Overlapping Coalitions, Bargaining and Networks

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Abstract

In a multi-agent system, there are many situations where group of agents can perform a task more efficiently than any single agent can. A desirable behavior in this case is to form a coalition : *alliance among individuals or groups which differ in goals* Gamson (1961). Forming a coalition can be viewed as writing an agreement together in order to attend some common objectives.

In politics, environmental issues, providing public goods, customs unions and many other situations, people use to write agreements. Unfortunately, the existing literature consider as granted the fact that *coalitions can not overlap*: meaning that *no player can belong to more than one coalition.* Yet there are several situations where coalitions overlap. In fact we have several situations where an agent (or group of agents) i can be signatory to an agreement to form a coalition S and in the same moment, be also signatory to another agreement to form a coalition S' where S differs from S'. This paper mentions several situations where coalitions overlap. After that, the paper aims to develop a theoretical model which would be useful for the analysis of overlapping coalitions, their structures, what their characteristics are likely to be and their possible applications. For this purpose, the paper provides an extension of the theory of endogenous coalition formation, with complete information and transferable utility, to the overlapping case.

First, the paper proposes a cover function bargaining game which allows the formation of overlapping coalitions at equilibrium. Secondly, the paper shows the existence of subgame perfect equilibrium. Thirdly, attention is focused on the symmetric case, and an algorithm to compute the equilibrium in this case is provided . Fourthly, the main

result of this paper establishes a bridge between networks theory and overlapping coalitions theory. In fact the paper provides an equilibrium cover representation for every network and shows that this representation is unique and is in both directions. Finally the paper provides two applications. The first one is a simple donors model in a Non Governmental Organization as an application of the algorithm in the symmetric case. The second is a group insurance model with externality : this example shows how one can solve network problems, using the framework of this paper.