Voting Rules in Sequential Search by Committees: Theory and Experiments

Online Appendix

A.1. Pairwise Correlation of Relative Ranks between Any Two Committee Members

Consider two different committee members, i and i', and their relative ranks $R_{i,j}$ and $R_{i',j}$ for the j-th alternative ($j > 1$) with respect to previous alternatives. As noted in the main text, the marginal distribution of either relative rank – the calculation of which involves aggregating over all possible $\overline{R}_j$ s – is a discrete uniform distribution over {1, 2, … j}. Thus, we may apply standard results for discrete uniform distributions to obtain:

$$E(R_{i,j}) = E(R_{i',j}) = \frac{j+1}{2} \text{ and } Var(R_{i,j}) = Var(R_{i',j}) = \frac{j^2-1}{12}.$$

Next, define:

$$\lambda \equiv \frac{(1-\sqrt{\mu})(j-1)}{j},$$

so that, conditioned on a realized value of $\overline{R}_j$, say R:

$$P(R_{i,j} = R \mid \overline{R}_j = R) = 1-\lambda, \text{ and}$$

$$P(R_{i,j} = R' \mid \overline{R}_j = R) = \lambda/(j-1) \text{ for } R' \in \{1,2,\ldots j\} \setminus \{R\},$$

and similarly for $R_{i',j}$. Note that the expected value of $R_{i,j}$ conditioned on it being *not* R is:

$$\frac{(1+2+\ldots j)-R}{j-1} = \frac{1}{j-1}\left[\frac{j(j+1)}{2} - R\right].$$

Hence:

$$E(R_{i,j}R_{i',j} \mid \overline{R}_j = R) = (1-\lambda)^2 R^2 + \frac{2\lambda(1-\lambda)}{j-1} R \cdot \left[\frac{j(j+1)}{2} - R\right] + \frac{\lambda^2}{(j-1)^2}\left[\frac{j(j+1)}{2} - R\right]^2$$
$$= \left[\frac{j-1-\lambda j}{j-1} \cdot R + \frac{j(j+1)}{2(j-1)} \cdot \lambda\right]^2.$$

It follows that:

$$E(R_{i,j}R_{i',j}) = E\left[\frac{j-1-\lambda j}{j-1} \cdot \overline{R}_j + \frac{j(j+1)}{2(j-1)} \cdot \lambda\right]^2$$
$$= \left(\frac{j-1-\lambda j}{j-1}\right)^2 E(\overline{R}_j^{\,2}) + \frac{j-1-\lambda j}{j-1} \cdot \frac{j(j+1)\lambda}{2(j-1)} E(\overline{R}_j) + \frac{j^2(j+1)^2\lambda^2}{4(j-1)^2}.$$

Substituting the standard results:

$$E(\overline{R}_j) = \frac{j+1}{2}, \quad E(\overline{R}_j^{\,2}) = \frac{1}{j}\sum_{R=1}^{j} R^2 = \frac{(2j+1)(j+1)}{6},$$

and rearranging terms, we obtain:

$$E(R_{i,j}R_{i',j}) = \frac{(2j+1)(j+1)}{6} - \frac{j(j+1)}{6}\lambda + \frac{(j+1)j^2}{12(j-1)}\lambda^2.$$

Therefore:

$$Corr(R_{i,j}R_{i',j}) \equiv \frac{E(R_{i,j}R_{i',j}) - E(R_{i,j})E(R_{i,'j})}{\sqrt{Var(R_{i,j})Var(R_{i,'j})}}$$
$$= \frac{12}{j^2-1} \cdot \left[\frac{(2j+1)(j+1)}{6} - \frac{(j+1)^2}{4} - \frac{j(j+1)}{6}\lambda + \frac{(j+1)j^2}{12(j-1)}\lambda^2\right]$$
$$= 1 - \frac{2j}{j-1}\lambda + \frac{j^2}{(j-1)^2}\lambda^2$$
$$= \left(1 - \frac{j\lambda}{j-1}\right)^2.$$

Substituting back $\lambda \equiv (1-\sqrt{\mu})(j-1)/j$ reduces the expression to:

$$Corr\,(R_{i,j}, R_{i',j}) = \mu.$$

A.2. Sample Instructions for Experiment 1 (Committee Search with Uncorrelated Preferences), Majority Voting Rule Condition

Welcome to our experiment on sequential observation and selection by committees. The instructions for the experiment are described below. If you follow them carefully and make good decisions, then you may earn $25 or more for the session. In addition, you will earn a $5 show-up bonus for your participation.

Description of the Task

Important business decisions are often made by committees whose members independently evaluate a number of alternatives in sequential manner. Because the committee members may come from different functional areas of the firm, they often use different criteria to evaluate the alternatives. For example, in evaluating the purchase of a new software product, the Accounting Manager might consider *data security* to be the highest concern, the Marketing Manager may consider *ease of use* to be more important, and the Finance Manager may be most concerned with how well the product *integrates* with existing software applications. Thus, as the committee of three members considers various software products, they may hold different opinions of each product considered. One product may rate high on data security (appealing to the Accounting Manager), but rate low on ease of use (unappealing to Marketing Manager). A second product alternative may rate high on ease of use and integration (appealing to both the Marketing and Finance Managers), but rate low on data security (unappealing to the Accounting Manager).

Together with two other participants, you will act as members of a 3-person committee. You will not be assigned to a specific managerial role (i.e., Accounting, Marketing, or Finance); rather, your evaluation for each alternative will be revealed to you in the alternative's *relative rank* (an explanation of relative and absolute ranks follows). Your objective is to try accepting as best an alternative as you can.

Your committee has to consider a maximum of 40 alternatives. Assume that these alternatives are ranked from 1 to 40 ("1" being the best) with no ties. We refer to these as **absolute ranks**. Absolute ranks are not revealed to the committee members until they reach a decision to accept a given alternative. Rather, as each alternative is presented, each committee member anonymously and independently makes an "accept" or "reject" decision which is based on the relative rank of the alternative. A **relative rank** is computed for each committee member separately in relation to the alternatives that the committee has already considered and rejected. Once rejected, an alternative cannot be recalled; if an alternative is accepted by the committee, further review of alternatives ends, the committee members' earnings for the trial are computed and revealed, and the game is repeated.

