

## REPORTS ON LATEST RESEARCH

### Report on the 5th Coalition Theory Network Workshop

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The Formation of coalitions is a central question in game theory. It examines the possibilities of co-operation between agents or regions and can be applied to various concrete economic fields such as the co-ordination of trade, taxation, technological, or environmental policies. The Fondazione Eni Enrico Mattei, Milan and Venice, together with the initial membership of CORE in Louvain-la-Neuve, GREQAM at the Université la Méditerranée and the Johnston Center at SMU in Dallas, is part of the Coalition Theory Network whose aim is to gather researchers working on coalitions theory. This year the 5th Workshop on Coalition Formation was hosted by the CODE (Center for the Study of Organisations and Decisions in Economics) located at the University Autònoma of Barcelona. The aim of this workshop is to give the latest insights on coalition formation theory with applications covering a large range of interests such as trade, environmental, fiscal, research and development policies. It intends to provide analytical tools and results to be used in the current theoretical framework as well as support for an interdisciplinary exchange. Compared to the 4th workshop held in Aix en Provence, this last workshop was characterised by an impressive number of papers (18 presentations in two days) and participants. In fact it gathered more than 30 scholars and researchers coming from research centers located in different countries: Greqam (France), CODE (Spain), CentER (Netherlands), CORE (Belgium), University of Warwick (England), CNRS-EHESS-CIRED (France), University of Vrije (Netherlands), University of Copenhagen (Denmark), University of Paris I (France), The Pennsylvania State University (USA), Southern Methodist University (USA).

In the first session, María Paz Espinosa, in collaboration with Inés Macho-Stadler, studied the equilibrium coalition structures in a model characterised by moral hazard within coalitions. The authors concluded that when moral hazard between coalitions is very severe, no partnership will form. However, when moral hazard is not too severe, the coalition structure will be either similar or more concentrated than without moral hazard. Moreover they stressed the fact that the presence of moral hazard can lead to an insufficient number of coalitions in the equilibrium. Then, Maria Montero examined coalition formation in games with random proposers in which coalitions impose externalities on other players. She showed that an agreement will be reached without delay provided that any set of coalitions profit from merging. Even under this strong assumption however, the formation of the grand coalition is not guaranteed. Thirdly, Francis Bloch developed a formal model of agenda control to analyse the power of the head of state in influencing the political coalitions formed. In particular, he related the power of the agenda setter to the underlying decisive structure among players using a co-operative sequential game in which coalitions are divided between losing and winning coalitions. The main result of his analysis is that the only structure in which the agenda setter can fully manipulate the outcome of coalitional bargaining is the apex structure, with one large and small players, where the large player only needs one of the small players to form a winning coalition. In all other structures, the power of the agenda setter is limited. During the second session Paola Conconi's model of international policy co-ordination focused on the effects of "tie-in negotiation" (a kind of issue linkage) for the stability of multilateral co-operation over trade and environmental policies. She concluded that this mechanism can either help or hinder international co-operation depending on the payoff structure of the underlying non co-operative game. More precisely tie-in negotiation appears to be relevant since the value of the inverse elasticity of marginal damage valuation is large. Richard Tol, during his presentation, investigated the impact of technological diffusion and learning-by-doing on the stability of climate coalitions. In this respect, he demonstrated that a free diffusion of technology leads to an increase in global welfare but also in the incentives to free ride on a Climate agreement. Imposing a restriction on technological diffusion can therefore in certain cases help build larger environmental coalitions. In the end, Jean-Christophe Péreau presented a model of environmental negotiations in which he introduced three strategies : co-operation, free-riding and precautionous unilateral commitment. This last one characterises countries that decide to commit unilaterally to reduce their emissions in the event of failure of international bargaining. They demonstrated that when countries can choose between the three kinds of strategies, the emergence of a small coalition creates an incentive for all the non signatories to commit unilaterally and lead to a non-coordinated global co-operation.

In the first paper of the 4th session Birgit Grodal introduced a theory of production in which a specified set of technologies is accessible to each firm. Labour skills are differentiated and acquired endogenously by workers. She showed what price systems are required so that competitive equilibrium exists and core outcomes are equivalent to competitive outcomes. Hubert Kempf, analysed then the formation and size of a club formed by wealthy people consuming conspicuous goods. It aims at investigating the effects of an overtaxation on luxurious goods and established that such a tax can't help in maximising global welfare. Michel Le Breton and Shlomo Weber studied next a co-operative game in which they defined an optimal rule for the distribution of the utilisation costs of a public good that allows avoiding secession of a part of the Community. They proved that, in this game, the core exists under certain conditions. In conclusion Salvador Barberà and Carmen Bevia discussed the merits of different social choice procedures by proposing allocation rules that are defined "self selection consistent" (that's to say allocation consistent and envy free) and that respect the Condorcet criterion.

Jordi Masso and Flip Klijn initiated the 5th session by introducing a concept of weak stability in a matching model applied to marriage. They demonstrated that the set of weakly stable and weakly efficient matchings coincides with the bargaining set of Zhou (1994). David Perez-Castrillo's paper present a mechanism, called "bidding mechanism" in which the players bid for the right to propose a sharing of the surplus generated by co-operation. They established that the payoff outcome of the subgame perfect equilibria of this game coincides with the Shapley value of the Game.

The 6th and last session directly adressed the Climate Change problem and was based on simulations from the RICE model (Nordhaus and Yang, 1996), a large-scale dynamic model of climate and economies. Firstly, Johan Eyckmans and Henry Tulkens tested the core property, which is a necessary condition for full voluntary co-operation, of transfers scheme designed to sustain full co-operation. They showed that these transfers yield an allocation in the core of the RICE carbon emission abatement game. In others words, under the transfers scheme presented here all coalitions are better off compared to the Nash equilibrium situation. Secondly, Johan Eyckmans investigated the stability of the Kyoto Protocol on Emissions of greenhouse gases when dealing with farsighted players (in the sense that they take into account possible subsequent deviations by other players). This approach, which considers the players as no longer myopic, leads to the conclusion that the Kyoto Protocol, including the possibility of emissions trading among Annex B countries, is not stable in that farsighted sense. However, simulations show that a coalition consisting of Annex B countries minus Japan is stable in a farsighted sense. Finally, Zili Yang's paper dealt with the determination of feasible and incentive-compatible coalitions to cope with potential climate change. He examined strategic interactions between regions that join a coalition and those that do not. He applied the concepts of "Incentives-compatible coalitions", meaning that a coalition in which the members' payoff is higher compared to the situation in which they do not belong to the coalition) and feasible coalitions (that's to say a coalition in which members' payoff are higher compared to the Nash situation). Numerical simulations showed that full co-operation is always a definitive Pareto improvement over the Nash Equilibrium and that it can be a feasible coalition after a redistribution of transfers. Moreover, they stressed the importance of partial co-operation since some sub-coalitions prove to be both feasible and incentive compatible coalitions.

To conclude, we can state that all papers presented have enlightened new important findings and promising results in the field of coalition formation and others issues that deserve further research efforts.