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APPROVAL VOTING IN PRACTICE

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Approval voting in practice*

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Abstract. Several leading professional associations have recently decided to use approval voting (AV). The largest of them, The Institute of Electrical and Electronics Engineers, Inc. (IEEE), with more than 300,000 members, adopted AV in response to practical political problems with conventional plurality elections of precisely the sort that AV was designed to solve. This paper analyzes results of the first three multicandidate elections conducted by the IEEE using the new system. Issues examined include participation rates, use of multiple votes, patterns of shared support, majority rule, AV-dominance, effects on outcomes, and encouragement of candidate entry. In general, AV appears to have had a successful test.

1. Introduction

Although contemporary analysts of electoral systems are preoccupied with voting for governmental offices, historically elections of non-governmental associations

stimulated some of the most important advances in the theory and practice of social choice. For example, as Black (1987: 184) relates:

> Borda,...like [Condorcet and Laplace], had already achieved distinction as a mathematician and had for the centre of his life the Academy of Sciences. It was no doubt elections to the Academy, membership of which was for him the most valuable of all privileges, and not the wider problems of politics that first directed his mind to the theory [of voting].

Besides inspiring theorists, non-governmental elections offer at least three advantages for trying out novel or unusual voting systems. First, elections held by non-governmental associations greatly exceed in number and frequency those held by governments. Second, non-governmental electoral arrangements are less often rendered immutable by constitutional barriers or the interests of entrenched officeholders and political parties. Third, some non-governmental associations--notably scientific societes--have members who especially appreciate the value of experimentation.

These factors have recently made non-governmental elections a valuable testing ground for one of the most interesting applications of modern social choice

theory--approval voting (AV). This reform is essentially a majoritarian corrective to the risk of minority victory that arises in conventional plurality elections when more than two significant contenders compete for an office--a problem recently conspicuous in the 1988 South Korean presidential election, British parliamentary elections, and U.S. primaries. Independently devised by five sets of inventors about twelve years ago, AV allows voters to vote for all candidates they consider acceptable, or approve of, in elections with more than two candidates. Each candidate approved of receives one vote, and all votes count equally.

Although the approval ballot can be combined with numerous decision rules, advocates recommend that it be used with the well-known plurality rule--i.e., the candidate with the most votes wins if only one is to be elected (Brams and Fishburn, 1983). This combination is called "approval plurality" (AP), in contrast with conventional "selection" or "single-vote plurality" (SVP), in which voters can vote for, or select, only one candidate, no matter how many are running (Merrill and Nagel, 1987). For simplicity, we shall follow common practice and refer to the system as approval voting, except when it is useful to highlight the difference between the new and old types of plurality electoral systems.

During its brief history, scholars have given AV

intensive scrutiny in scores of articles and at least three books (Brams and Fishburn, 1983; Nurmi, 1987; Merrill, 1988). Most of this work has had to depend on a priori rational-choice assumptions or computer simulations, because behavioral experience with the method has been mostly limited to non-binding straw votes (Nagel, 1984), small organizations (Felsenthal, Maoz, and Rapoport, 1986), experiments (Niemi and Bartels, 1984; Koc, 1988), and polls (Brams and Fishburn, 1983; Fenster, 1983; Merrill, 1988; Rapoport, Felsenthal, and Maoz, 1988). Thus, when scholars-turned-reformers recommend AV for governmental systems, they have been rebuffed not only by the usual reluctance of elected officials to change rules under which they have won, but also by another Catch 22--no political unit wants to be the first to institute an untested method.

At this juncture, innovative non-governmental associations can serve as a crucial source of experience and data. Thus, a significant advance occurred between 1985 and 1987 when approval voting was adopted by four leading professional societies--The Institute of Management Sciences (TIMS), the American Statistical Association (ASA), the Mathematical Association of America (MAA), and The Institute of Electrical and Electronics Engineers, Inc. (IEEE).

The purpose of this paper is to examine the adoption and use of approval voting in the last of these

associations, the IEEE. Analyses of AV elections in TIMS, the ASA, and the MAA have already appeared (Fishburn and Little, 1988; Brams and Fishburn, 1988; Brams, 1988) and have been cited in a recent exchange (Brams, Fishburn, and Merrill, 1988; Saari and Van Newenhizen, 1988), but approval voting in the IEEE is of special interest for two reasons. First, the IEEE is vastly larger than the other groups. Second, whereas the motivation to adopt AV in TIMS, the ASA, and the MAA appears to have been primarily scientific curiosity (with the initiative coming from members who had done research on the method), the IEEE adopted AV after experiencing problems with multicandidate SVP elections in which winners frequently received substantially less than a majority vote. Thus, its experience may have special relevance for decisions to inaugurate AV in governmental elections.