During this session, you will play 30 repeated games of this sequential observation and selection task, and will always be playing with the same 3-person committee. Each game is identical except that the alternatives that you consider appear in a different random order of ranks. And, as the example above with the Accounting, Marketing, and Finance managers shows, **each member of your 3-person committee will have different relative and absolute ranks for the alternatives presented**.

Decision Rules of the Committee

In the decision task described above, whether an alternative is adopted depends not only on how each committee member evaluates the alternative, but also on the decision rule used by the committee. For 3-person committees, several decision rules – Minority, Majority, and Unanimity may be considered.

Minority: under the minority rule, the current alternative is adopted if one or more committee members decide to accept it.

Majority: under the majority rule, the current alternative is adopted if two or more members decide to accept it.

Unanimity: under the unanimity rule, the current alternative is adopted if all three members agree to accept it.

In the present experiment, you and the other two members of your committee will be using the ***Majority rule*** in deciding between alternatives. Thus, two or more members of the committee must decide to "accept" before the alternative is adopted.

Determining Your Payoff

Your payoff (in points) in each game will be determined by the following formula:

Payoff = 30 – f,

where f is the ***absolute rank*** of the alternative among all 40 alternatives (including the ones that remain to be considered).

For example, supposing that your committee has reviewed and rejected 24 (out of 40) alternatives. As you consider the 25th alternative, you notice that it is currently ranked 2nd among all the alternatives considered so far. Assume that you and at least one of the other committee members decide to accept this alternative. With two accept decisions, the "majority rule" is satisfied and the alternative is adopted; a further review of alternatives ends, and the absolute ranks of all the 40 alternatives are revealed. In this example, the absolute rank of the alternative (according to your criterion) that the committee accepted turns out to be $f = 4$, as two of the fifteen remaining alternatives that have not been considered are ranked higher on your criterion. Your earnings for this game are computed to be (30 – 4) = 26 points. The earnings of the other members are determined in a similar way, using their own absolute ranks of alternative.

To further illustrate the kind of decisions that you will be making in the game, and to highlight the two different notions of *relative rank* and *absolute rank*, consider the following examples which – to simplify matters – assume that a maximum of 10 alternatives to be considered.

Relative and Absolute Ranks – Example #1

When the game begins, the relative rank of the first alternative is always 1 for each committee member, indicating that (by definition) this alternative is the best of those observed thus far. The relative ranks of the remaining alternatives are unknown at this point (see table below).

Alternative #	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Relative Rank	1	-	-	-	-	-	-	-	-	-

Assume that the committee decides to reject the first alternative. Then, the second alternative is presented and the relative ranks of the first two alternatives are compared to each other. Note that the relative rank of any alternative may change as each new alternative is considered. In this example (see table below) you find that alternative #2 is better than alternative #1 (according to your criterion). Note, too, that you are only aware of the relative ranks for your criterion, not those of the other committee members.

Alternative #	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Relative Rank	2	1	-	-	-	-	-	-	-	-

Suppose that the committee decides to reject alternative #2. The relative ranks of the first three alternatives are now presented (see table below).

Alternative #	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Relative Rank	2	1	3	-	-	-	-	-	-	-

Once again, the committee decides to reject this alternative and subsequently considers alternative #4 (see table below).

Alternative #	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Relative Rank	3	1	4	2	-	-	-	-	-	-

Alternative #4 is now ranked as the 2^{nd} best alternative (according to your criterion) of the alternatives considered so far. Let's assume that you and at least one other committee member decide to accept this alternative. Further alternatives are not considered, the game ends, and the absolute ranks of all 10 alternatives are revealed in the table below:

Alternative #	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Absolute rank	5	2	8	3	7	1	4	10	9	6

The table above shows that the absolute rank of alternative #4 is 3, but when the committee first accepted this alternative, it was ranked 2nd among the first 4 considered. It turns out that one of the remaining alternatives (#6) was ranked higher. Your payoff for the game is (30 – 3) = 27 points.

Relative and Absolute Ranks – Example #2

Suppose that in this example the committee has rejected the first eight alternatives. Alternative #9 is considered, with the following relative ranks:

Alternative #	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Absolute rank	4	1	7	2	9	3	6	8	5	-

Your choice is either to accept alternative #9, with a relative rank of 5 on your criterion, or reject this alternative and consider the tenth and final alternative, which must be accepted. Again, assume that the committee rejects alternative #9. Alternative #10 is observed, and the following absolute ranks are revealed:

Alternative #	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Absolute rank	5	1	8	2	10	3	7	9	6	4

Because this (last) alternative must be accepted, your payoff for this game is (30 – 4) = 26 points. The payoffs for other committee members depend on how this alternative ranks on their criteria.

These two examples illustrate that:

- Relative ranks may change as each new alternative is considered.
- Members of your 3-person committee will have **different relative and absolute ranks** for the alternatives presented.
- Each committee member may decide to either accept or reject an alternative, but members are required to accept the final (#40) alternative.
- Two or more members of the committee must decide to “accept” before the alternative is adopted.
- Alternatives are observed in a different random order of ranking in each game.
- Members of the committee are the same in each of the 30 games.
- Your earnings for each game are determined by the formula: 30 – *f*, where *f* is the absolute rank of the alternative the committee accepts. Note that if the absolute rank of the alternative is greater than 30, you could lose money for that game.

After all the participants have completed reading these instructions, the experimenter will be happy to answer any questions that you may have. You may take notes on scratch paper that we provide. If you have questions, please raise your hand.

Determining Your Payment at the End of the Session

You will be paid in cash at the end of the session: Five of the 30 games that you have completed (same for all the participants) will be chosen randomly, and your cumulative earnings in these five games will be converted to dollars at the rate of **$0.20** per point. In addition, you will be paid a $5 show up fee.

Thank you for your participation and good luck!

