N. Arthaud	8 %
J. Cheminade	3 %

certain big candidates, and to underestimate others, compared with AV. Here, the big candidates are F. Hollande, N. Sarkozy and M. Le Pen. Not only are they considered big by most commentators in the context of the official election, but we note that their official position is above the approval line, *i.e.*, to the left of the intersection between the approval and the official lines in Figure 3. More generally, according to the official method, the big candidates seem to benefit from a kind of focus or strategic effect. Indeed, if voters consider that some candidates who they like have very little chance of being selected for the second round, and since they can vote for one candidate only, they may strategically desert their preferred candidate in favor of a more serious contender (Cox 1997). Further, the presence of precisely three main candidates on whom the voters focus in the first round of a two-round election is consistent with Cox's view that such a first round is akin to the election of *two* candidates, which implies that there should be *three* serious contenders.

Secondly, the aspect of the curves of Figure 3 shows that among the three big candidates we identified above, two of them (N. Sarkozy and M. Le Pen) can be considered as favored by two-round system and disadvantaged by AV (the case of F. Hollande is discussed below). What characteristic, shared by N. Sarkozy and M. Le Pen, is likely to explain this feature? Tables 3a and 3b help us to answer this question. With these two statistics, it can be shown that not only do these candidates attract rather exclusive support from their voter base, but that they also elicit clear rejection by other voters. First, we see that those who gave their official vote to N. Sarkozy or M. Le Pen gave few approvals to other candidates. Table 3a reports the lowest averages

of approved candidates among those who voted for N. Sarkozy (2.41) and M. Le Pen (2.07). This proves that those who support these two candidates under the official rule stay focused on them even when presented with a plurinominal rule such as approval voting.

Second, Table 3b shows that voters who did not officially vote for N. Sarkozy or M. Le Pen almost never gave them an approval. Apart from the candidates identified as small (that is, N. Dupont-Aignan, Ph. Poutou, N. Arthaud, J. Cheminade), N. Sarkozy and M. Le Pen obtained the weakest scores according to this second group of statistics (19% for N. Sarkozy and 12% for M. Le Pen). Since N. Sarkozy and M. Le Pen are (i) supported by voters who gave very few approvals otherwise, and (ii) almost never supported by the rest, they can therefore be considered *exclusive* candidates in the sense that they arouse positive feelings from a specific segment of the voters, and are rejected by the rest.

Thirdly, pursuing the line of reasoning in the previous point, the aspect of the curves in Figure 3 shows that AV tends especially to favor some of the "secondary" candidates, notably F. Bayrou and J.-L. Mélenchon. With AV, the scores of these candidates exceed that of M. Le Pen, and almost reach that of N. Sarkozy. How can we explain the evolution of the importance of these two candidates relative to the big ones? To address this question, we refer once again to Tables 3a and 3b. Symmetrical arguments may hold for F. Bayrou and J.-L. Mélenchon. First, compared with N. Sarkozy and M. Le Pen, F. Bayrou and J.-L. Mélenchon obtained higher average numbers of approvals from their voters, as shown on Table 3a. This means that their voters approve of more candidates besides them – *i.e.* they do not focus

exclusively on them, as N. Sarkozy and M. Le Pen 's voters do. Second, and as shown in Table 3b, the most decisive factor as regards F. Bayrou and J.-L. Mélenchon is that both are often approved of by voters who do not vote for them officially (33% for F. Bayrou and 31% for J.-L. Mélenchon). Indeed, in the case of J.-L. Mélenchon, polls revealed that interest in this candidate extended beyond the realm of the extreme left.

F. Bayrou and J.-L. Mélenchon on the one hand, and N. Sarkozy and M. Le Pen on the other, manifest diametrically opposed characteristics, since F. Bayrou and J.-L. Mélenchon are (i) supported by voters who gave many approvals otherwise, and (ii) often supported by the rest. F. Bayrou and J.-L. Mélechon can thus be seen as *inclusive* candidates, in the sense that they seem to be appreciated by a large set of voters who nevertheless do not show exclusive attachment to their candidacy. Note that E. Joly's candidacy is of the same kind.

In brief, beside the usual distinction between the big candidates and the others, we have introduced two new notions to qualify types of candidates: exclusivity and inclusivity. An *exclusive* candidate is one who induces strong views, whether positive or negative, and whose support comes from one specific part of a fragmented society. An *inclusive* candidate is a unifying candidate, viewed positively by a large proportion of the voters, but whose support is not necessarily strong enough for them to receive an official vote. This does not mean that an inclusive candidate gathers support from all segments of the society, but rather that he or she is able to obtain some support from the electorates of different candidates.

Our conjecture is that, at first sight, *inclusive candidates seem to be fa-*

vored by the alternative rules, while exclusive candidates seem to be favored by the two-round system. But although this conjecture seems to be confirmed by the AV data as set out above, it cannot yet be considered a definitive conclusion. It first needs to be tested against all the other candidates, including the small ones, as well as with the winner of the official vote, F. Hollande. Note in particular that its application to the latter case is not straightforward. Although F. Hollande is obviously a big candidate, as are N. Sarkozy and M. Le Pen, it would be hard to claim that he is as disadvantaged by AV as they are, since he wins under both rules. Besides, according to Figure 1 it seems that he could be considered an inclusive candidate since he gains in the move from the official vote to AV; and even though the gap in scores is less significant than those of E. Joly, J.-L. Mélenchon or F. Bayrou, it is much higher than those of N. Sarkozy and M. Le Pen. Further, according to Table 3a, the average number of approvals given by his voters is 2.77, a little more than F. Bayrou's 2.52, while according to 3b, 30% of voters who did not vote for him nevertheless gave him an approval: after J.-L. Mélenchon and F. Bayrou, this is the third highest percentage among the ten candidates and the most important feature of an inclusive candidate. We thus need to check whether our provisional conclusion applies for the case of F. Hollande as well as for all other candidates. In doing this, we will have the opportunity to refine the notions of exclusive and inclusive candidates, as well as to look more closely at the relative importance of the different scales of evaluative voting. This task is undertaken in the following subsection.