2. The decision to adopt approval voting in the IEEE

With more than 300,000 members in 130 countries, the IEEE describes itself as "the largest technical professional association in the world."[1] Its income for 1988 was almost $82,000,000; and it employs about 500 persons, who help organize an impressive array of conferences, publications, and other services. This substantial enterprise is governed by a 33-person Board of Directors. The 76% of members who

have voting rights elect 24 directors: a president-elect (who serves on the Board for three years as president-elect, president, and past president), an executive vice president, ten delegates from specialized technical divisions, and ten delegates from geographic regions. (Six regions are in the U.S. The other four are Canada; Europe, Africa, and the Middle East; Latin America; and Asia and the Pacific.)

In order to provide voters with a choice of candidates, the IEEE Board in 1982 began the practice of nominating two candidates for President-elect. (See Table 1.) Third candidates nominated by petition participated in the 1983 and 1986 races. In 1983, the petition candidate ran a respectable second, with 32.2% of the vote, compared with the winner's 40.1%.[2] In 1986, 34.6% of the vote went to a new petition candidate who was frequently critical of the IEEE and its policies. Because the two Board candidates divided the remainder of the vote rather evenly, the petition candidate came within 242 votes of winning (out of a total of 52,405 votes cast), and the victor received support from only 35% of the voters. In 1987, the Board reverted to nominating just one candidate, who ran unopposed. Turnout fell by almost a tenth, and 13.6% of the members who did vote cast blank or write-in ballots.

The IEEE Board now faced a dilemma. Clearly, members wanted an opportunity to choose--in 1987 a majority (but

short of the two-thirds required) voted for a constitutional amendment that would have required the Board to nominate at least two candidates. On the other hand, if the Board bowed to popular pressure by nominating two candidates, they would risk the election of a petition candidate who represented what they believed was a minority viewpoint.

To resolve this issue, the IEEE Board decided to explore alternative electoral systems that might offer greater assurance than SVP of electing candidates who represent the wishes of the majority. Initially, they were inclined to institute a runoff (second ballot) between the top two contenders if no candidate received an absolute majority on the first ballot. Eventually, however, the Board decided instead to adopt the quicker and less expensive option of approval plurality, commencing with the 1988 elections.[3]

One important factor in the IEEE decision is of special interest because of its relevance to the terminological confusion that plagues the study of electoral systems (Lijphart, 1985). The IEEE is governed by the not-for-profit corporation law of New York State, which mandates that "directors shall be elected by a plurality of the votes cast" by members, unless the certificate of incorporation is amended by a two-thirds vote of the members to permit a different decision rule.[4] The change to a majority runoff

system would therefore require a time-consuming effort, uncertain of success, to win the assent of two-thirds of the members for a constitutional amendment. In contrast, the Board, acting on its own, could legally adopt any system consistent with the plurality rule stated in the statute.

Much of the recent literature on electoral systems habitually compares "approval voting" with "plurality voting"--usage that would have made it difficult for the IEEE to shift from the latter to the former without a constitutional amendment. By a remarkable coincidence, just months before the IEEE made its decision, Merrill and Nagel (1987) pointed out that, strictly speaking, "approval voting" is a balloting method whereas "plurality" refers to a decision rule. They urged that "voting systems should be designated by a combination of two words (or phrases or abbreviations), the first indicating the balloting method and the second, the decision rule"--thus, "approval plurality" and "single-vote plurality". This usage convinced the IEEE's lawyers that approval voting was a plurality electoral system as required by the New York law. Thus, the way was cleared for the Board to adopt AP, which it did in November 1987.[5]

3. Approval voting in the 1988 IEEE elections

The IEEE voting reform was first implemented in the

Institute's 1988 annual election, which was held by mail ballot during the fall of that year. This election comprised votes for fourteen offices. Eleven were uncontested or contested by just two candidates, so the change to AV was of practical importance for only three positions--president-elect (PE), executive vice president (EVP), and Region 2 vice chairman (VC). These races attracted four, three, and four candidates, respectively.[6]

In the remainder of this paper, we analyze AV results for these three contests, giving particular attention to the most visible and controversial, the vote for PE. We organize our report by posing nine questions relevant to arguments made by advocates or skeptics in the debate over AV in the IEEE and elsewhere. The first two questions bear on the acceptance of AV by IEEE members--their willingness and ability to use it.