A.3. Sample Instructions and Post-Experimental Questionnaire for Experiment 2 (Committee Search with Perfectly Correlated Preferences), Majority Voting Rule Condition

Welcome to our experiment on sequential observation and selection by committees. The instructions for the experiment are described below. If you follow them carefully and make good decisions, then you may earn $25 or more for the session. In addition, you will earn a $5 show-up bonus for your participation.

Description of the Task

Important business decisions are often made by committees whose members independently evaluate a number of alternatives in sequential manner. Together with two other participants in the computer lab, you will act as members of a 3-person committee. You will review alternatives sequentially, but the only information you have about each alternative is the *relative rank* (an explanation of relative and absolute ranks follows). Your objective is to try to accept an alternative with the best (lowest) absolute rank.

Your committee has to consider a maximum of 40 alternatives. Assume that these alternatives are ranked from 1 to 40 ("1" being the best) with no ties. We refer to these as **absolute ranks**. Absolute ranks are not revealed to the committee members until they reach a decision to accept a given alternative. Rather, as each alternative is presented, each committee member anonymously and independently makes an "accept" or "reject" decision which is based on the relative rank of the alternative. A **relative rank** is the rank of the alternative compared to those seen thus far. Each committee member will see the same relative rank for each alternative, but may make a different accept or reject decision. Once rejected, an alternative cannot be recalled; if an alternative is accepted by the committee, further review of alternatives ends, the committee members' earnings for the trial are computed and revealed, and the game is repeated.

During this session, you will play 30 repeated games of this sequential observation and selection task, and will always be playing with the same three-person committee. Each game is identical except that the alternatives that you consider appear in a different random order of ranks.

Decision Rules of the Committee

In the decision task described above, whether an alternative is adopted depends on how many "accept" decisions the committee makes for an alternative, and the decision rule used by the committee. For 3-person committees, several decision rules – Minority, Majority, and Unanimous may be considered.

<u>Minority</u>: under the minority rule, the current alternative is adopted if one or more committee members decide to accept it.

<u>Majority</u>: under the majority rule, the current alternative is adopted if two or more members decide to accept it.

Unanimous: under the unanimous rule, the current alternative is adopted if all three members agree to accept it.

In the present experiment, you and the other two members of your committee will be using the ***Majority rule*** in deciding between alternatives. Thus, two or more members of the committee must decide to "accept" before the alternative is adopted.

Determining Your Payoff

Your payoff (in points) in each game will be determined by the following formula:

Payoff = 30 – f,

where f is the ***absolute rank*** of the alternative among all 40 alternatives (including the ones that remain to be considered).

For example, supposing that your committee has reviewed and rejected 24 (out of 40) alternatives. As you consider the 25th alternative, you notice that it is currently ranked 2nd among all the alternatives considered so far. Assume that you and at least one of the other committee members decide to accept this alternative. With two accept decisions, the "majority rule" is satisfied and the alternative is adopted; a further review of alternatives ends, and the absolute ranks of all the 40 alternatives are revealed. In this example, the absolute rank of the alternative that your committee accepted turns out to be $f = 4$, as two of the fifteen remaining alternatives that have not been considered are ranked higher. Your earnings (and the earnings of the other two committee members) for this game are computed to be (30 – 4) = 26 points.

To further illustrate the kind of decisions that you will be making in the game, and to highlight the two different notions of *relative rank* and *absolute rank*, consider the following examples which – to simplify matters – assume that a maximum of 10 alternatives to be considered.

Relative and Absolute Ranks – Example #1

When the game begins, the relative rank of the first alternative is always 1 for each committee member, indicating that (by definition) this alternative is the best of those observed thus far. The relative ranks of the remaining alternatives are unknown at this point (see table below).

Alternative #	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Relative Rank	1	-	-	-	-	-	-	-	-	-

Assume that the committee decides to reject the first alternative. Then, the second alternative is presented and the relative ranks of the first two alternatives are compared to each other. Note that the relative rank of any alternative may change as each new alternative is considered. In this example (see table below) you find that alternative #2 is better than alternative #1 (according to your criterion).

Alternative #	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Relative Rank	2	1	-	-	-	-	-	-	-	-

Suppose that the committee decides to reject alternative #2. The relative ranks of the first three alternatives are now presented (see table below).

Alternative #	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Relative Rank	2	1	3	-	-	-	-	-	-	-

Once again, the committee decides to reject this alternative and subsequently considers alternative #4 (see table below).

Alternative #	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Relative Rank	3	1	4	2	-	-	-	-	-	-

Alternative #4 is now ranked as the 2nd best alternative (according to your criterion) of the alternatives considered so far. Let's assume that you and at least one other committee member decide to accept this alternative. Further alternatives are not considered, the game ends, and the absolute ranks of all 10 alternatives are revealed in the table below:

Alternative #	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Final Rank	5	2	8	3	7	1	4	10	9	6

The table above shows that the absolute rank of alternative #4 is 3, but when the committee first accepted this alternative, it was ranked 2nd among the first 4 considered. It turns out that one of the remaining alternatives (#6) was ranked higher. Your payoff for the game is (30 – 3) = 27 points.

Relative and Absolute Ranks – Example #2

Suppose that in this example the committee has rejected the first eight alternatives. Alternative #9 is considered, with the following relative ranks:

Alternative #	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Final Rank	4	1	7	2	9	3	6	8	5	-

Your choice is either to accept alternative #9, with a relative rank of 5 on your criterion, or reject this alternative and consider the tenth and final alternative, which must be accepted. Again, assume that the committee rejects alternative #9. Alternative #10 is observed, and the following absolute ranks are revealed:

Alternative #	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Final Rank	5	1	8	2	10	3	7	9	6	4

Because this (last) alternative must be accepted, your payoff for this game is (30 – 4) = 26 points. The payoff for each committee member is identical.

These two examples illustrate that:

- Relative ranks may change as each new alternative is considered.
- Members of your 3-person committee will have **identical relative and absolute ranks** for the alternatives presented.
- Each committee member may decide to either accept or reject an alternative, but members are required to accept the final (#40) alternative.
- Two or more members of the committee must decide to "accept" before the alternative is adopted.
- Alternatives are observed in a different random order of ranking in each game.
- Members of the committee are the same in each of the 30 games.
- Your earnings for each game are determined by the formula: 30 – *f*, where *f* is the absolute rank of the alternative the committee accepts. Note that if the final rank of the alternative is greater than 30, you could lose money for that game (negative values appear in parenthesis).