2.3 Comparing the grade profiles of candidates

We now focus on the frequencies of use of the different grades in the three rating scales of evaluative voting that were offered to the voters; we refer to these frequencies as the "grade profiles" of candidates. To make the comparison easier, the 21 grades of EV(0,...,20) have been divided into three intervals: from 0 to 6 for the lower grades – to be compared with the lower bound of EV(0,1,2) and EV(-1,0,1) –, from 7 to 13 – for the middle grades – , and from 14 to 20 – for the higher grades.[6]

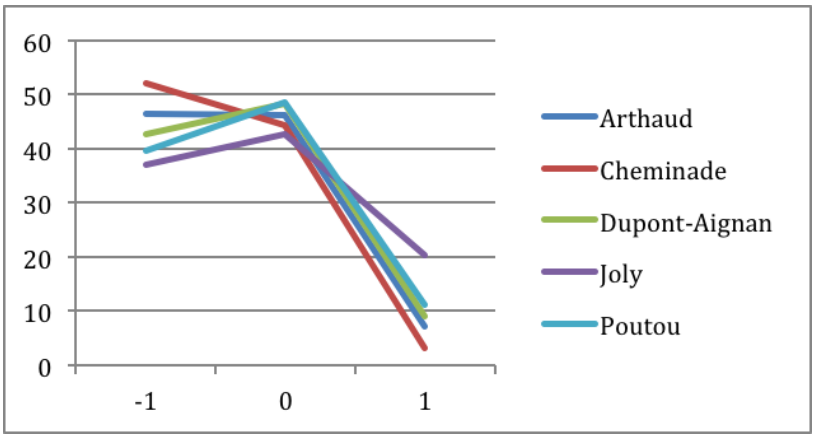
Let us firstly consider all those candidates who have not yet been identified as big, or as either exclusive or inclusive. We refer to these as the *small* candidates: N. Arthaud, J. Cheminade, N. Dupont-Aignan, Ph. Poutou, and, though to a lesser extent, E. Joly. Figures 4b and 4c confirm their status. Their grade profile is clearly decreasing: we see very high frequencies of lower grades (around 60% to 80%), low frequencies of middle grades (around 20%), and almost no high grades: even those voters who approved small candidates often prefer to give them the middle grade rather than the higher. Figures 4b and 4c also show that the extension of the grading scale from $\{0, 1, 2\}$ to $\{0, ..., 20\}$ does not substantially change the distribution of the grades given by voters for the small candidates.

However, the shape of the grade profiles for the small candidates is rather different for EV(-1,0,1), as represented in Figure 4a: here it is increasing until the average grade, then decreasing. The neutral or indifferent grade is 0 for

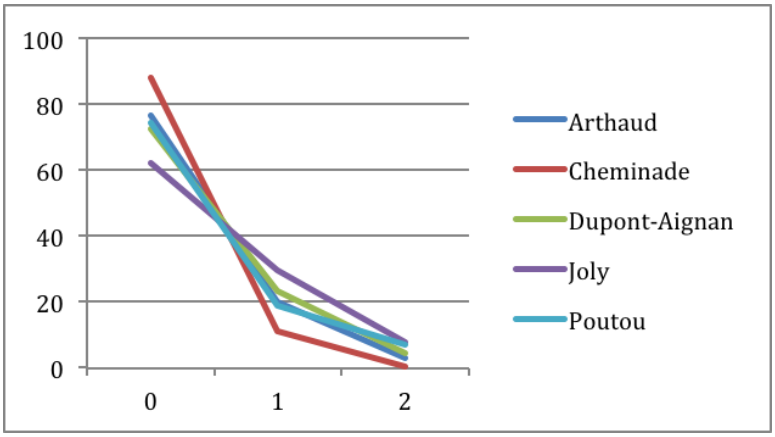
[6]It should be stressed that other intervals have been tested as well, but that they all led to the same kind of conclusions. We therefore chose to use the most balanced ones, *i.e.*, with an equal number of grades in each category.

Figure 4: Grade profiles of small candidates for three different scales of EV

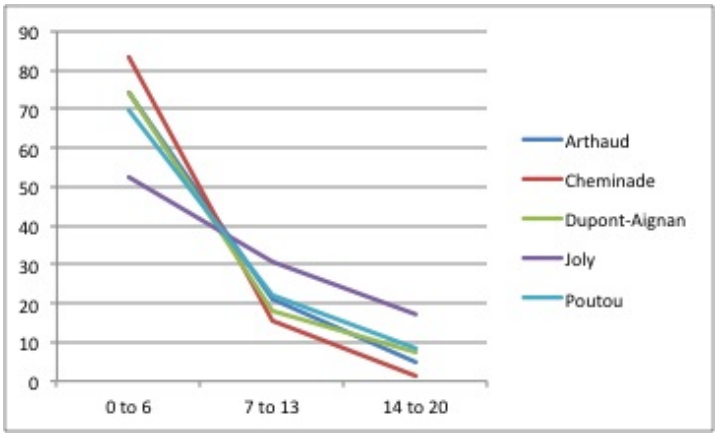
(a) EV(-1,0,1)



(b) EV(0,1,2)



(c) EV(0,...,20)



the three modalities of EV. Yet, for EV(-1,0,1), and unlike EV(0,1,2) and EV(0,...,20), it does not correspond to the lower grade. Therefore it seems natural to suppose that small candidates, who may be generally unknown to voters, would receive more 0s, whereas well-known candidates may risk being judged negatively on average. This leaves open the possibility that a system with negative grades could elect a largely unknown candidate.[7] In view of our results, however, it seems clear that this situation was not likely to have come about in 2012. Indeed, a striking feature of Figure 4a is that the middle grade, which is 0 with EV(-1,0,1) and is positive with the other scales, attracts more voters under EV (-1,0,1) than with the other scales. But this phenomenon is not sufficient to significantly raise the final scores of the small candidates because these candidates also receive a large number of the negative grade under EV(-1,0,1), sufficient to counterbalance their better performance in the mid-range. One might well imagine that participants in the 2012 experiment took into account the risk of contributing to the election of one of these candidates by a kind of abstention, and we cannot definitively reject the possibility that such a result could arise in other circumstances. Figures 4a, 4b and 4c thus require us to reject the principle that a change in the rating scale does not affect voters' behavior. Obviously, these three scales were not perceived as equivalent by participants.

Let us now examine the grade profiles of the candidates we previously

[7]Here we may add an important point: the participants in our experiment were clearly informed that a blank line for a candidate would correspond to the grade 0. This information was all the more significant in the polling stations of Louvigny, where EV(-1,0,1) was tested. We can verify that this rule was understood by the participants since for almost all experimental ballots, whatever the EV-scale, the boxes which correspond to grade 0 are almost never crossed.

called *exclusive*: N. Sarkozy and M. Le Pen.

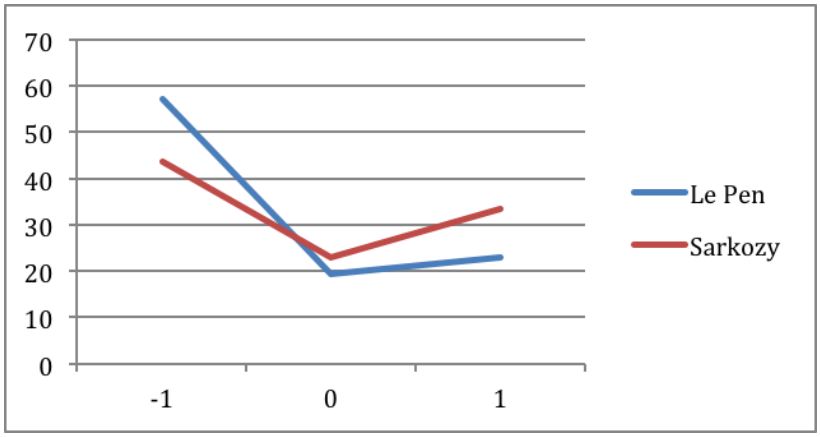
One observes from Figures 5a to 5c that the grade profiles for both candidates are broadly the same: the lines of the grades profiles are decreasing then increasing. This corresponds to a rather high frequency of lower grades (around 50%), a low frequency of middle grades (around 15% to 20%), while higher grades are more frequent than the middle ones. Contrary to the small candidates, the shapes of the grade profiles of these exclusive (and big) candidates are preserved whatever the scales of grades. It should be stressed that these grade profiles match in every respect the definition we proposed for exclusive candidates, namely candidates who induce strong views, whether positive or negative. Their high frequency of lower grades – and thus of rejection – explains why these two candidates, 2nd and 3rd in the official vote, fall so many ranks with evaluative voting.

