

Games without winners: Catching-up with asymmetric spillovers

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In this paper I study the potential consequences of the combined multi-modality and asymmetry for dynamic games. Multi-modal differential games (MMG) are getting increased attention in economic modelling with primary example being the situation with changing market leadership. I consider a special class of such games, namely the ones with state-dependent fixed switching condition. I explore the class of multi-modal games linear-quadratic in each regime and establish necessary conditions for the emergence of new previously unexplored equilibria types for such games.

In particular if the players are asymmetric and the leader can change the symmetric (pseudo)-equilibrium is observed where no player is established as a long-run leader. Moreover this equilibrium is supported by a cooperative game (social planner) also. At the same time the cycling equilibrium and chaotic dynamics are observed only in the non-cooperative setting. I derive conditions for these types of behavior and characterize the necessary degree of regulation's complexity.

I then study on the example of the R&D game with spillovers and imitation what degree of asymmetry is necessary for different types of these new equilibria. It turns out that the game must have rather a specific structure for non-deterministic chaos to be possible and players have to be almost symmetric in their characteristics. otherwise only the symmetric pseudo-equilibrium is possible.

I also discuss possible regularization of the non-cooperative game in chaotic mode through application of mean-field games tools.

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