

Power, control and coalition formation

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Summary

Each chapter of this dissertation is based on one article. The first two consider simple games and coalitions formation games while the third one introduces a new model of control, namely mutual control structures.

The first chapter is based on Karos (2012). It generalizes the class of apex games with one apex player to a class of games with a collection of apex sets. These simple games, together with a power index, canonically induce a hedonic coalition formation game. We analyze a monotonicity property of power indices and its meaning for the induced hedonic game. In particular, we give necessary and sufficient conditions for the existence of core stable coalitions in this hedonic game. We also consider the special cases of Shapley-Shubik index, Banzhaf index, and normalized Banzhaf index. The first two are monotonic, while the latter is not. We show that in case of classical apex games with one apex player, there is no core stable coalition if we apply the Shapley-Shubik index or the normalized Banzhaf index.

The second chapter is based on Karos (2013). Here we introduce power configurations. In contrast to a power index a power configuration specifies the power of each player in each winning coalition. We introduce a new power configuration which takes into account bargaining among players in coalitions. We show that under very weak conditions on a bargaining solution there is a power configuration which is stable with respect to renegotiations. We further show that given this power configuration there is a coalition which is both internally and Nash stable. We consider two different bargaining solutions on apex games and show under which conditions there are core stable coalitions. Finally, we investigate how infeasible coalition might affect the outcome and apply our model to the German parliament.

The last chapter is based on Karos and Peters (2013) and introduces the notion of mutual control structures. In a mutual control structure agents exercise control over each other. Typical examples occur in the area of corporate governance: firms and investment companies exercise mutual control, in particular by owning each others' stocks. In this paper we formulate a general model for such situations. There is a fixed set of agents, and a mutual control structure assigns to each subset (coalition) the subset of agents controlled by that coalition. Such a mutual control structure captures direct control. We propose a procedure in order to incorporate indirect control as well: if S controls T , and S and T jointly control R , then S controls R indirectly. This way, invariant mutual control structures result. Alternatively, mutual control can be described by vectors of simple games – simple game structures, each simple game describing who controls a certain player, and also those simple games can be updated in order to capture indirect control. We show that both approaches lead to equivalent

invariant structures.

In the second part of the paper, we axiomatically develop a class of power indices for invariant mutual control structures. We impose four axioms with a plausible interpretation in this framework, which together characterize a broad class of power indices based on dividends resulting both from exercising and from undergoing control. By adding an extra condition a unique power index is singled out. In this index, each player accumulates his Shapley-Shubik power index assignments from controlling other players, diminished by the sum of the Shapley-Shubik power index assignments to other players controlling him.

About the Author

Dominik Karos was born on July 6, 1987 in Saarbrücken, Germany. He studied mathematics at Saarland University and reached his diploma in 2010. During the last two years of his studies he worked as consultant for financial risk management in Luxembourg. After his graduation he quit this position and started as research and teaching assistant at the Chair of Economic Theory at Saarland University under the supervision of Dinko Dimitrov in June 2010. From November 2011 he was under joint supervision of Dinko Dimitrov and Hans Peters, Maastricht University.

His research focuses on cooperative game theory. He is particularly interested in power indices and coalition formation. This dissertation is based on his research from June 2010 to May 2013.