Hence we have confirmed that AV and all the other variants of EV tend to be unfavorable to exclusive candidates, unlike the two-round system.

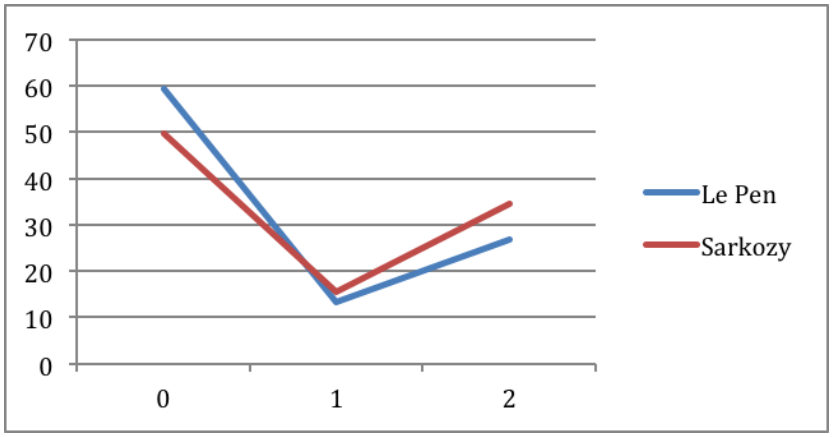
Lastly, let us examine the grade profiles for the inclusive candidates, F. Bayrou, J.-L. Mélenchon and F. Hollande. Figures 6b and 6c show that these three candidates share the same characteristics: rather low frequencies of lower grades as compared with small and exclusive candidates, and intermediate frequencies of middle and higher grades (between 30% and 40%). Note that the similarities of F. Bayrou's, J.-L. Mélenchon's and F. Hollande's grade profiles strengthen our previous provisional conclusion that F. Hollande can be seen as an inclusive candidate. With EV(-1,0,1), one observes in Figure 6a that the frequency of lower grades is even weaker (around 30% against 40%). This could mean that even when voters do not support these

Figure 5: Grade profiles for exclusive candidates

(a) EV(-1,0,1)



(b) EV(0,1,2)



(c) EV(0,...,20)

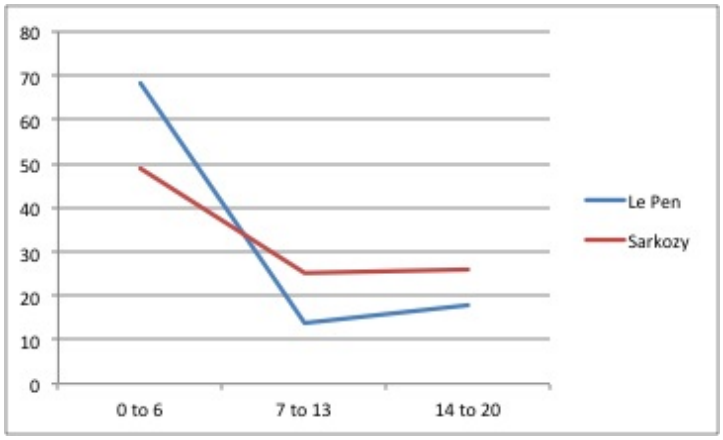
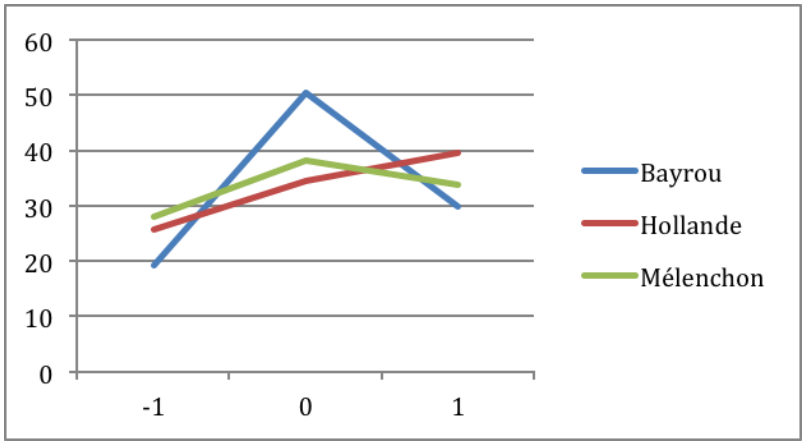
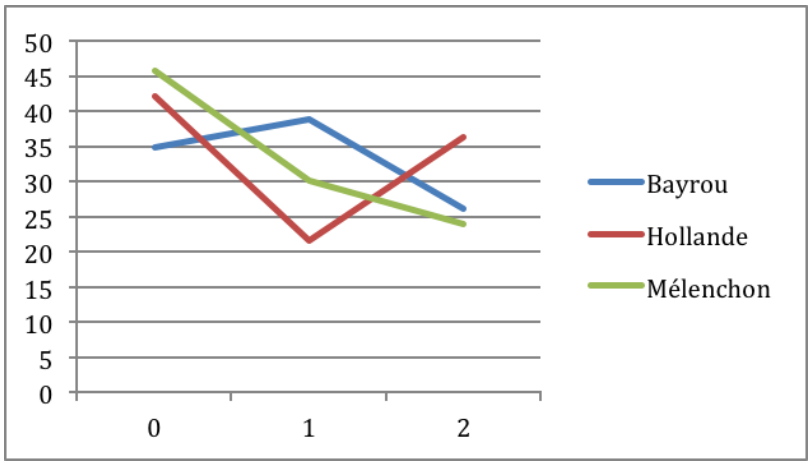


Figure 6: Grades profiles for inclusive candidates

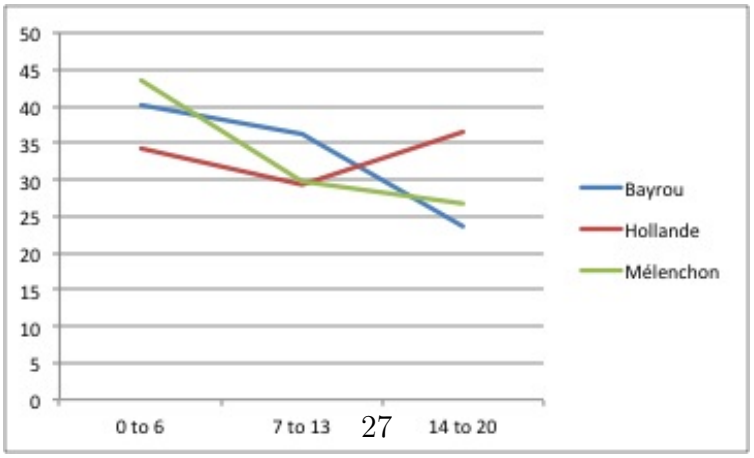
(a) EV(-1,0,1)



(b) EV(0,1,2)



(c) EV(0,...,20)



candidates (according to AV), they do not necessarily give them a negative grade, since that would reflect a stronger degree of rejection which does not really represent their feelings towards them. Consequently, $\{0, 1, 2\}$ is the only evaluative scale for which the lowest grade is the least frequent for these three candidates. Whatever the scale is, EV then improves the rank of these inclusive candidates with respect to AV (except of course F. Hollande who remains the winner in every case). All these observations corroborate our definition of inclusive candidates. Hence we have confirmed that AV and all the other variants of EV tend to favor inclusive candidates.

