

On power in mutual control structures

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The purpose of this paper (Karos and Peters, 2013) is to study ultimate control and power in situations where agents are controlled by but also exercise control on each other. In a typical example, agents are financial institutions and companies who own shares among each other (see Crama and Leruth, 2011, for a survey article). More generally, agents may be connected in a network via mutual interests and decision making bodies.

We model this situation by a *mutual control structure*, which is a map assigning to each coalition (subset of agents) the subset of agents who are controlled by that coalition. A mutual control structure describes *direct control* but can be extended to include *indirect control*. For instance, if S controls T and T controls R then S controls R indirectly. A mutual control structure that incorporates all such kinds of indirect control is called *invariant*. We start by providing an algorithm which determines for each mutual control structure its unique invariant extension. (Cf. Gambarelli and Owen, 1994, who propose an algorithm in this spirit for shareholders in corporate structures.)

Alternatively, a mutual control structure can be described by a collection of simple games: for each agent or player, there is a simple game in which the winning coalitions are those that control that player. We describe an algorithm, based on substitutions of players by coalitions that control them, leading to an invariant collection of simple games. We show that the latter collection corresponds to the invariant extension of the original mutual control structure.

The second part of the paper is devoted to developing a power index for invariant mutual control structures. We propose a number of axioms, capturing both exercising and undergoing control, and resulting in a tight characterization of a power index which can be formulated as a specific combination of Shapley-Shubik power index values on the invariant collection of simple games associated with the mutual control structure.

References

- Crama Y, Leruth L (2011) Power indices and the measurement of control in corporate structures. *International Game Theory Review*, forthcoming
- Gambarelli G, Owen G (1994) Indirect control of corporations. *International Journal of Game Theory* 23:287–302
- Karos D, Peters H (2013) On power in mutual control structures. Working paper, forthcoming