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Search theory, competitive equilibrium, and the Nash bargaining solution ☆

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Abstract

We investigate a canonical search-theoretic model without entry. Two agents are randomly matched with a long side being rationed. The matched agents face a pair of randomly drawn non-transferable payoffs, and then choose whether or not to form a partnership subject to a small probability of exogenous break down. As this probability and friction vanish, the Nash bargaining solution emerges as the unique undominated strategy equilibrium outcome if the mass of each party is the same. If the size of one party is larger than the other, the short side extracts the entire surplus, a sharp contrast to Rubinstein and Wolinsky (1985) [16].

JEL classification: C70; C78; D83

Keywords: Matching; Search; Undominated strategy equilibrium; Nash bargaining solution

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1. Introduction

This paper studies a two-sided random matching model in which each agent has an option to form and terminate a long term relationship with a matched partner. The society is populated with two groups of continua of infinitely-lived agents, row and column agents. In each period, unmatched row agents and column agents are randomly matched in pairs, with a long side being rationed, to face a relation-specific pair of non-transferable payoffs drawn randomly from a compact convex set of feasible utilities. The two players form a long term relationship if both agree upon this pair of payoffs; otherwise, they both return to their respective pools of unmatched agents. The long term relationship lasts until either one of the agents terminates it or a random shock forces the pair to separate. When the long term relationship is dissolved, both agents return to their respective pools of unmatched agents. The time span of each period quantifies the friction in the economy. We focus on the set of undominated strategy equilibria to exclude a "no trade" equilibrium outcome, in which every player rejects every proposal in every period.

We demonstrate that, if the economy is populated by equal masses of buyers and sellers, then in any sequence of undominated strategy equilibria, every agreed pair of payoffs converges to the Nash bargaining solution as the discount factor and the continuation probability of the partnership converge to one.[1] In an equilibrium, every agent in the society would behave as if he had agreed upon the Nash bargaining solution, despite the absence of a central authority to enforce the solution, or an institution to collect and disseminate the information in the society.[2] If the mass of one party is larger than the mass of the other party, then the short side achieves the largest feasible payoff as the friction vanishes.

Matching models can be classified into three classes, depending on whether agents leave the pool or not, and if so, whether they leave the economy and are replaced by new entrants or not. The first class, as is often seen in search-theoretic models of money such as [9], assumes that people trade but remain in the pool. The second class of models, as laid out by [16], assumes that agents leave the economy upon agreement and are replaced by new entrants to keep the size of the economy constant. The third class of models, often used in search-theoretic models of labor markets, assumes that agents leave the pool but remain in the economy even after they agree to be matched and come back to the economy in a stochastic manner.

The present model belongs to the third class with an important twist, uneven sizes of two populations. In our model, the relative size of agents in the matching pools is affected by the degree of friction. As the friction vanishes, the ratio of the sizes of two populations in the pool may go to either zero or infinity. Existing models side-step this feature of matching in a number of ways. For example, [16] and their successors avoided the same problem by introducing steady inflows of new agents to keep the sizes of both sides in the matching pool bounded away from 0 to maintain the relative size of the populations. In [11], it is assumed that the mass of the buyers is equal to the mass of the sellers.

[1] The Nash bargaining solution is a pair of payoffs that maximizes the product of the individual gains over the disagreement outcome.

[2] [18] proposed a bargaining solution more than two decades before [12]. Zeuthen applied his concept to labor dispute, discussing the case of transferable utility only. There, the risk of breakup and the amount of concession are balanced between the two parties, which is also seen in the Nash demand game [13]. Later, [7] reformulated Zeuthen's theory to show the equivalence of Zeuthen's and Nash's concepts.