We may thus draw the interim conclusion that AV and all the other variants of EV tend to favor inclusive candidates and are unfavorable to exclusive candidates. If we want to complete the proof of our conjecture, we need to identify the mechanisms that are at work here. It is to this that we now turn.

3 Why do different rules induce different results?

We have shown that approval voting and evaluative voting favor inclusive candidates and disfavor exclusive ones, contrary to the two-round system. A new question therefore arises: Why do different voting rules induce these different kinds of results? We have already made the preliminary proposal that the differences may be explained by two mechanisms. On the one hand, there is a mechanical effect due to the plurinominal nature of approval voting

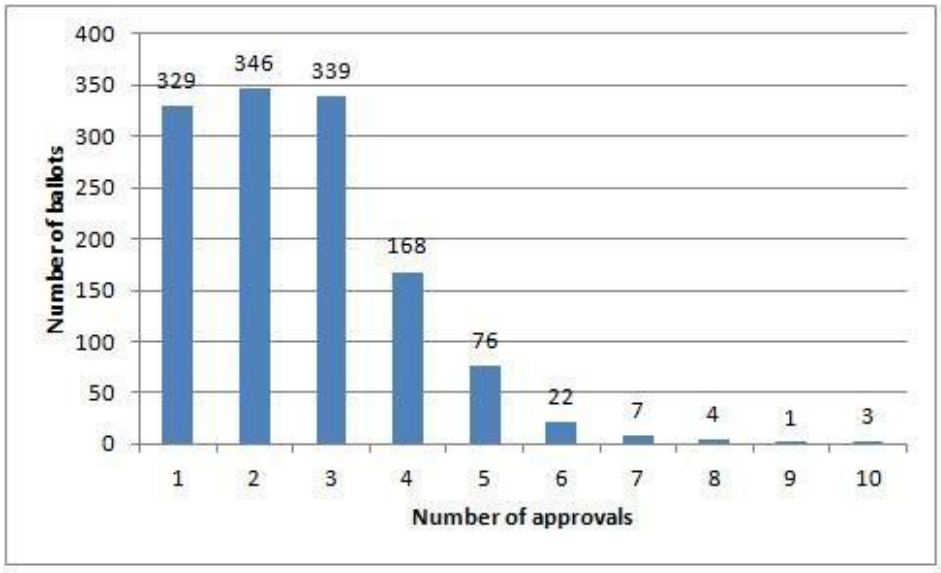
and evaluative voting as compared to a uninominal rule such as the first round of the two-round system. On the other hand, there is a behavioral effect, since different rules induce different patterns of strategic and expressive voting (Baujard and Igersheim 2011b). This section aims at confirming and making more precise these assertions in the specific case of this experiment. This further scrutiny will permit us to confirm our conjecture.

3.1 The mechanical effect: The expressive potential of approvals and grades

To shed light on the way participants in the experiment used the expressive potential offered by their experimental ballot, we turn to the global statistics regarding approval and evaluative voting. According to Figure 1, each participant approves 2.58 candidates on average. Looking at Figure 7, we observe that the peak of the distribution of number of candidiates approved is 2. Further, the ratio of participants who gave one approval only is 25.41%: that is to say, under AV, one-fourth of participants stay within the constraints of uninominal voting (*i.e.*, give an approval to one candidate only).

But this kind of uninominal reasoning does not hold under EV. In Louvigny, 2.19% of voters gave the grade +1 to one candidate only and -1 to all the others; in Saint-Etienne, 6.46% of voters gave the grade 2 to one candidate only and 0 to all the others; and in Strasbourg, 3.93% gave a grade 20 to one candidate and 0 for all the others. All these elements clearly show that even though some voters continue to reason in a uninominal fashion under

Figure 7: Number of approved candidates

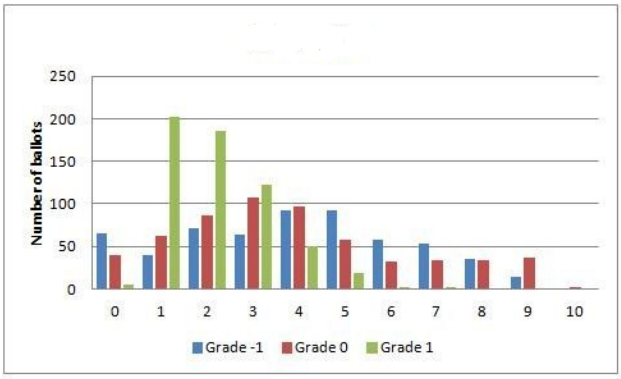


AV, they make a definite break with it under EV, and thus seem to be more willing to change the mode of expression of their political preferences.

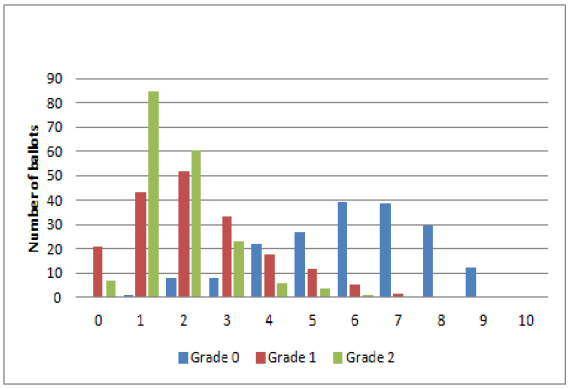
Indeed, as shown in Figure 8, the participants gave a more precise expression of their preferences under EV. For instance, histogram 8c for EV(0,...,20) reads as follows: 82 ballots gave no grade between 14 and 20, 177 ballots gave just one grade between 14 and 20, 136 ballots gave two grades between 14 and 20, and so on. We may make three observations about the scorings. First, for each form of EV, many ballots gave the maximal grade(s) to one or two candidates. Second, we know that a strategic vote under EV would involve giving either maximal or minimal grades but no intermediate ones (Núñez and Laslier 2012). As shown in these distributions, the intermediate grades are extensively used by the participants, who again seem to prefer to express their preferences sincerely rather than vote strategically. Third and

