In search of advice for participants in matching markets which use the deferred-acceptance algorithm

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Abstract

Many centralized entry-level labor markets use the firm-proposing deferred-acceptance (DA) algorithm to compute the matching that is implemented among workers and firms. We propose a definition of the strategic options a worker faces in the DA-algorithm. Then we develop a theory to advise workers who distinguish between the firms from which they believe not to receive a proposal, the firms from which they might receive a proposal, and the firms from which they certainly receive a proposal. If a worker is not able to deduce which new proposals she receives after having rejected others, then it is not profitable for her to submit a list that reverses the true ranking of any two acceptable firms. Furthermore, it is not beneficial for her to include a firm in her submitted list that is unacceptable to her.
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1. Introduction

In the United States (US) and Canada, entry-level medical markets are organized by a centralized clearinghouse. Each year these markets proceed as follows: first, the clearinghouse announces which hospitals offer positions and which finishing students are

available; second, each hospital and each student submit a ranking over the agents on the opposite side of the market; and third, given the profile of submitted preferences, the clearinghouse uses the hospital-proposing (or firm-proposing) deferred-acceptance (DA) algorithm (Gale and Shapley, 1962) to assign positions to students at hospitals.[1] Because salaries are not negotiated between hospitals and students but specified in the description of a position, each participant's true preference is simply a ranking of the opposite set. Hence, an entry-level medical market together with the DA-algorithm induce a preference revelation game. Several other entry-level labor markets are also based on the DA-algorithm, for instance, entry-level markets for Canadian lawyers and articling positions.

It has been argued that the DA-algorithm performs better than other centralized mechanisms in entry-level labor markets (Roth, 1991). Indeed, one of the merits of the DA-algorithm is the fact that under complete information, for each firm submitting its true preference is an undominated strategy (Roth, 1982; Dubins and Freedman, 1981), furthermore a worker might gain by misrepresentation (Roth, 1982). Other papers investigating strategic issues in matching markets with complete information are Roth (1984), Zhou (1991), Alcalde and Barberà (1994), Ma (1995), Alcalde (1996), Sönmez (1997), Romero-Medina (1998), Alcalde and Romero-Medina (2000), and Teo et al. (2001).[2] There is only little known about incomplete information. In the markets considered here, we cannot expect that an agent necessarily knows the rankings submitted by the other agents. Indeed, an individual participant seeks advice on how to maximize her outcome given her true preference and her uncertainty about the stated lists.[3]

Even though it is still an undominated strategy for each firm to submit its true preference relation (Roth, 1989), until Roth and Rothblum (1999) we were not able to advise a worker with incomplete information about the others' submitted preferences. They show in a low information environment when a worker is not able to deduce any differences in the preferences for any two firms, she could only possibly gain by submitting a list that truncates her true list. Such a list, called a truncation strategy, reveals the true ranking of its acceptable firms and any of its acceptable firms are preferred to any of its unacceptable ones under the true preference. In particular, it does not rank any firm as acceptable, which is unacceptable to the worker.

However, as shown in Roth and Rothblum (1999, Example 3), their analysis stops when a worker is able to distinguish between the preferences of the firms. Typically, a worker is able to partition the firms into three sets: the firms from which she does not conceive to obtain an offer; the firms from which she might receive an offer; and the firms from which she certainly receives an offer. The purpose of this paper is to search for advice for workers who have those natural general information structures.

In doing that, we will propose a definition of strategic options a worker faces at each execution of the DA-algorithm (a detailed description will be given below). When a worker

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[1] Some markets use the student-proposing DA-algorithm. For example, in 1998 the National Resident Matching Program in the US changed the hospital-proposing DA-algorithm to the student-proposing DA-algorithm (Roth and Peranson, 1999).

[2] This is an incomplete list.

[3] See a letter to Roth on p. 22 in Roth and Rothblum (1999).