3.1 Did AV encourage or discourage voting participation?

Proponents of AV sometimes predict that it will increase voter turnout by enabling voters to express their preferences better and more flexibly (Brams and Fishburn, 1983: 4). On the other hand, if a great many IEEE members resented the new system or found it difficult to understand, voting participation might drop.

Turnout in IEEE elections can be measured by the ratio

of valid ballots returned to ballots mailed. We present this information in Table 1 for IEEE annual elections from 1980 through 1988. In 1988, 217,158 ballots were mailed, of which 55,310 were reported returned in valid form, for a turnout rate of 25.5%. This was the second highest turnout of any IEEE election in the 1980s, exceeded only by the 26.1% attained in 1986. Thus, it would be hard to justify any claim that AV depressed turnout.

Table 1 about here

Despite the relatively high level of voting in 1988, one should not infer that AV directly encouraged participation. As column 8 of Table 1 shows, only in 1983, 1986, and 1988 did petition candidates challenge PE nominees sponsored by the IEEE Board. The 1988 turnout considerably exceeds the 1983 figure of 21.7%, but 1986 is more comparable to 1988, for three reasons: (a) there appears to be a general upward trend through the decade; (b) the IEEE regularly experiences lower participation in odd years; and (c) the same well-known, controversial petition candidate ran in both 1986 and 1988, but not in 1983.

In the 1988 multicandidate contests where AV came into play, blank ballots serve as another possible indicator of voters' willingness and ability to use AV. Column 5 of Table 1 gives this figure for PE voting since 1980, and column 6 expresses it as a percentage of valid ballots returned. The 1988 rate of blank ballots for PE is 2.0%, which is the

median for the entire nine-year series. However, the percentage blank for EVP in 1988 (not shown in the table) is 10.8%, second only to the uncontested election in 1987, when 11.3% did not vote for that office. Of course, abstention may also express protest, indicate dissatisfaction with all candidates, or reflect lack of interest. Thus, not too much can be inferred from the figures for blank ballots--either the troublingly high rate for EVP or the reassuringly modest rate for PE.

In short, we caution against drawing firm conclusions about any direct effect of AV on participation on the basis of just the 1988 experience. However, we would suggest a possible indirect effect. The existence of a contest, particularly one joined by petition candidates, almost surely motivates members to vote. The effect of competition on voting becomes especially apparent if one subtracts blank ballots from ballots returned in assessing voting participation. As Table 1 shows, blank ballots are more frequent when there is no competition. If AV encourages more candidates to seek office, then it may indirectly promote voting participation, quite aside from whatever direct effect it has. (We consider the effect of AV on candidate entry in section 3.9 below.)

3.2. Did voters use the opportunity to approve more than one candidate?

Under AV, it is perfectly legitimate to approve only one candidate; however, if all electors vote this way, the system loses its distinctive properties, and AP reduces to conventional SVP. Thus, the decision to institute approval voting matters only if a significant proportion of voters take advantage of their right to cast multiple votes.

How does the willingness of IEEE members to cast multiple approval votes compare to theoretical expectations and previous experience? Mathematically, one maximizes the probability that one's ballot will decide the outcome by voting for half the candidates, assuming all other voters are equally likely to approve or not approve of any candidate (Brams and Fishburn, 1983: 74-84). To vote rationally, however, one should not seek merely to maximize objective efficacy but should also take into account one's subjective preferences (or utility). Several theorists have shown that, in the absence of prior knowledge about other voters' plans, one should approve all candidates with above-average utility, as defined by one's own preference schedule (Brams and Fishburn, 1983: 84-88). An empirical study by Snider (1979) suggests that the personal utilities of most voters will be skewed, with the greater number of candidates bunched toward the low end of the scale. This assumption implies that the average number of approval votes cast will be somewhat less than half the number of

candidates. In numerous previous experiments with AV, voters have behaved consistently with this prediction (Merrill and Nagel, 1987: 511-12).