Figure 8: Distribution of grades, for EV

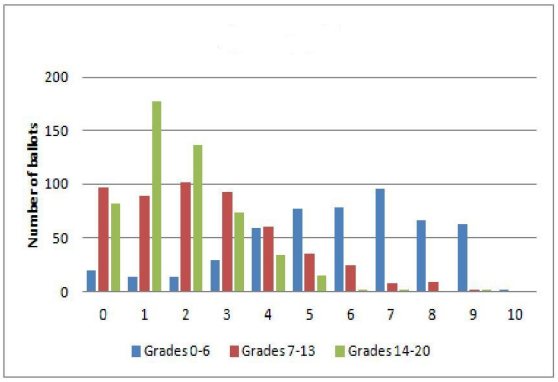
(a) EV(-1,0,1)



(b) EV(0,1,2)



(c) EV(0,...,20)



lastly, the distributions of EV(0,...,20) and EV(0,1,2) look similar in spite of the difference of scales, while, conversely, the distribution of EV(-1,0,1) does not share their features. Indeed, the minimal grade(s) is(are) given much more often for EV(0,1,2) and EV(0,...,20) than for EV(-1,0,1), as previously previously noted and as is clear from the histograms. Thus we again see similarities between EV(0,...,20) and EV(0,1,2), while EV(-1,0,1), with its negative grade, presents distinct characteristics.

In this sub-section we have stressed that voters do use the alternative voting rules to express their electoral preferences in a more extensive fashion, and particularly under EV. Under the rules we have considered, where grades are simply summed to find the winner, this extra potential for expression obviously plays in favor of the inclusive candidates.

3.2 The behavioral effect: Strategic voting under the two-round system

According to the questionnaire attached to the experimental ballots, the majority of voters took account of various strategic considerations in deciding who to vote for in the official election. This should not come as a surprise, since the French two-round system and the number of candidates in the first round of the presidential election (10 in 2012) mean that issues concerned with strategic and sincere voting have a high public profile (in French, strategic voting is often referred to as 'vote utile', meaning 'useful vote'). Blais (2003) and Van der Straeten, Laslier and Blais (2012) report similar findings.

In what follows we provide an assessment of the effects of strategic voting

under the two-round system.[8] As already mentioned, our study is based on ballots for which participants have declared their official vote. By comparison of their official vote with the preferences expressed through their experimental vote – and more specifically with their evaluative vote –, we are able to guage the impact of strategic voting on the results of the official vote. To do this, we compared the chosen candidate under the official vote with the grades assigned to the ten candidates.

We are led to distinguish between three types of ballots. For the first type (*Type 1*), the chosen candidate has the highest grade and is the only one to have this grade. In such a case, the uninominal voting is in accordance with the voter's preferences. Consequently, unless the voters chose to exactly reproduce their strategic behavior during the experimentation, strategic voting does not seem to play any role in the official vote. For the second type (*Type 2*), the chosen candidate is one of the candidates who receive the highest grade. Although it depends on the evaluation scale, strategic concerns may (or may not, according to the actual individual preferences) have affected the official vote in the selection of the one candidate for whom to vote officially among these candidates. In the last type of ballots (*Type 3*), the chosen

[8]We fully acknowledge that approval voting and evaluative voting can lead to other patterns of strategic voting; but for the purposes of this section we will refer to the EV ballots as the main indicator of voters' true electoral preferences. As we have observed above, the fact that there was extensive use of intermediate grades indicates that full strategic voting was not at all common in the case of EV(0,...,20) or the other scales. As well as this, larger (more finely gradated) ratings scales allow for more reliable comparisons for the purpose of the study of strategic voting under the two-round system. Since the scale of AV (two grades) is narrower than EV(0,1,2) and EV(-1,0,1) (three grades), it is a more delicate matter to assess strategic voting under the two round-system using AV data than that of EV: according to the typology developed above, the total percentage of voters of Type 3 is almost non-existent, while the total percentage of voters of Type 2 is higher than 70% (we develop the definitions of Types 1, 2 and 3 in the rest of the section).

candidate was not given the highest grade. The voter's behavior is then clearly strategic. The voter's choice does not reflect her preferences probably because she took into account the chances that the various candidates would be elected.

Under 3 grades EV, the evaluative scale is very narrow and voters cannot express the intensity of their support for the candidates they like. This is particularly true for EV(-1, 0, 1) which has a very high percentage of voters of *Type 2* (65.5%), and remains true under EV(0, 1, 2) (53.4%). Ballots where the chosen candidate was not given the highest grade are almost non-existent, 0.8% under EV(-1, 0, 1) and 2.5% under EV(0, 1, 2) (see Table 4). Thus, the extent of "unquestionable" strategic voting (voters of *Type 3*) is difficult to assess under 3 grades EV. Voters of *Type 2* may indeed have had strategic concerns, but this cannot be shown uncontroversially.

EV(0, ..., 20) affords a better assessment of strategic voting, since the scale allows voters to rank the ten candidates with a greater degree of nuance. As we see from table 4, *Type 2* ballots are unsurprisingly much less frequent (13.1%), whereas *Type 3* ballots are much more numerous (8.8%). Consequently, about 22% of voters (*Type 2* and *Type 3* ballots) are likely to have behaved strategically in their official choices, and among them 8.8% did so for sure. It is for ballots of *Type 2* and *Type 3* that we see the largest differences between the rankings resulting from EV and that of the official rule. The reason for this is that they give first rank to one or several candidates who were not chosen under the uninominal vote. Beyond the distinction of uninominal versus plurinominal, this phenomenon of strategic voting also explains the discrepancies that we previously observed between the results

Table 4: Distribution of ballots indicating a strategic (official) vote (%)

	EV(-1, 0, 1)	EV(0, 1, 2)	EV(0,..., 20)
Type 1	33.7	44.1	78.1
Type 2	65.5	53.4	13.1
Type 3	0.8	2.5	8.8
Total	100.0	100.0	100.0

of the official and experimental votes.

Let us now see which candidate is most advantaged by strategic voting in the two-round system. Table 5 shows the distribution of official votes per type for the five main candidates. It reads as follows. Among 100 *Type 1* ballots identified on the basis of the EV(0,1,2) and the EV(-1,0,1) tests, 21.7 were for M. Le Pen. J. L. Mélenchon represents 14.7% of the *Type 2* ballots. And, because he is an exclusive candidate who is strongly supported by the people who vote for him, N. Sarkozy collects most ballots of *Type 1*, 43.3% in the case of 3 grades EV, and 31% in the other case. Conversely, F. Hollande attracted 72.2% of *Type 3* ballots in the 3 grades EV, and 49.9% in the latter case. Although these percentages should be treated with care, since they are based on a small number of ballots, this table still shows clearly that F. Hollande attracted the highest number of ballots from strategic voters among all candidates.