After all the participants have completed reading these instructions, the experimenter will be happy to answer any questions that you may have. You may take notes on scratch paper that we provide. If you have questions, please raise your hand.

Determining Your Payment at the End of the Session

You will be paid in cash at the end of the session: Five of the 30 games that you have completed (same for all the participants) will be chosen randomly, and your cumulative earnings in these five games will be converted to dollars at the rate of **$0.20** per point. In addition, you will be paid a $5 show up fee.

When the experiment ends, please raise your hand and the supervisor will come to assist you.

Thank you for your participation and good luck!

Post-Experimental Questionnaire

Please answer the following **5** questions regarding the study you just completed. You'll be rewarded $1 for every correctly answered question.

No. ______________________________ Date _______

1. What is the maximum number of alternatives that you might observe during a given game? (please circle)
   - **a. 10**
   - **b. 20**
   - **c. 30**
   - **d. 40**

2. Supposing that your committee has already observed and rejected the first **three** alternatives whose **absolute** ranks are 5, 15, and 25, respectively. The next (4^{th}) alternative has an absolute rank of 8. What is its **relative** rank? (please circle)
   - **a. 1**
   - **b. 2**
   - **c. 3**
   - **d. 4**

3. In the scenario described in Question 2, if your committee accepts the 4^{th} alternative which has an absolute rank of 8, what will be your payoff in the game (in points)? (please circle)
   - **a. 20**
   - **b. 22**
   - **c. 26**
   - **d. 28**

4. Supposing that your committee has already observed and rejected the first **three** alternatives whose **absolute** ranks are 5, 15, and 25, respectively. The next (4^{th}) alternative has a **relative** rank of 3. What are its possible **absolute** ranks? (please circle)
   - **a. Between 1 and 4**
   - **b. Between 6 and 14**
   - **c. Between 16 and 24**
   - **d. Between 26 and 40**

5. Supposing that your committee has already observed and rejected the first three alternatives. The next (4th) alternative has a **relative** rank of 2. Under which (one or more) of the following scenarios will the alternative be accepted by the committee? (please circle **ALL** that apply)
   a. Only one of the three members votes ACCEPT
   b. Two of the three members vote ACCEPT while the third member votes REJECT
   c. All three members vote ACCEPT

Thank you for your answers.

(The correct answers are: 1 – d; 2 – b; 3 – b; 4 – c; 5 – a, b, and c if participant was in the minority rule condition, b and c if participant was in the majority rule condition, c if participant was in the unanimity rule condition)

A.4. Sample Instructions for Experiment 3 (Single-Decision Maker Search)

Welcome to our experiment on sequential observation and selection. The instructions for the experiment are described below. If you follow them carefully and make good decisions, then you may earn $25 or more for the session. In addition, you will earn a $5 show-up bonus for your participation.

Description of the Task

Important business decisions are often made by reviewing alternatives in sequential fashion, and making **accept** or **reject** decisions as each alternative is presented. In this experiment you are asked to consider a maximum of 40 alternatives. Assume that these alternatives are ranked from 1 to 40 ("1" being the best) with no ties. We refer to these as **absolute ranks**. Absolute ranks are not revealed to you until you decide to accept a given alternative. Rather, as each alternative is presented, you will see the **relative rank** of each alternative and make an "accept" or "reject" decision based on the relative rank of the alternative. A **relative rank** is the rank of the alternative compared to those seen thus far. Once rejected, an alternative cannot be recalled; if an alternative is accepted, further review of alternatives ends, and the computer displays the absolute ranks for all 40 alternatives and your earnings for the trial.

During this session, you will play 50 repeated games of this sequential observation and selection task. Each game is identical except that the alternatives that you consider appear in a different random order of ranks.

Determining Your Payoff

Your payoff (in $US) in each game will be determined by the following formula:

Payoff = 9 – *f*,

where *f* is the ***absolute rank*** of the alternative among all 40 alternatives (including the ones that remain to be considered) that you have selected.

For example, suppose that you have reviewed and rejected 24 (out of 40) alternatives. As you consider the 25^{th} alternative, you notice that it is currently ranked 2^{nd} (relative rank) among all the alternatives considered so far. Assume that you decide to accept this alternative. Further review of alternatives ends, and the absolute ranks of all the 40 alternatives are revealed. In this example, the absolute rank of the alternative that you accepted turns out to be *f* = 4, as two of the fifteen remaining alternatives that have not been considered are ranked higher. Your earnings for this game are computed to be (9 – 4) = $5.

To further illustrate the kind of decisions that you will be making in the game, and to highlight the two different notions of *relative rank* and *absolute rank*, consider the following examples which – to simplify matters – assume a maximum of 10 alternatives to be considered.

Relative and Absolute Ranks – Example #1

When the game begins, the relative rank of the first alternative is always 1, indicating that (by definition) this alternative is the best of those observed thus far. The relative ranks of the remaining alternatives are unknown at this point (see table below).

Alternative #	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Relative Rank	1	-	-	-	-	-	-	-	-	-

Assume that you decide to reject the first alternative. Then, the second alternative is presented and the relative ranks of the first two alternatives are compared to each other. Note that the relative rank of any alternative may change as each new alternative is considered. In this example (see table below) you find that alternative #2 is better than alternative #1.

Alternative #	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Relative Rank	2	1	-	-	-	-	-	-	-	-

Suppose you decide to reject alternative #2. The relative ranks of the first three alternatives are now presented (see table below).

Alternative #	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Relative Rank	2	1	3	-	-	-	-	-	-	-

Once again, you decide to reject this alternative and subsequently considers alternative #4 (see table below).

