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Symmetric play in repeated allocation games ☆

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Abstract

We study symmetric play in a class of repeated games when players are patient. We show that, while the use of symmetric strategy profiles essentially does not restrict the set of *feasible* payoffs, the set of *equilibrium* payoffs is an interesting proper subset of the feasible and individually rational set. We also provide a theory of how rational individuals play these games, identifying particular strategies as focal through the considerations of Pareto optimality and simplicity. We report experiments that support many aspects of this theory.

JEL classification: C72; C73; C92; D01

Keywords: Symmetry; Repeated games; Focal points; Experiments

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1. Introduction

We are interested in the economic implications of how people behave in symmetric situations with repeated interaction. We explore this issue by studying what we call allocation games. An allocation game involves two issues: a coordination issue and a competition issue. Much of our analysis concerns the two player case, which is essentially the battle-of-the-sexes, and is described as follows. There are two prizes (x_1, x_2) with $x_1 > x_2$. Each player simultaneously demands an element of x. If the demands are distinct, payoffs are awarded according to the chosen demands; otherwise payoffs are zero to both.

The efficient Nash equilibria of an allocation game deliver asymmetric payoffs, thus providing motivation for players to coordinate on asymmetric play.[1] We study the process by which ex-ante symmetric players eventually come to occupy different roles and receive different payoffs. But we require the process to operate within the confines of a symmetric equilibrium of the repeated game. One reason to focus on symmetric play is that players may have no commonly understood labels or characteristics that could serve, via a norm or convention, to coordinate their actions on an asymmetric outcome. More generally, our goal is to respect the symmetric structure of the underlying game, and understand how strategic behavior dictates the development of asymmetric outcomes along the path of play.

The first to study symmetric equilibria of the repeated battle-of-the-sexes game was Bhaskar [7].[2] A key event in both Bhaskar's [7] and our analyses is the breaking of symmetries. As players are ex-ante symmetric, and do not communicate directly, the only means they have to distinguish their roles is the realized history of the game itself. As long as players play the same action in the stage game, they remain in symmetric positions. Once one player plays one action and the other a different action, symmetries are said to be broken.

Bhaskar [7] showed that, for finite repetitions of the game, as well as for the infinitely repeated game with discounting, among all symmetric equilibria of the game, those and only those that promise equal continuation payoffs at the history at which symmetries are broken are (Pareto-) efficient. All other equilibria yield lower ex-ante expected payoffs. The intuition for this result is simple. A promise of equal payoffs allows players to randomize over the two actions with equal probability prior to the breaking of symmetries. Such uniform randomization then leads to the fastest possible breaking of symmetries. Notice, thus, that in an efficient symmetric equilibrium of this repeated game, it may well be that an asymmetric outcome is realized in a particular stage. At the first such realization, it must be that the asymmetry in stage game payoffs is exactly compensated by payoffs in later stages, at least in expectation.

[1] We do observe such asymmetric outcomes. For instance, the norm in some societies that men hold the door open to allow women to pass through first can be seen as an instance of an efficient Nash equilibrium with asymmetric payoffs in the battle-of-the-sexes game.

[2] There are few papers on similar topics before Bhaskar [7]. Crawford and Haller [19] study repeated pure coordination games, in which not only players but also strategies are symmetric. Crawford and Haller [19] show that, even if players cannot a priori condition their choice of actions on their names, the repeated game has symmetric subgame perfect equilibria where players expect to coordinate after very few rounds. Farrell [20] studies a situation in which one instance of the battle-of-the-sexes game is preceded by possibly infinite rounds of cheap-talk communication. Farrell [20] shows that, under symmetric strategic behavior, even infinite rounds of cheap talk do not allow players to always coordinate on an efficient equilibrium in the battle-of-the-sexes game.