



Paths to stability for matching markets with couples[☆]

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Abstract

We study two-sided matching markets with couples and show that for a natural preference domain for couples, the domain of weakly responsive preferences, stable outcomes can always be reached by means of decentralized decision making. Starting from an arbitrary matching, we construct a path of matchings obtained from ‘satisfying’ blocking coalitions that yields a stable matching. Hence, we establish a generalization of Roth and Vande Vate’s [Roth, A.E., Vande Vate, J.H., 1990. Random paths to stability in two-sided matching. *Econometrica* 58, 1475–1480] result on path convergence to stability for decentralized singles markets.

Furthermore, we show that when stable matchings exist, but preferences are not weakly responsive, for some initial matchings there may not exist any path obtained from ‘satisfying’ blocking coalitions that yields a stable matching.

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1. Introduction

We consider entrance level labor markets that can be modeled as two-sided matching problems: one side consisting of students, graduates, or workers, the other side consisting of residencies, jobs, or firms. Since in the last couple of decades the number of couples with the same

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professional interests has been growing, we focus on labor markets in which both members of couples seek positions. A famous example of such an entrance level labor market with couples in the US is the market where each year thousands of medical school graduates seek their first employment as residents or interns. Since the 1950s this labor market has been administered by the National Resident Matching Program (NRMP).¹ One of the reasons for centralizing this market, and later for reorganizing it,² was that market outcomes did not seem to be ‘stable’ as indicated by unraveling (pre-NRMP) or a significant reduction of voluntary participation in the NRMP (pre-reorganized NRMP). For simplicity, from now on we refer to one side of the market as students and to the other side of the market as hospitals, even though we do not exclusively restrict our attention to centralized markets such as the NRMP.

Loosely speaking, an outcome or matching is stable if there are no students/couples and hospitals that are not matched with each other, but in fact would prefer to be. Thus, it is easy to see that whenever contracts are not enforceable, stability is a minimal requirement for the persistence of an outcome for any market (centralized or decentralized). Gale and Shapley (1962), the ‘pioneers’ of two-sided matching theory, provided an algorithm, the famous deferred acceptance (DA) algorithm, that always finds a stable matching in markets with only single students. The algorithm first used by the NRMP in fact was a slight modification of the deferred acceptance algorithm, which was independently developed. Hence, a stable matching can be implemented for any centralized ‘singles market.’ Moreover, Roth and Vande Vate (1990) showed that a stable matching can also be reached by means of decentralized decision making. They demonstrated that, starting from an arbitrary matching, the process of allowing randomly chosen blocking coalitions to match will converge to a stable matching with probability one. Thus, as long as we restrict attention to singles markets, in these markets—centralized or not—stability is possible. Unfortunately, once couples emerge on one side of the market, stability is in danger: stable matchings may not exist (Roth, 1984) and it may be very difficult (i.e., NP-hard) to decide if stable matchings exist for a given ‘couples market’ (Ronn, 1990).

Klaus and Klijn (2005a, 2005b) showed that for a special preference domain for couples, namely the domain of ‘(weakly) responsive’ preferences, stable matchings exist. A couple’s preferences are responsive if the unilateral improvement of one partner’s job is considered beneficial for the couple as well. If responsiveness only applies to acceptable positions, then preferences are weakly responsive. Hence, (weakly) responsive preferences may reflect situations where couples search for jobs in the same metropolitan area (if one partner switches to a job he/she prefers and the couple can still live together, then the couple is better off). In fact, when couples have weakly responsive preferences, one can derive associated individual preferences for all students that are members of a couple. Klaus and Klijn (2005a, 2005b) demonstrated that any stable matching of an associated singles market is also stable in the couples market.

Klaus and Klijn (2005a, 2005b) also showed that under a restricted unemployment aversion condition, the domain of weakly responsive preferences is maximal for the existence of stable matchings. In view of this result, the class of weakly responsive preferences is a natural starting point for the study of decentralized decision making in couples markets. One may wonder whether there is a path of ‘satisfying’ blocking coalitions that leads to a stable matching. We answer this question in the affirmative. This implies in particular that starting from an arbitrary matching, the process of allowing randomly chosen blocking coalitions to match will converge

¹ See Roth (1984) and Roth and Sotomayor (1990).

² See Checker (1973), Roth and Peranson (1999), and Roth (2002).

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