Alternative #	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Relative Rank	3	1	4	2	-	-	-	-	-	-

Alternative #4 is now ranked as the 2nd best alternative of the alternatives considered so far. Let's assume that you decide to accept this alternative. Further alternatives are not considered, the game ends, and the absolute ranks of all 10 alternatives are revealed in the table below:

Alternative #	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Absolute Rank	5	2	8	3	7	1	4	10	9	6

The table above shows that the absolute rank of alternative #4 is 3, but when you accepted this alternative, it was ranked 2nd among the first 4 considered. It turns out that one of the remaining alternatives (#6) was ranked higher. Your payoff for the game is (9 – 3) = $6.

Relative and Absolute Ranks – Example #2

Suppose that in this example you have rejected the first eight alternatives. Alternative #9 is considered, with the following relative ranks:

Alternative #	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Relative Rank	4	1	7	2	9	3	6	8	5	**-**

Your choice is either to accept alternative #9, with a relative rank of 5, or reject this alternative and consider the tenth and final applicant, which must be accepted. Again, assume that you reject alternative #9. Alternative #10 is observed, and the following absolute ranks are revealed:

Alternative #	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Final Rank	5	1	8	2	10	3	7	9	6	4

Because this (last) applicant must be accepted, your payoff for this game is (9 – 4) = $5. These two examples illustrate that:

- Relative ranks may change as each new alternative is considered.
- You may decide to either accept or reject an alternative, but you are required to accept the final (#40) alternative.
- Alternatives are observed in a different random order of ranking in each game.
- Your earnings for each game are determined by the formula: 9 – *f*, where *f* is the absolute rank of the alternative you accepted. Note that if the final rank of the alternative is greater than 9 you could lose money for that game.

After all the participants have completed reading these instructions, the experimenter will be happy to answer any questions that you may have. You may take notes on scratch paper that we provide. If you have questions, please raise your hand. When everyone is ready, the experimenter will reveal the “Passcode”, which you will enter on the computer screen to initiate the software program.

Determining Your Payment at the End of the Session

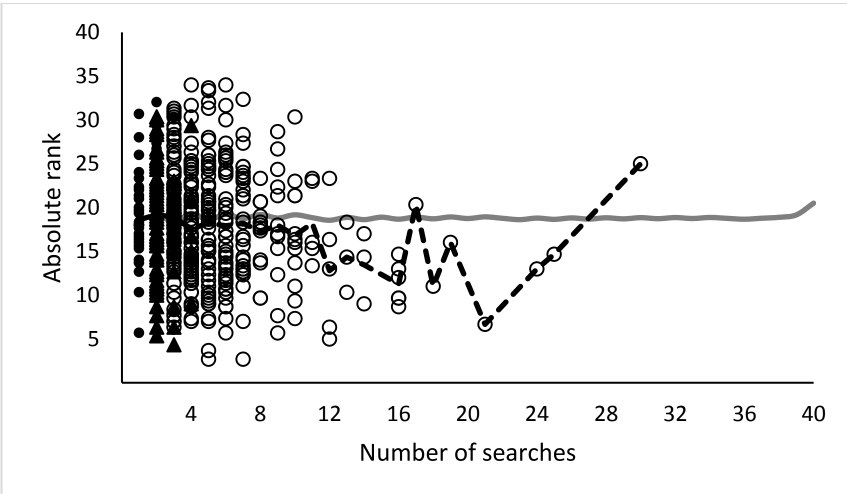
You will be paid in cash at the end of the session: Five of the 50 games that you have completed will be chosen randomly, and your total earnings in each of these five games will be added together. In addition, you will be paid a $5 show up bonus.

Thank you for your participation and good luck!

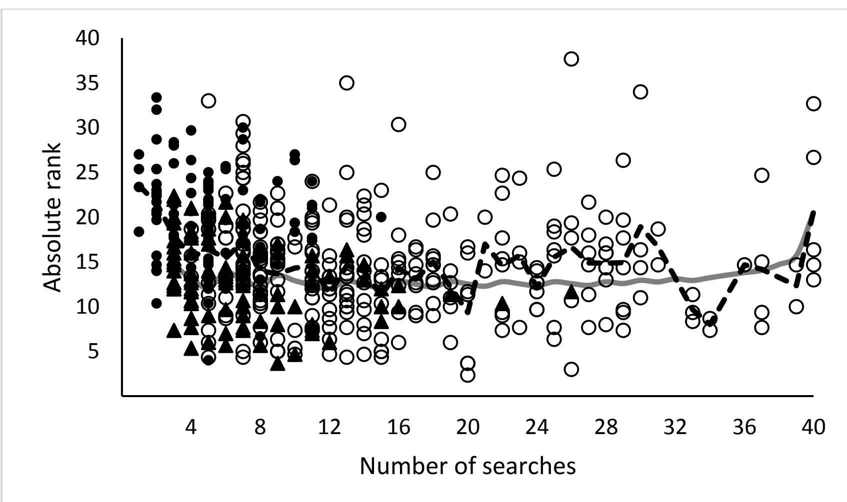
A.5. Search Performance in Experiments 1, 2, and 3

(a) Experiment 1 (committee search with uncorrelated preferences)

