11th Coalition Theory Network Meeting - Dynamic Coalition Formation and the Structure of Social Relationships

The 11th CTN Meeting was held at the University of Warwick, UK, from the 19th to the 21st of January 2006. The workshop was organised with the support of the Department of Economics of the University of Warwick, UNINET, the British Academy, and the Association for Public Economic Theory.

This year's workshop had a special focus on dynamic coalition formation and structure of social relationships, including inequality and its consequences. Contributions focused both on the theory of network and social relations, and on empirical applications and analyses.

After a brief overview of the mathematical aspects of network theory by MM. Kirkilionis, covering topics such as graph theory and network topology, attaching state spaces to network graphs, and continuous dynamic systems of networks, the paper by Galeotti, Goyal and Jackson explored the questions of how location in the network affects individual behaviour, and how the structure of the network as a whole influences individual behaviour. A general theoretical model is built to analyse strategic interactions when the structure of the neighbourhood affects individuals' payoffs, and there is incomplete information on the underlying structure of the network. The main findings of the model are that, with incomplete information, there are clear-cut monotonicity properties of the result – more specifically, every equilibrium with symmetric players is monotonically increasing (decreasing) in games with strategic complements (substitutes) if there exist externalities. On the other hand, monotone equilibria can exist with more rich information structures, but not all equilibria are monotone.

Network stability is the topic of the next two papers. Hering, Mauleon and Vannetelbosh introduce pairwise farsighted stable networks as a new concept to predict which networks may form among farsighted players. A network is said to be pairwise farsighted stable if (i) all the possible "pairwise" deviations are deterred by the threat of ending with worse (or equal) payoffs; and (ii) if, when adding of deleting links in the network, farsighted players come back to the original network when they are allowed to successively add or delete links. Page and Wooders look at what networks are likely to emerge and persist by introducing the concept of path dominance relation. Under the path dominance relation, a network G path dominates another network G' if there is a finite sequence of networks, beginning with G and ending with G', where each network along the sequence dominates its predecessor.

Finally, the paper by Chillemi, Gui and Rocco presents a theoretical framework to investigate the effects of the presence of cooperative agents in a heterogeneous community, when there is asymmetric information on agents' type and group stability is endogenous. A model of network formation where connected agents contribute to aggregate payoffs and the Myerson value is applied to determine the share of the resources to agents is on the other hand discussed by P. Ping. Using a refinement of pairwise stability, the author is able to demonstrate that, for any N, when the equilibrium is a tree (acyclical connected graph) and there is no decay, the diameter of the network never exceeds 8.

Various authors explore the emergence of norms and institutional designs.

The problem faced by Konrad and Leininger is one of allocating payoffs among clan members. The proposed framework is fully non-cooperative, but it is found that a group of players can successfully coordinate on efficient actions and on an equitable division of the total revenue. The main results are that a fully efficient first-best outcome of the collective good problem can be

implemented, in which all members of the group receive some –possibly the same– share in the group's income. What matters for the sharing of the benefit is the difference between the two strongest players of the group: a clan can benefit from cooperation if this difference is not too large and the distribution of the benefits is merit-based. In the paper by Faias and Wooders, a strategic Nash two stage model of club formation is presented, in which players' crowding characteristics emerge endogenously in the model. That is, they are a by-product of their private consumption, and of the private consumption of others. In the first stage of the game, players acquire their crowding type through their choice of private consumption, which depends on the unobservable genetic type of the player. In the second stage, with the crowding profile for the whole economy already determined, players choose which club to join. In this second stage of the game, players are assumed to choose lotteries (probability distribution) over jurisdictions. The authors find that, under the given assumptions, an SPE in mixed strategies exist, even though the equilibrium is not fully characterised. Finally, Sànchez-Pagés and Straub also explore the endogenous emergence of institutions as mechanisms to coordinate actors, where agents have the possibility to institute (costly) institutions, which need to be self-enforcing.

The issue of identifying the underlying community structures from network data was the subject of a paper by Čopič, Jackson and Kirman, who propose a new methodology to overcome the shortcomings of existing methods, which are defined by algorithms and do not have a real model about what a community is. This paper adopts a reverse perspective: starting with a model of what a community structure is and how it generates networks, the most likely community structure is inferred, using a maximum likelihood estimations. This well-established statistical approach not only identifies the most likely community structure, but also provides a complete ranking of alternative community structures. The approach, however, precludes layers of community. The authors also provide axioms that uniquely identify ML as a method for identifying community structures.

Several papers explore the impacts of externalities on network formation and coalition stability.

Amann and Gall look at the formation of social groups, where externalities exist in the form of human capital accumulation. The authors propose a one-side matching model with endogenous group size and strictly non-transferable utility, building on stylised facts observed in the context of capital acquisition in education. The hypothesis is that, if capital accumulation is the only form of utility for members of a group, homogenous groups would form in terms of members' grades. On the other hand, if other forms of utility are present, emerging groups may be heterogeneous. To explore this hypothesis, an additional source of utility is included in the model: the existence of positive peer effects in study groups is well documented, but members may also gain from "consumptive" peer effects that increase their utility instantaneously. These may be thought of as favours provided by group members to their mates. Gains from trading across productive and consumptive peer effects are introduced by assuming agents are heterogeneous along the two dimensions. The model predicts segregation at the top and at the bottom of the attribute space, and a bunching in different regions of the type space for intermediate values. The possibility for agents to compensate across dimensions drives this result.