IEEE voters also conformed to the pattern. Relevant data are presented in Tables 2 and 3, in which candidates are designated by letters. Table 2 shows the numbers voting for every possible subset of candidates in each of the three elections, and Table 3 aggregates the votes each candidate received from various classes of voters--1-voters who approved exactly one candidate, 2-voters who approved exactly two, etc. A total of 55,969 ballots were tallied.[7] Excluding the voters who approved of no candidates, the mean numbers of votes cast in the four-way contests were 1.52 for PE and 1.37 for VC. In the three-way contest for EVP, the mean number of votes per ballot was 1.33. Thus, IEEE members took advantage of the multiple-vote option at roughly the rates one would expect. Moreover, although multiple voters were a minority in all three elections, they cast a substantial proportion of all votes--59.7% for PE, 42.5% for EVP, and 46.0% for VC. These rates of multiple voting were high enough to have had a potentially significant impact. To discover what those effects were, we first examine the extent to which candidates shared support from multiple voters.

Table 2 & 3 about here

3.3. Were there patterns in candidates' sharing of approval

votes?

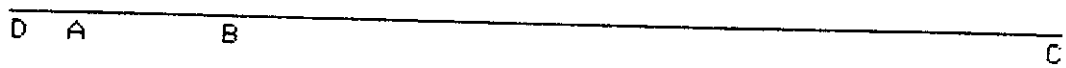
As we address this question, it will be helpful to know that in the race for PE, candidates A and D were nominated by the Board and B and C by petition; for EVP, X, Y, and Z were all nominated by the Board; and for VC, J was nominated by petition, whereas K, L, and M were nominated by the Region Committee.

We devote most of our attention in this section to the election for PE. Considering first the 3-voters, note that nearly everyone in this category voted for ABD--5,605, to be precise. By contrast, only 148, 143, and 89 voters, respectively, supported the other 3-subsets of ABC, ACD, and BCD. Evidently, the numerous supporters of ABD voted against C (the petition candidate who also ran in 1986) by voting for everybody except C. This essentially negative kind of voting against C can also be seen in voting for the six 2-subsets. The three 2-subsets that do not include C (AB, AD, and BD) had an average of 4,027 voters each, whereas the three that included C (AC, BC, and CD) had an average of only 897 voters each.

In addition to the predominant clustering of support around A, B, and D, there are some more subtle differences in the sharing of support. For each pair of candidates, we computed an index of shared support by taking the ratio of ballots approving both candidates by 2-voters and 3-voters

to total ballots, excluding abstentions and votes for all four candidates (leaving a total of 54,204 as the base for this analysis). By this measure, A and D have the most affinity, with 22.9% shared support. They are followed by A and B, 17.2%; and then by B and D, 13.9%. Although A, B, and D share much less support with C, B at 3.1% shares slightly more with him than do A (1.8%) and D (1.5%).

From these results, one might infer an underlying dimension on which D and C occupy opposite extremes, whereas A and B are located at intermediate positions. A is somewhat closer than B to D, but both B and A are much closer to D than to C, as in the depicition below:



This representation corresponds to certain facts about the candidates. D and A were both Board nominees, whereas C is a vigorous critic of IEEE officers, Board, and staff. B, though like C a petition candidate, is in other ways close to the IEEE establishment, having previously served on the Board. As for the slight distinction between D and A, judging from the candidates' biographies and statements, it may reflect D's emphasis on technical research, which perhaps made him seem most distant from C, who presented himself as the champion of the "working engineer."

Of the 54,204 ballots analyzed in this section, only

3,323 (6.1%) are inconsistent with the assumption that voters' preferences are based on the DABC ordering of candidates. These are the ballots cast for subsets CD (608), AC (659), ACD (143), BCD (89), and--accounting for more than half the inconsistencies--the minor departure represented by pattern BD (1,824). Of the multiple voters, 17,435 (84.0%) cast ballots strictly consistent with that ordering.

The less salient elections for EVP and VC do not yield such a simple spatial ordering. The most notable AV features of the EVP contest are the relatively large numbers who voted for no candidates (10.7%) and all candidates (7.8%). As all three EVP candidates were Board-nominated, we infer that these two blocs represent the members least and most inclined to support the IEEE leadership.

In the VC election, there is also a tendency for voters to issue blanket approval to official nominees. Of the 351 voters who approved three candidates, 166 chose the triplet that excluded the petition candidate (and included the three Committee nominees), whereas the three triplets that included him averaged only 62 voters each. However, in this election, the bloc vote for the endorsed candidates was not large enough to prevent the petition candidate's victory.

In short, AV had its intended effect: in all three elections, candidates with obvious affinities tended

disproportionately to share approval from multiple voters.

