

Core structure and comparative statics in a hybrid matching market

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Abstract

Flexible firms compete by means of wages in the Assignment market while rigid firms have no flexibility over terms of appointment in the Marriage market. Workers trade with both kinds of firms in the hybrid market.

Examples show that standard results that characterize the core of the Marriage market (respectively, Assignment market) are not robust to the entrance of flexible (respectively, rigid) firms to this market. A new algebraic structure provides a different characterization for the core of the hybrid model and reflects a sort of robustness to the exit of rigid (respectively, flexible) firms from this market. Meaningful comparative static results are derived.

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1. Introduction

As observed by Cournot (1897), Edgeworth (1881), Bohm-Bawerk (1923) and other authors, two-sided market models are important, not only for the insights they can provide into economic situations with many types of agents, but also because, in real situations, most transactions are actually bilateral. A special class of these markets is that of matching markets. The theory for such markets started with Gale and Shapley (1962), who introduced the Stable Matching problem for the Marriage and the College Admissions markets, as a rare instance of an exercise in “pure”

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mathematics (combinatorial theory of ordered sets). In 1972, Shapley and Shubik introduced money into the Marriage model, establishing the Assignment game. Over the years the stable matching problem has been generalized to several two-sided matching models, which have been widely modeled and analyzed under the cooperative and non-cooperative game theoretic approaches. Through these models a variety of markets has become better understood, which has considerably contributed to their organization.

The two-sided matching markets have as primary object the formation of partnerships between agents on one side with agents on the opposite side. For a wide class of such markets, if a partnership is formed, the partners undertake some joint activity, which produces a gain that is split between them. A special subclass is that of job markets with heterogeneous and well-informed firms and workers: If a firm hires a worker, the productivity of the pair is allocated into salary for the worker and profit for the firm. In some markets the salary can be negotiated between the two agents; in some other markets the salaries are part of the job description, and are only one of the factors that determine the preferences that workers have over firms. Traditionally, the former kind of market has been modeled as a continuous matching market, whose simplest form is the Assignment Game. Salary may vary continuously on the set of real numbers. The latter has been modeled as a discrete matching market known as the Marriage Market. The key notion in both markets is that of stability. In the Marriage Market, a matching is stable if it is individually rational and if no firm and no worker prefer each other to their current partners. For the Assignment Game, an outcome is a matching plus a payoff vector, with one payoff for each agent. It is stable if it is individually rational and if no firm and worker can negotiate a payoff, which is higher than their current payoff. In both models the set of stable outcomes coincides with the core.

The core mathematical structure of these models is determined by the following properties, which are discussed in the text:

- (A) The set of stable payoffs is a non-empty complete lattice¹ under the partial order induced by the preferences of the workers and under that induced by the preferences of the firms.²
- (B) There is an opposition of interests between the two sides of the market along the whole set of stable outcomes: If x and y are two core outcomes and all workers prefer x to y then all firms prefer y to x .
- (C) If some agent is unmatched under some stable outcome of the Marriage market, then this agent is also unmatched under any other stable outcome of this market (Gale and Sotomayor, 1985a). If some agent is unmatched under some stable outcome of the Assignment market, then this agent receives zero payoff under any other stable outcome of this market (Demange and Gale, 1985).

¹ A lattice is a partially ordered set any two of whose elements have a supremum and an infimum. A lattice is complete when each of its subsets has a supremum and an infimum. (See Birkhoff, 1973.)

² The lattice property of the core for the Assignment market was originally obtained by Shapley and Shubik (1972). They also showed that there is a polarization of interests between the two sides of the market along the whole core. With regard to the Marriage market with strict preferences, the original proof of that mathematical structure for the set of stable matchings is due to Conway and the existence of that polarization of interests to Knuth (1976). A different proof of both results was given by Gale and Sotomayor (1985a). This proof is also presented in Roth and Sotomayor (1990) where the reader can find an overview of these two models.

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