We have already observed that some big candidates are favored under the two-round system because they benefit from a kind of focus or strategic effect: F. Hollande was one of them. However, since his gap of scores is notably more important than others' between the two-round system and

Table 5: Distribution of official vote per type of voters for the five main candidates (%)

	3 grades EV			EV(0,...,20)		
	Type 1	Type 2	Type 3	Type 1	Type 2	Type 3
F. Hollande	21.4	32.7	72.7	26.7	30.3	49.9
N. Sarkozy	43.3	19.6	15.8	31.0	21.8	4.7
M. Le Pen	21.7	15.3	0.0	18.5	6.9	20.6
J.-L. Mélenchon	4.0	14.7	6.8	10.1	16.7	9.2
F. Bayrou	7.2	10.8	0.0	9.5	10.6	3.2
...	...	...	...	...	...	...
Total	100.0	100.0	100.0	100.0	100.0	100.0

approval voting, we also concluded that he can be considered an inclusive candidate, and thus might be relatively disadvantaged by the two-round system. Table 5 now clearly shows that F. Hollande is the main recipient of strategic voting. Indeed, he benefited from the clear majority of *Type 3* ballots which unambiguously reflect strategic behavior.

Consequently, it is not surprising that F. Hollande was both the winner of the first round of the two-round system, and the winner of the alternative plurinominal rules we tested: he drew benefit from both of the factors we have cited, the mechanical and the behavioral. As an inclusive candidate, he is favored by the plurinominality of approval voting and evaluative voting. As a big candidate, he is favored by strategic voting under the two-round system.

4 Concluding remarks

An intrinsic limitation of the kind of experiment proposed here is that it takes as given the political supply. The number of parties, and the platforms they adopt, might indeed be different under a different voting method; and thus not only the voters but also the candidates would make different choices, and the whole political landscape would be changed (Dellis 2009, Laslier and Maniquet 2010, Baujard, Igersheim, and Senné 2011). This study thus does not attempt to "predict" what would have happened in France in 2012 if the rule had been different. It compares, *for given electoral preferences*, how differences in results and rankings are induced by the rules. This should be considered as only one brick in the analysis of voting rules.

With this proviso, the material discussed in this paper clearly points in one direction. Evaluative voting rules, including the particular case of approval voting, favor inclusive candidates who are able to gather numerous approvals, or relatively good grades from large segments of the electorate. At the same time, these rules disadvantage exclusive candidates who receive almost no support or high grades from outside their electorate. The reason for both phenomena lies in two factors. First, a mechanical factor, which concerns the extended potential of expression given by evaluative voting rules and the fact that the grades obtained by a candidate are aggregated by simple sum. This factor means that inclusive candidates are more favored under evaluative voting rules than under the two-round system. Second, a behavioral factor which concerns strategic thinking under the two-round system. This second factor favors the exclusive candidates under the two-

round system.

We have observed that, just like in real elections, voters in these experiments seem to be motivated both by a desire for personal expression and by considerations pertaining to collective choice. Indeed, both the mechanical and the strategic effects of uninominal voting rules create a gap between the individual electoral preference and the way people are induced to express it in the collective context of an election. They may have a desire to express themselves plainly and honestly, but they are aware that the rule encourages them to take into account how the mechanism of collective choice works in practice. This double intention means that the results of evaluative voting elections reflect two distinct yet relevant types of information: what the voters think of the candidates, and which candidate they wish to see elected. The use of evaluative voting ballots instead of single-name ones does not dissipate the fundamental double nature of democratic elections, but it may nevertheless facilitate the resolution of the voting question at the individual level since it enables the voters to disentangle these issues.

5 Supporting Information

5.1 Design and description of the 2012 experiment

Five voting stations in three localities were selected to host the experiment: the two voting stations of the village of Louvigny, Normandy (where one of the 2007 experiments had already taken place); one voting station (Bureau de la Terrasse) in the city of Saint-Etienne, Rhône-Alpes; and two voting stations (Bureaux de la salle de la Bourse) in the city of Strasbourg, Alsace. On April 22$^{\text{nd}}$, 2012, *i.e.*, during the first round of the French presidential elections, the voters were invited to test two other voting rules, approval voting (AV) and one modality of evaluative voting: EV(0,1,2) in Saint-Etienne, EV(-1,0,2) in Louvigny, and EV(0,...,20) in Strasbourg.

Two weeks before the voting day, each registered voter received a letter by post, informing her or him of the existence of the experiment, and of the principle of the two tested rules. Just before the actual election, voters were also informed by brief notices in the local press and on the radio, as well as posters around the voting stations. In Louvigny, an information meeting was organized two weeks prior, where voters could come and ask questions.

On April 22$^{\text{nd}}$, as illustrated in figure 9, the experiment was run as follows. Volunteers welcomed the registered voters who showed up in their respective official voting stations, and informed them about the experiment when they entered the building. After (and conditional upon) their participation in the official vote, they were invited to head to the experimental voting stations; these were located in the same building, either in another room (Louvigny and Saint-Etienne), or in the same room (Strasbourg). At the experimental

Figure 9: Official and experimental voting stations, Saint-Etienne la Terrasse, April 22nd, 2012

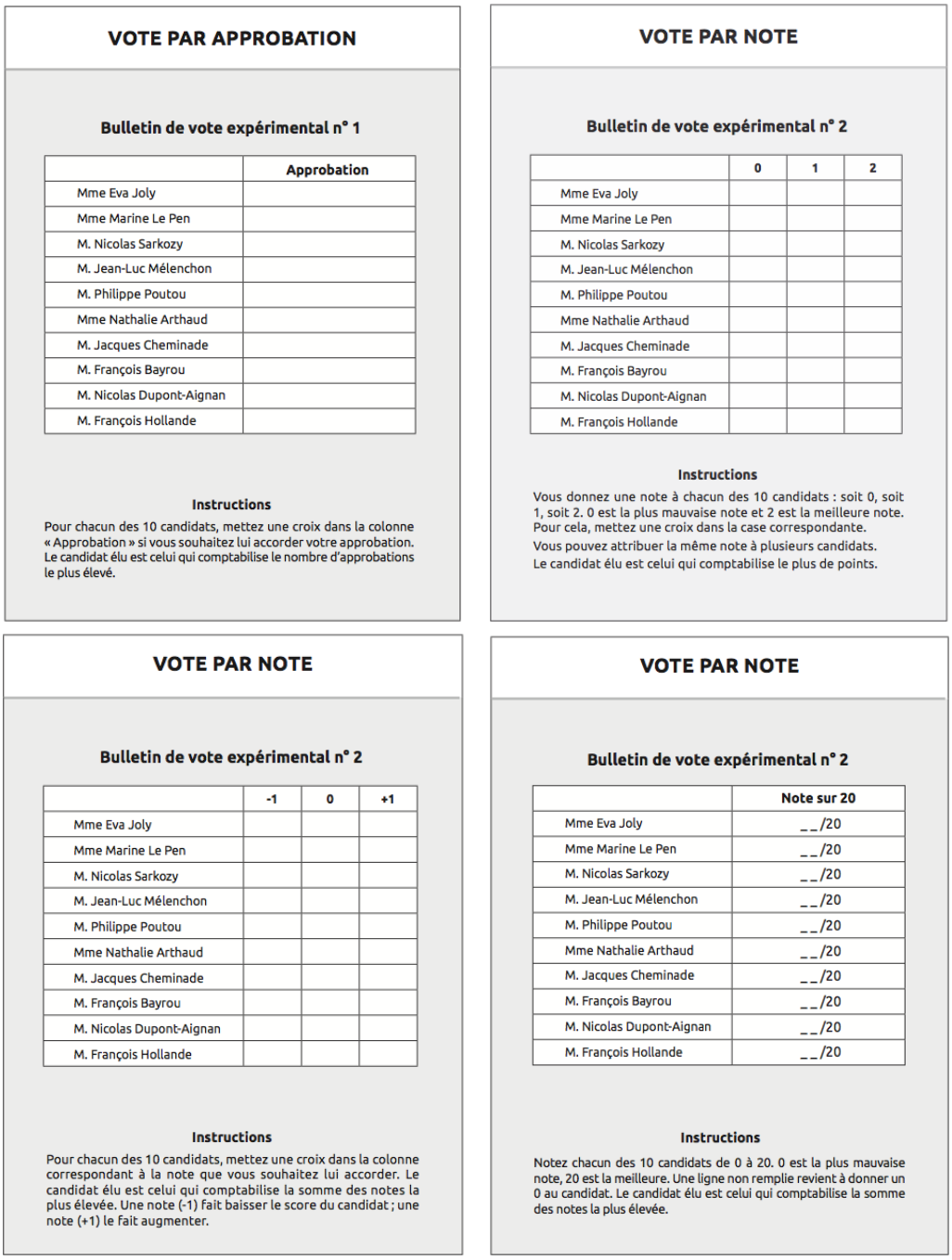
voting station the participants are presented with the experimental ballot papers, envelopes, voting booths, a transparent ballot box, and sign-off sheets. Assessors were present to provide information on the tested rules and, as in the official vote, to organize the process of the ballot. Then voters could "vote experimentally," that is, participate in the test of two alternative voting rules. It was stated clearly that the experimental votes would, of course, have no influence on the actual outcome of the presidential election.