3.4. Did AV elect the Condorcet winner?

One of the main arguments for AP over SVP is that AP will more often elect Condorcet winners when they exist. Candidate A was the victor in the AP election for PE. Was he also a Condorcet winner? By themselves, the AV data do not provide a sufficient number of unequivocal pairwise preference orderings to permit a firm answer to this question. However, the comparisons strictly implied by the data may be supplemented with additional inferences based on the hypothetical spatial ordering developed in section 3.3.

If most voters perceived the candidates on a spectrum similar to that shown above, then we may infer additional preference rankings from the limited approval votes they cast. For example, 1-voters who voted for D may be assumed to rank A second, B third, and C fourth. Conversely, those who voted only for C probably ranked B second, A third, and D fourth. Similar inferences can be made about 2-voters and 3-voters whose votes are consistent with the spatial representation. Thus, for example, we may infer that AD voters ranked B above C.[8]

Even with this method of inference, we cannot order two types of candidate pairs: (i) In the case of multiple voters, we make no assumptions about preference rankings

within the pairs or triplets they approved. Thus we do not know if a BC voter preferred B to C or vice versa. (ii) In the specific case of 2-voters who approved pairs that are inconsistent with the diagram, we cannot make inferences about preferences between the two candidates not approved. For example, we cannot infer whether a DC voter preferred A to B, or B to A.

Despite these limitations, the extra inferences derived from the spatial assumption, combined with rankings given directly by the AV results, enable us to determine majority winners for hypothetical contests between four of the six pairs of candidates. In the other two cases (A vs. B and D vs. B), the leaders (A and D) fall less than one percent short of an absolute majority. Only a small fraction of the non-allocatable voters need to prefer A and D in these pairings to put them over 50%, so it seems safe to conclude that they would both have won a majority against B.[9]

The inferred Condorcet procedure yields a transitive ordering of the candidates: A defeats all the others, D defeats B and C; and B defeats C. This ranking exactly corresponds to the order in which the candidates finished in the actual approval voting. Thus, in the contest for PE, AV probably chose the Condorcet winner.

3.5. Did AV elect the lowest common denominator?

A frequent criticism of both the Condorcet criterion and AV is that they supposedly favor the election of "lowest common denominator" candidates--bland nonentities who offend no one and who therefore win because they are everyone's second choice. Presumably, such a candidate would receive most of his or her approval from multiple voters, whereas stronger, more sharply defined candidates would receive disproportionate support from the more intense partisans who vote for only one candidate. To test this claim, we examined the numbers of votes that candidates for each office received from various classes of voters, as presented in Table 3.

A candidate is defined to be AV-dominant if he or she wins among all classes of voters (Brams and Fishburn, 1988). In the voting for PE, observe that A is AV-dominant, beating the second choice of 1-voters (D) by 2,217 votes, the second choice of 2-voters (also D) by 1,805 votes, and the second choice of 3-voters (B) by 54 votes. Thus, A's victory does not depend on the choices of some classes of voters but not others. Indeed, because he wins decisively among both 1-voters and 2-voters, it is clear that his support derives primarily from voters who rank him either best, or among the two best, candidates.

On the other hand, the candidate that most observers would agree was least bland--C--did win a disproportionate

share of his vote from 1-voters. He received the support of 22.8% of all 1-voters, but only 19.7% of total voters. C's last-place finish overall is attributable to his huge falloff among 2-voters and 3-voters, which enabled B easily to outdistance him for third place with 34.5% approval.

It should be emphasized, however, that C did not finish first among 1-voters but was instead defeated by both D and the overall winner, A. In short, personality judgments aside, it is apparent that the AV winner for PE was the dominant candidate among all classes of voters, including those who felt intensely enough about their favorites to vote for just one nominee.

The EVP election offers no surprises. X won among both 1-voters and 2-voters and so is AV-dominant; Y came in second among both classes, and Z third. There is no candidate, like C in the PE race, whose support among multiple voters differs dramatically from that received from 1-voters.

A quite different pattern appears in the much closer contest for VC. Here petition candidate J won among both 1-voters and 2-voters and was also the overall winner. But M led among 3-voters, with J finishing last in this category because 47.3% of the 3-voters supported the trio of Committee nominees. Nevertheless, though J is not AV-dominant, it would be peculiar to characterize him as a

kind of lowest common denominator, because he received more support than any of the other candidates from precisely the voters who presumably have the most intense preferences.

