

On the distribution of dividends in games with ordered players

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ABSTRACT

A situation in which a finite set of players can obtain certain payoffs by cooperation can be described by a cooperative game with transferable utility, or simply a TU-game. In a TU-game players only differ with respect to their position in the game. Examples of models in which players not only differ with respect to their position in the game, but also are part of some relational structure which affects the cooperation possibilities or payoff distributions, are games in coalition structure, games with a limited communication structure, and games with a permission structure.

The underlying paper is in line with the third type of model. Here we also assume the players to be hierarchically ordered. Instead of restricting cooperation possibilities we let the hierarchical order directly affect the distribution of Harsanyi dividends in the game. We introduce two solutions which distribute dividends in the spirit of the Selectope and the Harsanyi set for arbitrary TU-games.

In the Selectope for games with ordered players the dividend of a coalition is assigned to a player that is not dominated within the coalition. In the Harsanyi set for games with ordered players we distribute the dividend of a coalition among the players in that coalition in a way such that the share of a player that is dominated within the coalition is at most equal to the share of a player by which it is dominated in the coalition.

Although for TU-games the Selectope and Harsanyi set are equivalent, we will see that for games with ordered players their ideas give different solutions. For every game with ordered players the Selectope is a subset of the Harsanyi set. The Selectope might be empty, whereas the Harsanyi set is always non-empty (and always contains the Shapley value of the original game). We also show that the Harsanyi set for games with ordered players generalizes both the Shapley value and the Harsanyi set for arbitrary TU-games. Further, we discuss a method of computing the extreme points of the Harsanyi set for any game with ordered players, and we provide a characterization of the Harsanyi set.

Finally, we apply the Harsanyi set to peer group games. This gives new solutions for some well-known special cases such as airport games, sequencing games and auction games.