5.2 Experimental ballots

The voter receives an A4 folded sheet, making four pages. On page 1 is an overall presentation of the experiment, designed to emphasize its "scientific" purpose.

The two experimental ballots are on the central pages, as presented in figure 10. On the left was Approval Voting (AV), and on the right was the version of Evaluative Voting (EV) tested in the city. These voting rules are simple enough that only a few sentences are required to completely describe them. The list of candidates was always given according to the official list

Figure 10: AV, EV3(0,1,2), EV3(-1,0,1), EV21 experimental ballots. April 22nd, 2012



VOTE PAR APPROBATION

Bulletin de vote expérimental n° 1

	Approbation
Mme Eva Joly	
Mme Marine Le Pen	
M. Nicolas Sarkozy	
M. Jean-Luc Mélenchon	
M. Philippe Poutou	
Mme Nathalie Arthaud	
M. Jacques Cheminade	
M. François Bayrou	
M. Nicolas Dupont-Aignan	
M. François Hollande	

Instructions

Pour chacun des 10 candidats, mettez une croix dans la colonne « Approbation » si vous souhaitez lui accorder votre approbation. Le candidat élu est celui qui comptabilise le nombre d'approbations le plus élevé.

VOTE PAR NOTE

Bulletin de vote expérimental n° 2

	0	1	2
Mme Eva Joly			
Mme Marine Le Pen			
M. Nicolas Sarkozy			
M. Jean-Luc Mélenchon			
M. Philippe Poutou			
Mme Nathalie Arthaud			
M. Jacques Cheminade			
M. François Bayrou			
M. Nicolas Dupont-Aignan			
M. François Hollande			

Instructions

Vous donnez une note à chacun des 10 candidats : soit 0, soit 1, soit 2. 0 est la plus mauvaise note et 2 est la meilleure note. Pour cela, mettez une croix dans la case correspondante.
Vous pouvez attribuer la même note à plusieurs candidats.
Le candidat élu est celui qui comptabilise le plus de points.

VOTE PAR NOTE

Bulletin de vote expérimental n° 2

	-1	0	+1
Mme Eva Joly			
Mme Marine Le Pen			
M. Nicolas Sarkozy			
M. Jean-Luc Mélenchon			
M. Philippe Poutou			
Mme Nathalie Arthaud			
M. Jacques Cheminade			
M. François Bayrou			
M. Nicolas Dupont-Aignan			
M. François Hollande			

Instructions

Pour chacun des 10 candidats, mettez une croix dans la colonne correspondant à la note que vous souhaitez lui accorder. Le candidat élu est celui qui comptabilise la somme des notes la plus élevée. Une note (-1) fait baisser le score du candidat ; une note (+1) le fait augmenter.

VOTE PAR NOTE

Bulletin de vote expérimental n° 2

	Note sur 20
Mme Eva Joly	__/20
Mme Marine Le Pen	__/20
M. Nicolas Sarkozy	__/20
M. Jean-Luc Mélenchon	__/20
M. Philippe Poutou	__/20
Mme Nathalie Arthaud	__/20
M. Jacques Cheminade	__/20
M. François Bayrou	__/20
M. Nicolas Dupont-Aignan	__/20
M. François Hollande	__/20

Instructions

Notez chacun des 10 candidats de 0 à 20. 0 est la plus mauvaise note, 20 est la meilleure. Une ligne non remplie revient à donner un 0 au candidat. Le candidat élu est celui qui comptabilise la somme des notes la plus élevée.

(randomly) drawn by the French Constitutional council for this election. Hence the order of appearance of names was the same for the official and the experimental rules. The scale for EV was $\{0, 1, 2\}$ in Saint-Etienne; this had already been used there in 2007. It was $\{-1, 0, +1\}$ in Louvigny. We were curious to see how the voters would use the negative values. Lastly, the scale for EV was $\{0, ..., 20\}$ in Strasbourg; this wider scale is the common scale of grades in the French school system.

Finally, page 4 contained the short optional questionnaire that each voter could fill in. We do not report, in the present paper, on the detailed analysis of the questionnaire.

5.3 Participation and expression rates

As mentioned above, 4,319 persons showed up in their respective official voting stations, representing an average turnout of 80.41%, as compared with the general turnout of 79.48% at the national level. Among these voters, 2,340 agreed to take part in the experiment, *i.e.*, 54.18% over the five voting stations. Details on turnout and participation rates are presented in Table 6. The experimental participation rate is the ratio of the number of voters who agreed to take part in the experiment to the number of registered voters who did vote in their respective official voting station, as only voters could participate in the experiment. 85.85% of the voters who participated the experiment answered the questionnaires. Among the responses gathered there, it is notable that 55% of the participants were female; 39% were 35 years old or less; 23% were over 55; and 67% of people who answered the

Table 6: Participation rates

	Louvigny (2 stations)	Saint-Etienne (1 station)	Strasbourg (2 stations)	Total
Official vote				
Registered electors	2,036	1,112	2,223	5,371
Votes cast	1,722	863	1,734	4,319
Official participation rate	84.58 %	77.61%	78.00%	80.41%
Experimental vote				
Participants	930	387	1023	2,340
Experimental participation rate	54.01%	44.84%	59.00%	54.18%

corresponding question declared themselves to have an occupation.