The fear of some that AV might elect the most inoffensive candidate, whose support comes mostly from multiple voters, is thus unfounded for all three IEEE elections. Two of the three winners received across-the-board support from all classes of voters, and the third led among all but the smallest class of voters. Except for candidate C, the presumably more lukewarm support that candidates received from multiple voters correlated with their presumably more ardent support from 1-voters.

In this respect, the IEEE results by and large corroborate earlier findings on the use of AV by The Institute of Management Science, the American Statistical Association, and the Mathematical Association of America, as analyzed in Fishburn and Little (1988), Brams and Fishburn (1988), Brams, Fishburn, and Merrill (1988), and Brams (1988). Generally, the winners in these societies were AV-dominant; even in elections in which they were not, their victories were usually more attributable to "narrow" voters than "wide" voters (i.e., to voters who approved few rather than many candidates), as in the IEEE VC election.

3.6. Did the use of AV change the outcome?

Because the winners of the PE and EVP elections were AV-dominant, it seems likely that they would also have won under the SVP system used in previous IEEE elections. In the PE balloting, C might have come in third rather than fourth, based on his support among 1-voters and the expectation that SVP would induce many multiple voters who approved B to abandon him for one of the front runners. But C would not have won, because A's victory (and D's second-place finish) were substantial among 1-voters, even if not as overwhelming as among multiple voters.

The VC contest is harder to interpret with confidence. If SVP induced 3-voters who favored the three committee nominees to splinter their support among K, L, and M, then J's margin over the runner-up, M, would have been larger than the narrow (45-vote) victory he achieved under AV. However, this inference assumes no strategic voting. J's status as a petition candidate might have persuaded voters under SVP that he had no chance to win. If so, strategic voting could have led to his defeat (a possibility we examine in section 3.8 below).

Of course, the raison d'etre for AP does not depend on its ability either to mimic or to depart from SVP in any particular election. Instead, it rests on arguments which suggest that when AP and SVP winners differ, the AP winner is not only (by definition) acceptable to more voters than

any other candidate, but he or she is also more likely to be the proper social choice according to independent criteria (Brams and Fishburn, 1983; Merrill, 1988).

3.7. Did AV produce majority support for the victors?

To IEEE leaders, an important virtue of AP compared with SVP was the greater likelihood that AP winners would receive support from a proportion of voters approaching or surpassing a majority, which would enhance their legitimacy as leaders and make the voting population appear less fractionated. Did this effect occur in the IEEE elections?

Counting all voters--including abstainers, those who voted for all candidates, and write-in voters--50.2% approved of A, the winner in the PE race; 43.6% approved X, the winner for EVP; and 38.2% approved J, the winner for Region 2 VC. As Table 3 shows, if abstainers and write-ins are excluded, these proportions rise to 51.3%, 48.9%, and 42.7%, respectively.

Can we gauge how much the single-vote ballot would have shrunk the expressed support for these victors? Obviously, there is no way to estimate the figures with any precision, but a rough approximation can be obtained by assuming that under SVP the votes of each group of multiple voters would have been divided equally among the candidates in the approved subset. This arbitrary but serviceable method

yields SVP totals of 32.7% for A, 37.4% for X, and 32.9% for J--so far below a majority that the legitimacy of their victories would almost surely have been vitiated and their standing as leaders weakened. In short, AV seems to have enhanced the level of expressed support for victorious candidates, giving the president-elect an absolute majority and the executive vice president a near-majority.

3.8. Did AV increase the vote for underdogs?

Generally speaking, AV will result in relatively higher vote totals for "underdog" candidates, provided that they are not so isolated or extreme that they share little support with other candidates. This prediction is based on the argument that, under AV, voters need not worry about "wasting" their votes if they want to support someone thought to have little or no chance of winning. Instead, they can have it both ways by approving simultaneously the underdog and another candidate with better prospects for victory.

Skeptics sometimes worry that AV may give another, less desirable boost to underdogs. Some voters, these critics fear, will treat their multiple votes too lightly, using them to express protest or frivolous sentiments by bestowing approval on candidates whom they would never want to see actually win office.

In the IEEE PE election, we may assume that the two

petition candidates were perceived as underdogs by most voters. One of them, C, also ran for president-elect in 1986 under SVP. Did his vote total rise under AV? On the contrary, as previously noted, C ran a close second in 1986 with 18,132 votes--34.6% of the total. Despite the expected advantages of AV for a perceived underdog, C received only 11,257 votes in 1988, which represented approval from 20.5% of the voters (not including abstainers).