Macho-Stadler, Pérez-Castrillo, and Wettstein deal, on the other hand, with the emergence of cooperative behaviour in the presence of externalities, where the surplus generated by a group of agents depends upon the organisation of agents outside the group. The authors propose mechanisms to implement the Shapely value in the presence of positive and negative externalities, which are extensions of the multi-bidding procedure proposed by Pérez-Castrillo and Wettstein (2001) and (2002), for environments with no externalities. The mechanisms are parameterised by the weighted averages (nonnegative weights) of the externalities. The family of values satisfies the properties of

efficiency, anonymity, linearity and the null player property. The main result is that the Subgame Perfect Equilibrium outcomes of these mechanisms coincide with the sharing proposals: these mechanisms thus provide a non-cooperative foundation to the family of values suggested in Macho-Stadler et al. (2004), and may be used in the presence of externalities, thus overcoming the problem of strategic behaviour.

Applying network theory, Berghammer, Rusinowska and de Swart use the concept of network stability and propose the use of graph theory to identify stable (i.e. undominated) government coalitions. Their paper proposes a procedure to select a government in the absence of an undominated government - in graph-theoretic terms, when the dominance graph has no source. The approach is based on a combination of graph theory and social choice method, and it is applied to analyse government formation in Poland after the 2001 elections. The method suggests the removal of government which are least attractive for two reasons: because they are most frequently dominated, and because they dominate other governments less frequently. If this refinement procedure does not lead to the identification of a unique government, the final stable government is selected by applying bargaining theory or some social choice rules.

Another interesting application of network theory is presented in the paper by A. Galeotti, which combines a model of consumer search with a social network to explore the general research question of how social interactions and markets jointly shape economic outcome. In this model, two identical firms compete in prices. Consumers, who are linked in a social network, can acquire information on product prices in two ways: (i) through (costly) searches or (ii) through social relations and (free) information sharing. The author finds that social connections create free riding incentives among consumers, thus making the equilibrium outcome be closer to the monopolistic outcome. Comparing across networks, it is shown that there are perverse incentives in more connected networks, and the expected equilibrium price is higher. Intuitively, connections increase consumers' incentives to free ride on information collection. It is suggested that this may contribute to explaining why the emergence of internet shopping did not bring about the expected price reduction: search is less costly but, as information is a public good, competition may have been reduced rather than increased.

Finally, Deroian presents an application of network theory to the study of firms' incentives to take part in R&D alliances, where the knowledge generated by such an alliance propagates though the network of existing alliances.

The rest of the papers discuss a variety of topics, ranging from aversion to inequality to the empirical investigation of neighbours' influence on individual choices.

The issue of inequality is explored by Maria Montero. Starting from the observation that both empirical evidence and experimental results indicate that two parties share a surplus more equitably than the theory would predict, a sequential offer bargaining game in which unanimity is not required is used to examine the implications of inequity aversion. Contrary to expectations, it is found that aversion to inequality may lead to a more inequitable outcome than would occur with selfish preferences, when players' utilities are specified using the utility function proposed by Fehr and Schmidt (1999). This is due to the analogy between inequity and risk aversion: even though responders dislike getting less than the proposer, they are willing to accept smaller shares in order to avoid the risk of being excluded altogether. Furthermore, the effect of impatience may be reversed, and work against the proposer. This is because the equilibrium outcome may be so inequitable that responders would actually prefer that all players get 0 and, by rejecting the proposal, they can temporarily enforce this outcome. As players become more impatient, rejecting

the proposal becomes more attractive and the proposer must compensate the responders if he wants the proposal to be accepted.

Beal and Quérou look at the (non-cooperative) formation of networks with bounded rational players, who have the possibility of forming links among each other providing access to pair-wise interactions. The authors consider a repeated game of network formation with finite time horizon, where agents who are initially unconnected can form or remove links with each other. Unanimity is needed to form a link, whereas removal may be unilateral. Agents are boundedly rational, that is, their strategies are restricted in the sense that they have limited ability to anticipate opponents' behaviour. The main conclusion of the paper is that there is considerable difference between networks emerging with rational or boundedly rational agents – by restricting the set of strategies available to players, some form of coordination is more likely to emerge.

The effect of commitment strategies on bilateral bargaining in a non-cooperative setting is explored in the paper by Bade, Haeringer and Renou. More specifically, parties cannot sign binding agreements, but have the power to restrict their own action sets. In the first stage of the game, players decide on their commitment strategies. In the second stage, bilateral bargaining takes place. In this setting, self-enforceability of a commitment strategy is obtained through a simple sequential game structure. The set of action profiles that can be implemented through commitment are fully characterised. These implementable profiles are found to be generally inefficient, but the authors show that the ability to restrict own set of strategies can nonetheless improve upon the status quo.

In the paper by Maurin and Moschion, the influence of neighbourhood characteristics on labour choices by mothers is explored using econometric estimation techniques. The distribution of the sex of siblings of other mothers living in the neighbourhood is used as an instrumental variable to identify the influence of other mothers on the decisions to participate in the labour market. According to the models' estimations, a 10 percent points increase in the participation rate of neighbours increases a woman's probability of participation by about 8 percent points. The empirical results thus support a significant influence of neighbourhood on individual decisions.

The final paper by Tangian presents a model to assess the five leading German political parties and their coalitions in terms of their popularity (the percentage of the electorate represented) and universality (the frequency of representing a majority), derived from party manifestos and the results of 2005 parliamentary elections.