Minority rule condition

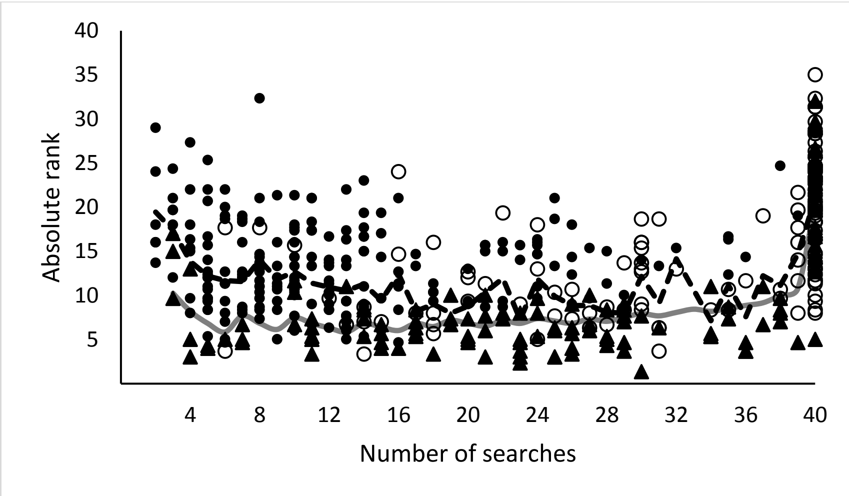


Majority rule condition



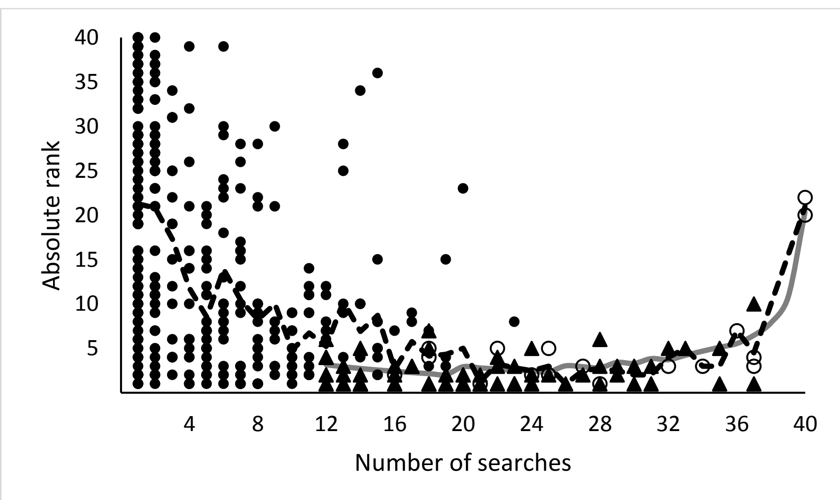
(a) Experiment 1 (committee search with uncorrelated preferences) (cont'd)

<u>Unanimity rule condition</u>



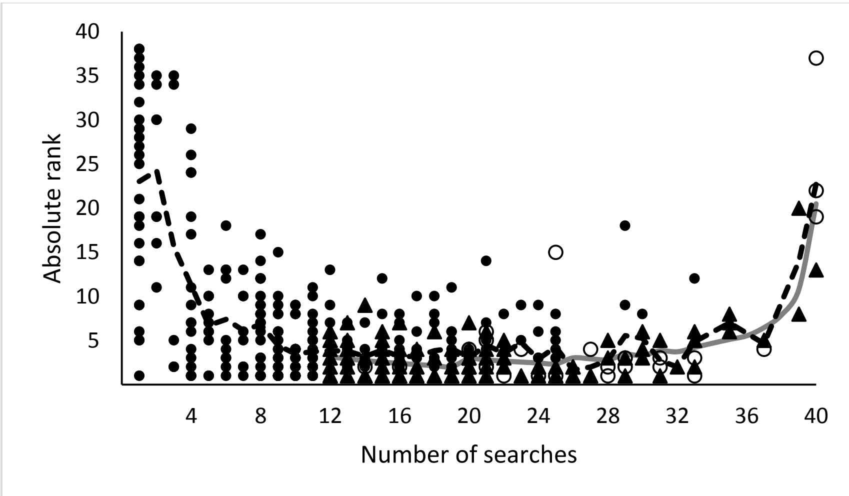
(b) Experiment 2 (committee search with perfectly correlated preferences)

<u>Minority rule condition</u>

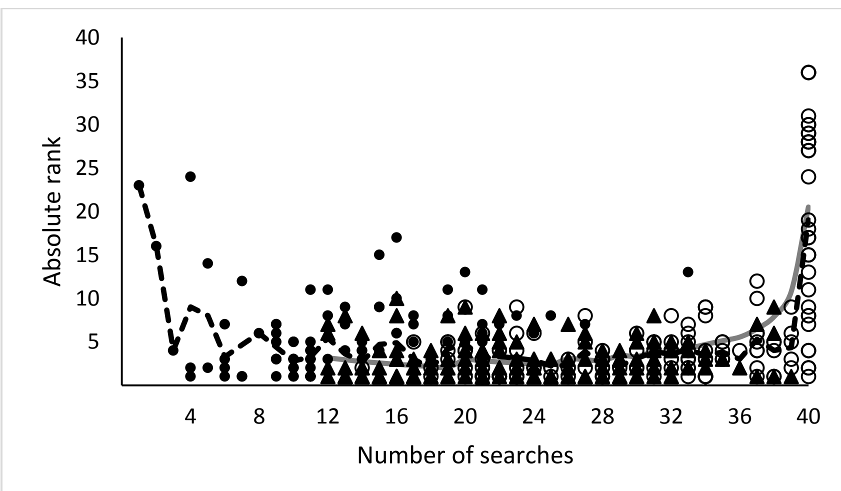


(b) Experiment 2 (committee search with perfectly correlated preferences) (cont'd)

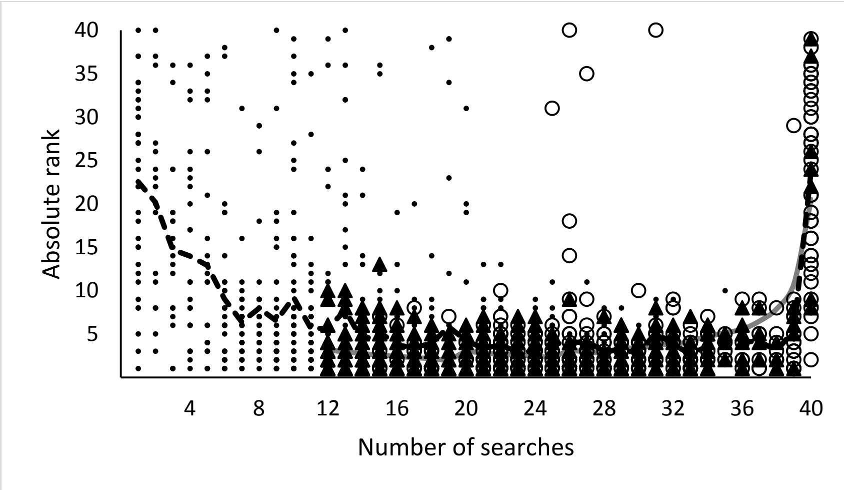
<u>Majority rule condition</u>



<u>Unanimity rule condition</u>



(b) Experiment 3 (single-DM search)



Note. Each marker represents a single search game. In each panel, dot (●) and hollow (○) markers indicate under- and over-search, respectively, when compared with the equilibrium strategy; while triangular (▲) markers indicate that the final decision making unit (three-person committee in Experiment 1 and 2, single DM in Experiment 3) had made exactly as many searches in that game as in equilibrium. The dashed line indicates observed mean absolute ranks across final decision making units by number of searches; the gray line indicates the corresponding expected absolute ranks under the equilibrium strategy.