Clearly, the sharp decline in C's support offers no reason to think that AV encouraged protest or frivolous votes in the IEEE. Why did C do less well in 1988? Two explanations occur to us, neither of which has anything to do with AV: (i) After C came so close to winning in 1986, IEEE members in 1988 may have judged him more strictly, as a candidate with a real chance to win; thus, he may actually have benefited more from protest voting in the SVP election. (ii) C may have been discredited in the eyes of many IEEE members before the 1988 election by attention IEEE publications gave to some of his less temperate behavior.

AV probably gave more of a boost to the second petition candidate, B. He received the least support from 1-voters, but shared approval with A and D from many multiple voters. Under SVP, it is likely that many of these 2-voters and 3-voters would have deserted B, either because he was not their first choice or because they would have feared that,

as a petition candidate, he would have little chance to win. Thus, SVP might well have dropped B into fourth place, compared with the respectable third he achieved under AV.

There were no petition candidates in the EVP race, so we turn to the more interesting VC contest, which may illustrate the boost AV can give to an underdog with potentially broad appeal. Running against three committee-endorsed candidates, the petition candidate J emerged victorious under AV. If his lack of endorsement had led voters under SVP to see him as having no chance, then J might have lost most of the support that AV allowed him to receive from multiple voters. If so, M would have won decisively. On the other hand, if J's monopoly of opposition resulted in voters' perceiving him as a principal challenger, then he would probably have done just as well under SVP as under AV.

3.9. Did AV affect the number of candidates?

A controversial issue surrounding AV, particularly in the context of governmental elections in two-party systems, is the possibility that it may encourage entry by additional candidates or parties (Riker, 1982). It is therefore noteworthy that more candidates ran for both PE and EVP in 1988 than in any other IEEE election during the 1980s.

Clearly, it was not coincidental that the IEEE Board

reinstituted its previous practice of nominating at least two candidates for the major offices at the same time that it inaugurated AV. We do not know whether AV also encouraged the entry of petition candidates. In the long run, we would expect AV to discourage candidates who hope under SVP to benefit from the splintering of the majority vote; but AV may also encourage the entry of additional candidates who seek to appeal to perceived majority sentiments. If the IEEE continues to use AV, observers should follow with interest its effect on the number of entrants and the nature of their competition.

4. Conclusion

The experience of the IEEE is important both because it is the largest organization to adopt AV to date and because it did so under circumstances of vigorous political competition. If, as appears likely at this writing, the IEEE continues to use AV, its elections--potentially as many as twelve contested votes per year--will provide a rich and rapidly accumulating source of data about the effects of AV over time. Until more of those future returns come in, any judgments must remain tentative; but, in our view, the initial test of approval voting in the IEEE was an encouraging success.

Notes

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1. Information on the IEEE is drawn from the 1986 Annual Report, recent issues of the The Institute (a monthly newspaper), the 1988 Annual Election Ballot, and IEEE officials.

2. Election results are from IEEE Tellers Committee reports.

3. IEEE officers initiated discussion of AV as early as 1984 and subsequently corresponded with Brams about the method. In 1987, Nagel made presentations about AV to the IEEE Executive Committee and Board of Directors. Both authors served as consultants to the IEEE in preparing ballots and informational materials and in analyzing results.

4. State of New York, Not-for-Profit Corporation Law, sections 613 and 615.

5. Recently, the question has been raised whether the IEEE's adoption of approval voting violates another section of the law, which restricts each member to "no more than, nor less than, one vote" (Bellinger, 1990). However, the statute, which was adopted before the invention of approval voting, permits an exception for organizations that wish to use cumulative voting.

6. The Region 2 vice chairman normally becomes the region's sole nominee for Delegate/Director in the following year. Region 2 is the Eastern U.S.

7. This figure is derived from our tabulations of data provided us by the Independent Election Corporation of America (IECA). It inexplicably differs from the 55,310 total valid ballots reported by the IEEE Tellers Committee and shown in Table 1. To maintain consistency of sources for various comparisons, we use 55,310 as a base in the earlier analyses based on Table 1, and 55,969 as the gross base in this and subsequent analyses. There are also minor discrepancies between the tellers report and the IECA data for the VC election; Tables 2 and 3 rely on the latter. To simplify calculations, the PE sections of Tables 2 and 3 exclude 164 voters who cast write-in votes: 48 who wrote in various names and did not vote for A, B, C, or D; 93 who voted for a write-in as well as at least one, but not all,

of the listed candidates; and 23 who wrote in names and voted for all four listed candidates. The data given us by the IECA do not show any write-ins for EVP and VC.