Table 7 reports the expression rates for AV and the three variants of EV. An experimental ballot paper is "null" when there are annotations that are not in accordance with the rules of AV or EVs. It is "blank" when it is entirely empty. One notices that the total votes cast for AV is quite satisfying (96.03%), and they are also high for the three EV. But it should be pointed out that the expression rates in Louvigny and Saint-Etienne are higher than in Strasbourg. One main explanation for this is open to us: namely, that the experimental ballot paper seems at first sight much more complex in Strasbourg than in Louvigny or Saint-Etienne, since the participants in Strasbourg were asked to vote for EV(0,...20) (plus AV): some participants might have considered EV(0,...20) as more complicated and time-consuming than EV(0,1,2) or EV(-1,0,1). Therefore, the participants who agreed to take part in the experiment without a real and deep interest in the initiative might have decided either to fill in quickly the whole ballot paper (*i.e.*, AV included) without reading the instructions carefully, or simply renounced the idea of taking an effective part in the experiment. As a consequence, these

Table 7: Expression rates

		AV			EV		
Place / EV-scale	Number of ballots	Spoiled blank/null	Votes cast	% cast	Spoiled blank/null	Votes cast	% cast
Louvigny EV(-1,0,1)	930	25 (21/4)	905	97.31	11 (5/6)	919	98.82
St-Etienne EV(0,1,2)	387	11 (11/0)	376	97.16	13 (5/8)	374	96.64
Strasbourg EV(0,...,20)	1,023	57 (41/16)	966	94.43	67 (59/8)	956	93.45
Total	2,340	93 (73/20)	2,247	96.03	91 (69/22)	2,249	95.95

specific participants made more mistakes (which explains the higher ratio of null ballots in Strasbourg) or voted blank. From this fact, we may infer that rules which are too complicated or time-consuming, whether regarding the complexity of the questions asked of the voters or the difficulty of understanding the mechanism (Laslier 2011), should be re-considered very carefully.

In spite of this latter observation, though, all the expression rates remain high enough to argue that most participants took the experiment seriously, and that the collected data are reliable.

5.4 Adjusted data

Since this paper compares rankings that result from various rules for given actual electorate preferences, the main benchmark should be the actual voting rule, which is in this case the two-round system. The raw data for approval scores, evaluative scores and official results are presented in tables

Table 8: Raw results: Approval Voting and Official voting for the five voting stations

	Approval voting				Official voting		
	Number	% approvals	% voters	Ranking	Number	% voters	Ranking
F. Hollande	1,373	22.47	61.10	1	1,406	33.16	1
N. Sarkozy	677	11.08	30.13	5	946	22.31	2
M. Le Pen	398	6.51	17.71	6	533	12.57	4
J.-L. Mélenchon	1,078	17.64	47.98	2	574	13.54	3
F. Bayrou	921	15.07	40.99	3	492	11.60	5
E. Joly	733	12.00	32.62	4	153	3.61	6
N. Dupont-Aignan	224	3.67	9.97	9	66	1.56	7
Ph. Poutou	381	6.24	16.96	7	41	0.97	8
N. Arthaud	228	3.73	10.15	8	24	0.57	9
J. Cheminade	97	1.59	4.32	10	5	0.12	10
Total	6,110	100.00	271.92		4,240	100.00	

Nb: For Table 10, as in the rest of the paper, the candidates are ranked according to the official national results.

8 and 9.

But, as shown in Table 10, the raw data (from AV and EV) suffer from two biases which preclude direct comparisons between the official and experimental results. First, there is a participation bias since, even though a large number (54.18%) of the official voters took part in our experiment, these participants are probably not representative of all the voters of the five experimented polling stations. Thus the raw results for AV and EV cannot be directly compared with the official ones. In Table 10, this bias can be observed by comparing lines 3 and 4: line 4 reports the answers of the participants who answered question 5 in our questionnaire "what is your official ballot?"). Second, we face a geographical bias. We cannot draw general conclusions on French elections with the raw data because of a sampling bias: as

Table 9: Raw results: Three modalities of evaluative voting for the five voting stations

	Evaluative Voting EV(-1,0,1) Louvigny (919 ballots)		Evaluative Voting EV(0,1,2) Saint-Etienne (374 ballots)		Evaluative voting EV(0,...,20) Strasbourg (956 ballots)	
	Sum of grades	Average score	Sum of grades	Average score	Sum of grades	Average scores
F. Hollande	310	0.34	401	1.07	10,873	11.37
N. Sarkozy	-248	-0.27	253	0.68	6,026	6.3
M. Le Pen	-497	-0.54	323	0.86	3,196	3.34
J.-L. Mélenchon	156	0.17	323	0.86	8,057	8.43
F. Bayrou	176	0.19	242	0.65	9,192	9.62
E. Joly	-68	-0.07	115	0.31	7,394	7.73
N. Dupont-Aignan	-300	-0.33	127	0.34	3,344	3.5
Ph. Poutou	-170	-0.18	114	0.3	5,097	5.33
N. Arthaud	-299	-0.33	163	0.44	4,143	4.33
J. Cheminade	-444	-0.48	55	0.15	2,353	2.46
Total	-1,384	-1.51	2,116	5.66	59,675	62.42

Table 10: Comparison with official results, and candidate weights

	F. Hollande	N. Sarkozy	M. Le Pen	J.-L. Mélenchon	F. Bayrou	E. Joly	N. Dupont-Aignan	Ph. Poutou	N. Arthaud	J. Cheminade
Official national results (%)	28.63	27.06	18.03	11.14	9.10	2.31	1.79	1.15	0.56	0.25
Official results, experimented stations (%)	33.16	22.31	12.57	13.54	11.60	3.61	1.56	0.97	0.57	0.12
Declared official votes of the participants (%)	41.11	14.37	5.87	16.62	13.37	5.95	1.16	1.00	0.15	0.39
Weights	0.70	1.89	3.05	0.67	0.68	0.39	1.55	1.14	3.65	0.65

Nb: The weights listed above are those obtained for AV. For the three variants of EV, one obtains slightly different weights, since they are computed for each experimented location.

shown by lines 2 and 3 of Table 10, the official results of our 5 experimental polling stations (line 3) largely differ from those of France (line 2).

We thus have adjusted the raw data, using a simple weighting scheme, to be able to compare the experimental results with the official results. To do so, we appeal to question 5 of our questionnaire which asks the participants in our experiment to give the name of the candidate for whom they voted in the official vote – 57% of the participants (67% of those who answered the questionnaires) answered that question. Then, we apply to the participant in our experiment who declared an official vote for candidate x a weight equal to the ratio between the official score of candidate x and his experimental score for the official ballot. For instance, according to the last line of Table

10, a participant who declared a vote in favor of E. Joly, the Green candidate, has a weight of 0.39 (*i.e.*, 2.31/5.95), while a participant who voted for M. Le Pen, the candidate of the extreme Right, has a weight of 3.05 (17.90/5.87). In other words, in our experiment the voters for E. Joly were over-represented, while the voters for M. Le Pen were under-represented. After adjustment, these voters are properly represented.

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