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An experimental test of a committee search model

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ABSTRACT

The objective of this paper is to design a laboratory experiment for an infinite-horizon sequential committee search model in order to test some of the implications obtained by the model in Albrecht et al. (2010) (AAV). We find that, compared with single-agent search, the search duration is longer for committee search under the unanimity rule, but is shorter for committee search in which at least one vote is required to stop searching. In addition, according to estimates from round-based search decisions, subjects are more likely to vote to stop searching in committee search than in single-agent search. This confirms that agents are less picky in committee search. Overall, the experimental outcomes are consistent with the implications suggested by the AAV model. However, despite the prediction from the AAV model, we could not obtain a significant outcome in relation to the size order of the probabilities of voting to stop searching in committee search for the various plurality voting rules.

1. Introduction

The decision mechanism of agents regarding whether to stop or continue searching has been considered in many fields of economics, including labor economics, monetary economics, macroeconomics, and industrial organization. Very recently, there has been an emerging interest in committee search, in which a decision is made by a group of multiple agents rather than by a single agent. An evolving theoretical literature duly analyzes the properties of decision-making in the case of committee search (Albrecht et al., 2010; Compte and Jehiel, 2010). However, to our best knowledge, no corresponding empirical studies have been conducted, mainly because it is generally difficult to collect data on committee search processes. This paper is thus the first attempt to provide experimental evidence on committee search and to test the theoretical implications obtained by the committee search model in Albrecht et al. (2010) (hereafter AAV). Overall, we find that our experimental outcomes are consistent with those obtained by the AAV model.

In the AAV model, a group engages in search activity to fill a vacant employment position or searches for a new house as a family. The members of the group or family then decide by vote whether to hire a newly encountered worker or to purchase a house. The AAV model assumes that members are homogeneous with respect to preferences and that each member draws a value from an identical and independent distribution across members. The model then compares the member's reservation value in single-agent search and committee search in an environment where the drawn value differs among the members under various plurality voting rules. The main predictions of the AAV model are that members are less picky in committee search than in standard single-agent search in the sense that each member's threshold is lower and that

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the members' thresholds vary by voting rule. Another implication obtained in the AAV model is that the search duration increases with the number of votes required to stop the committee search process.

The search environment characterized in the model is usually far removed from the environment observed from the micro data. Therefore, the search environment cannot be perfectly duplicated using micro data. However, we can recreate this search environment in the laboratory using controlled treatments. In recent years, many studies have been devoted to experimental analysis of the single-agent search model (Cox and Oaxaca, 1989; Harrison and Morgan, 1990). This experimental task is empirically tractable and attractive for testing the implications of sequential search models. Experimental studies on the sequential search model have proliferated, covering a range of topics such as the effect of unemployment benefit sanctions on individual search behavior (Boone et al., 2009) and the differences in individual search behavior by attitudes toward loss and risk (Schunk, 2009). In addition, Schunk and Winter (2009) explored the reasons why in many of these studies agents stop searching earlier than what is theoretically optimal.

We expand upon this body of work by examining the decision-making processes of multiple agents engaged in a committee search activity. The main feature of our experimental design is that we conduct three types of game to identify exactly the predictions of the AAV model where agents are assumed to be homogeneous with respect to preferences. Game A provides the benchmark as a standard single-agent search task, Game B is a committee search task where three group members have a common value drawn from a distribution, and Game C is a committee search task where three group members each draw different values from the same distribution.[1] The difference between Games A and B is attributable to heterogeneity among members with respect to their risk and loss attitudes, time preferences, and any unobserved characteristics.[2] The difference between Games A and C arises from the heterogeneity among members already mentioned, plus additional heterogeneity in the sense of the different values the other members independently draw from the same distribution. Therefore, the difference between the above two differences is caused only by the second form of heterogeneity among members, in that the values drawn by the other members of the group are different. This is similar to the AAV model. In addition, we design three subgames for each of Games B and C: Subgame 1 adopts a plurality voting rule in which the committee search activity is stopped if at least one member votes to stop searching (the one-vote rule); in Subgame 2, the committee search activity is stopped only if at least two-thirds of members vote to stop searching (the majority rule); and in Subgame 3, the committee search activity is stopped only if all members vote to stop searching (the unanimity rule). The results of these subgames provide evidence concerning the effect of voting rules.

We conducted experimental tests of an infinite-horizon sequential search model with a 5% probability that the search coercively ends. With this experiment, the focus is on exploring (i) the search duration and (ii) the probability of voting to stop searching in committee search with various plurality voting rules compared with single-agent search. Our finding regarding search duration is that, compared with single-agent search, the search duration is longer for committee search with the unanimity rule but shorter for committee search with the one-vote rule, after controlling for the heterogeneity of preferences among group members regarding risk and loss attitudes, time preferences and any unobserved factors. However, in our experiments, the difference in search duration between single-agent search and committee search with the majority rule is statistically unclear. These outcomes imply that two effects operate to determine this relationship.

The first effect is that it takes more time to reach an agreement in committee search with the majority rule than it does in single-agent search. Thus, on the one hand, the committee search structure with the majority rule lengthens the search duration. However, on the other hand, the second effect is that committee search with the majority rule lowers each subject's reservation value because she or he is less picky, thereby shortening the search duration. In our experiment, under the majority rule, these opposing effects cancel each other out, leading to the conclusion that there is no difference in search duration between single-agent search and committee search with the majority rule. These results imply that search duration is increasing in the number of votes required to stop the committee search, which supports the first part of Proposition 5 in the AAV model. In addition, a comparison of the search duration between committee search with the unanimity rule and single-agent search shows that the search duration is increasing in group size, holding the unanimity rule fixed. The single-agent search structure is regarded as a special case of the unanimity rule. This supports the implication obtained from the second part of Proposition 4 in the AAV model.

Our second focus is on identifying differences in a subject's willingness to accept a drawn value between single-agent search and committee search. To do this, we estimate the average marginal effects from a probit model to examine the determinants of the probability of voting to stop searching using data from every round-based decision about whether to vote to stop searching. Our findings are that subjects are more likely to vote to stop searching in committee search than in single-agent search, and that this outcome is strongly observed in committee search with the one-vote and majority rules. These estimated results confirm the threshold effect referred to in the AAV model (Proposition 2 therein), in the sense that subjects lower their reservation values in committee search and thus become less picky about the standard of acceptance.

However, our experimental outcome cannot statistically support the AAV model's prediction in terms of the size order of the reservation values among the types of committee search with the various plurality voting rules. The AAV model predicts that the reservation value is either hump-shaped or monotonically increasing in the number of votes required to stop the search (the second part of Proposition 5 in the AAV model). Unfortunately, given our limited sample size, we cannot

[1] This implies that each member draws a value from an independent and identical distribution.
[2] The heterogeneity of preferences among members in a group is ruled out in the AAV model.