8. Of course, we do not expect that the rankings of every individual conformed to these assumptions; but we do think it reasonable to posit that a large enough proportion did to justify the basic conclusions drawn below.

9. Calculations are available from the authors.

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Table 1. Participation in IEEE elections for president-elect, 1980-1988

(1) Year	(2) Ballots mailed	(3) Valid ballots returned	(4) Turnout (3)-(2)	(5) Blank ballots	(6) Percent blank (5)/(3)	(7) Board candidates	(8) Petition candidates
1980[a]	160,965	35,334	22.0	2,401	6.8	1	0
1981	164,215	33,263	20.3	1,792	5.4	1	0
1982	172,169	41,192	23.9	1,109	2.7	2	0
1983	179,761	38,925	21.7	442	1.1	2	1
1984	187,892	44,360	23.6	819	1.8	2	0
1985	197,020	43,494	22.1	518	1.2	2	0
1986	202,517	52,815	26.1	321	0.6	2	1
1987	209,470	49,436	23.6	4,228	8.6	1	0
1988[b]	217,158	55,310	25.5	1,100	2.0	2	2

[a]Election for president.

[b]Election using approval voting.

Source: Reports of IEEE tellers committees, except for 1988 blank ballots, which are from the Independent Election Corporation of America.

Table 2. Numbers of voters who voted for different subsets of candidates

President-elect:[a]

		None = 1,100			
	A = 10,738	B = 6,561	C = 7,626	D = 8,521	
AB = 3,578	AC = 659	AD = 6,679	BC = 1,425	AD = 1,824	CD = 608
	ABC = 148	ABD = 5,605	ACD = 143	BCD = 89	
		All = 523			

Executive vice president:

	None = 6,001	
X = 14,365	Y = 12,254	Z = 11,478
XY = 2,934	XZ = 2,746	YZ = 1,811
	All = 4,380	

Region 2 vice chair:[b]

		None = 931			
	J = 2,018	K = 981	L = 965	M = 1,891	
JK = 171	JL = 243	JM = 474	KL = 149	KM = 208	LM = 158
	JKL = 36	JKM = 91	JLM = 58	KLM = 166	
		All = 280			

[a]Excluded are 164 voters who wrote in the names of additional candidates. Petition candidates are B and C.

[b]Petition candidate is J.

Table 3. Numbers of votes for candidates by different types of voters.

President-elect:

Candidates	1-Voters	2-Voters	3-Voters	4-Voters	Total
A*	10,738	10,916	5,896	523	28,073 (51.3%)
B	6,56	6,827	5,842	523	19,753 (36.1%)
C	7,626	2,692	380	523	11,221 (20.5%)
D	8,521	9,111	5,837	523	23,992 (43.8%)
Total votes	33,446 (40.3%)	29,546 (35.6%)	17,955 (21.6%)	2,092 (2.5%)	83,039 (100.0%)
No. of voters	33,446 (61.1%)	14,773 (27.0%)	5,985 (10.9%)	523 (1.0%)	54,727 (100.0%)

Executive vice president:

Candidates	1-Voters	2-Voters	3-Voters	Total
X*	14,365	5,680	4,380	24,425 (48.9%)
Y	12,254	4,745	4,380	21,379 (48.9%)
Z	11,478	4,557	4,380	20,415 (40.9%)
Total votes	38,097 (57.5%)	14,982 (22.6%)	13,140 (19.8%)	66,219 (100.0%)
No. of voters	38,097 (76.2%)	7,491 (15.0%)	4,380 (8.8%)	49,968 (100.0%)

Table 3 (cont'd)

Region 2 vice chair:

Candidates	1-Voters	2-Voters	3-Voters	4-Voters	Total[b]
J[*]	2,018	888	185	280	3,371 (42.7%)
K	981	528	293	280	2,082 (39.1%)
L	965	550	260	280	2,055 (26.0%)
M	1,891	840	315	280	3,326 (42.2%)
Total votes	5,855 (54.0%)	2,806 (25.9%)	1,053 (9.7%)	1,120 (10.3%)	10,834 (100.0%)
No. of voters	5,855 (74.2%)	1,403 (17.8%)	351 (4.4%)	280 (3.5%)	7,889 (100.0%)

[*]Winner

[a]Excludes voters who abstained or wrote in the names of additional candidates.

[b]Percentages in this column based on voters.