A.6. Game-level Deviation Counts in Experiments 1, 2, and 3

	Minority rule (*q*=1)			Majority rule (*q*=2)			Unanimity rule (*q*=3)		
	No. of games with (relative to equilibrium play) …								
	Under-search	No deviation	Over-search	Under-search	No deviation	Over-search	Under-search	No deviation	Over-search
Expt. 1	2.1 (4.2)	6.3 (4.7)	21.7 (6.5)	6.4 (6.2)	6.1 (4.3)	17.4 (7.8)	13.4 (7.3)	9.2 (5.4)	7.4 (5.0)
Expt. 2	24.1 (8.9)	4.7 (6.9)	1.2 (2.4)	18.1 (7.2)	10.2 (5.6)	1.7 (2.6)	6.1 (5.8)	13.6 (5.7)	10.3 (4.5)
Expt. 3				19.4 (13.8)	21.7 (10.4)	8.9 (7.4)			

Note. *SD*s (with committee as the unit of analysis in Experiment 1 and 2 and individual subject as the unit of analysis in Experiment 3) are in parentheses. The sum of the three means in any condition is (up to rounding errors) equal to the total number of games per session, that is, 30 in Experiments 1 and 2, and 50 in Experiment 3.

A.7 Empirical Best Response Threshold Ranks and Comparisons with Equilibrium

	Experiment 1 (uncorrelated preferences)						Experiment 2 (perfectly correlated preferences)					
j	*q*=1		*q*=2		*q*=3		*q*=1		*q*=2		*q*=3	
1	0	*0*	0	*0*	0	*0*	0	*0*	0	*0*	0	*0*
2	1	*0*	1	*1*	0	*0*	0	*0*	0	*0*	0	*0*
3	1	*0*	1	*0*	1	*0*	0	*0*	0	*0*	0	*0*
4	2	*0*	1	*0*	1	*0*	1	*1*	0	*0*	0	*0*
5	2	*0*	2	*1*	1	*0*	1	*1*	0	*0*	0	*0*
6	3	*0*	2	*0*	2	*1*	1	*1*	0	*0*	0	*0*
7	3	*0*	2	*0*	2	*0*	1	*1*	0	*0*	0	*0*
8	3	*-1*	3	*1*	2	*0*	1	*1*	0	*0*	1	*1*
9	3	*-1*	3	*0*	3	*1*	1	*1*	1	*1*	1	*1*
10	3	*-2*	3	*0*	3	*0*	2	*2*	1	*1*	1	*1*
11	3	*-2*	4	*1*	3	*0*	2	*2*	1	*1*	1	*1*
12	4	*-1*	4	*1*	4	*1*	2	*1*	1	*0*	1	*0*
13	4	*-2*	4	*0*	4	*1*	1	*0*	1	*0*	1	*0*
14	4	*-2*	5	*1*	5	*1*	2	*1*	1	*0*	1	*0*
15	5	*-2*	5	*1*	5	*1*	2	*1*	1	*0*	1	*0*
16	6	*-1*	6	*1*	5	*1*	2	*1*	1	*0*	2	*1*
17	6	*-2*	6	*1*	6	*1*	2	*1*	2	*1*	2	*1*
18	6	*-2*	6	*1*	6	*1*	2	*1*	2	*1*	2	*1*
19	7	*-2*	7	*1*	6	*0*	2	*1*	2	*1*	2	*1*
20	7	*-2*	7	*1*	7	*1*	1	*-1*	2	*0*	2	*0*
21	9	*-1*	8	*2*	7	*1*	2	*0*	2	*0*	3	*1*
22	9	*-1*	8	*1*	8	*1*	2	*0*	3	*1*	3	*1*
23	10	*0*	8	*1*	8	*1*	2	*0*	3	*1*	3	*1*
24	12	*1*	9	*2*	9	*1*	3	*1*	3	*1*	3	*1*
25	15	*4*	9	*1*	9	*1*	3	*1*	3	*1*	4	*2*
26	16	*4*	9	*1*	10	*2*	3	*0*	4	*1*	4	*1*
27	17	*5*	9	*1*	11	*2*	3	*0*	4	*1*	4	*1*
28	17	*4*	9	*0*	12	*3*	4	*1*	5	*2*	5	*2*
29	18	*5*	11	*2*	12	*2*	4	*0*	6	*2*	5	*1*
30	30	*16*	11	*1*	13	*2*	6	*2*	6	*2*	6	*2*
31	.	.	11	*1*	14	*3*	6	*1*	7	*2*	6	*1*
32	.	.	11	*0*	15	*3*	7	*2*	7	*2*	7	*2*
33	.	.	12	*1*	15	*2*	8	*2*	9	*3*	8	*2*
34	.	.	14	*2*	16	*3*	8	*1*	10	*3*	11	*4*
35	.	.	14	*1*	16	*2*	9	*1*	11	*3*	11	*3*
36	.	.	15	*1*	17	*2*	9	*0*	11	*2*	12	*3*
37	.	.	15	*0*	18	*2*	19	*8*	16	*5*	14	*3*
38	.	.	15	*-2*	19	*1*	19	*5*	17	*3*	18	*4*
39	.	.	19	*-1*	20	*0*	20	*0*	20	*0*	21	*1*

Note. Italics indicate the threshold rank difference: Empirical best response - Equilibrium. Differences that are at least four in absolute value are highlighted in gray. No observed searches in the minority rule condition (q=1) in Experiment 1 went beyond alternative 30, so that we could not estimate continuation expected payoff beyond that. We assumed an empirical best response threshold of 30 for that alternative.

A.8. Analysis of Post-Experimental Questionnaire Data in Experiment 2

On average, subjects in the minority rule condition scored 3.7 questions correct out of 5 (s.d. = 0.7 with committee as the unit of analysis) in the post-experimental questionnaire, in other words a 74% average rate of correctly answering a question. The corresponding averages for the majority and unanimity rule conditions were 3.8 (s.d. = 0.7) and 4.0 (s.d. = 0.6) out of 5, respectively. There was no significant difference in these average scores across voting rule conditions. A three-condition between-subjects ANOVA for the average scores, with condition as the single independent variable and committee as the unit of analysis, yielded $F(2,39)=0.94$, $p > 0.4$.

We also examined whether exposure to the decision task, in terms of the total number of searches done, would impact the questionnaire scores. In the minority and majority rule conditions a committee's average number of searches per game did not have a significant correlation with the average score of the committee in the questionnaire ($p > 0.1$). Meanwhile, the correlation was significantly positive (= 0.38; $p < 0.05$) in the unanimity rule condition. This finding suggests that some of the especially long searches in the unanimity rule condition (cf. Table 3, as well as Online Appendix A.5) did create some differences among committees within that condition regarding understanding of the task; however, the effect was not sufficiently impactful to lead to a significantly higher score in that condition compared with the other two.

Hence, we conclude that subjects' understanding of the decision task was generally and uniformly high across conditions; in addition, such level of understanding was achieved early in the sessions.

A.9. Analysis Regarding Hypothesis Testing and Familywise Errors

Regarding false positives issues in hypothesis testing, we gauge the reliability of our claims using Maniadis et al. (2014)'s approach, and focusing on the main findings of under- or over-search across conditions in the three experiments. There are two major dependent variables (MSL and MAR) and seven experimental conditions in our three experiments, which form a total of 14 means. For 13 of these means, we claim deviations from equilibrium predictions at significance level $p < 0.05$ according to *t*-tests (see Table 3). Using the observed means as proxy of the true means, we find that the powers of these significant deviations range from 0.6 to effectively 1. We then calculate the post-study probability (PSP) under a range of scenarios following the approach of Maniadis et al. (2014). Specifically, we use representative values of powers at 0.6 and 0.9, priors at 0.05, 0.1, and 0.55, and assume that there are no competing studies. The PSP estimates thus obtained are listed in table (a) below. They show that even with priors as low as 0.1, our PSP estimates are at least 0.5 (see Maniadis et al. 2014 on interpreting PSPs).

(a) Post-Study Probability (see Maniadis et al. 2014) Estimates for the Experiments

	Power	
Prior	0.6	0.9
0.01	0.11	0.15
0.1	**0.57**	**0.67**
0.55	**0.94**	**0.96**

Note. Estimates above 0.5 are highlighted in bold.

Regarding familywise errors, our approach is to employ Holm-Bonferroni correction. The results are listed in table (b) below. Overall, the deviations remain significant at $p < 0.05$ after the corrections; three of the deviations are significant at unadjusted $p < 0.01$ but only significant at Holm-Bonferroni adjusted $p < 0.05$.

(b) Holm-Bonferroni Corrections for *p*-values of Significant Deviations from Equilibrium

			p-value	
Experiment	Voting rule condition	Dependent variable	Unadjusted	Holm-Bonferroni
1	1	MAR	**0.0053**	**0.0265**
1	1	MSL	0.0002	0.002
1	2	MAR	0.0173	0.0346
1	2	MSL	**0.0028**	**0.0168**
1	3	MAR	< 0.0001	< 0.0013
1	3	MSL	0.0101	0.0303
2	1	MAR	0.0002	0.0018
2	1	MSL	< 0.0001	< 0.0013
2	2	MAR	0.0386	0.0386
2	2	MSL	< 0.0001	< 0.0013
2	3	MAR	0.0007	0.0049
3	–	MAR	0.0005	0.004
3	--	MSL	**0.0073**	**0.0292**

Note. Bold *p*-values indicate deviations that are significant at unadjusted $p < 0.01$ but at Holm-Bonferroni adjusted $p < 0.05$.

A.10. Optimal Voting Rules *q under Equilibrium for a Sample of Committee Sizes *m* and Preference Correlations *μ* (*n* = 40)**

	μ = 0			μ = 1/3			μ = 2/3			μ = 1
m	*q**	*q*/m*	MAR	*q**	*q*/m*	MAR	*q**	*q*/m*	MAR	MAR
1	1	1.00	3.3	1	1.00	3.3	1	1.00	3.3	3.3
2	2	1.00	7.3	2	1.00	5.1	2	1.00	4.0	3.3
3	3	1.00	10.9	3	1.00	6.4	3	1.00	4.4	3.3
4	3	0.75	11.8	4	1.00	7.6	4	1.00	4.8	3.3
5	4	0.80	12.5	4	0.80	8.6	5	1.00	5.2	3.3
6	5	0.83	14.1	5	0.83	8.5	6	1.00	5.6	3.3
7	5	0.71	14.5	6	0.86	8.7	6	0.86	6.0	3.3
8	6	0.75	14.8	7	0.88	9.1	7	0.88	5.8	3.3
9	6	0.67	15.4	7	0.78	9.5	8	0.89	6.0	3.3
10	7	0.70	15.4	8	0.80	9.5	9	0.90	6.0	3.3
20	13	0.65	17.0	16	0.80	10.8	17	0.85	6.7	3.3
50	30	0.60	18.4	38	0.76	11.7	43	0.86	7.3	3.3
100	57	0.57	19.0	74	0.74	12.2	85	0.85	7.5	3.3

Note. A voting rule with *q** means a threshold number of *q** votes are required to stop the search. When μ = 1 (perfectly correlated preferences), all the committee members follow the same benchmark strategy and always accept/reject alternatives unanimously, so that all voting rules are equally optimal. Moreover, the optimized mean absolute rank is the same (= 3.3) regardless of group size. The latter values are included in the table for ease of comparison. Likewise, the trivial case of *m* = 1 is included for comparison's sake.