This paper proposes several multilateral negotiation mechanisms for studying simple coalition formation problems with externalities (see, e.g., Bloch (1996) and Gomes and Jehiel (2005)) where each player's payoff depends not only on the coalition he/she belongs to but also on how others partition themselves. For example, each cartel member's profits depend both on the cartel it belongs to and on the other cartels in the industry. We analyze and compare the efficiency properties of the equilibrium outcomes in these mechanisms.

The non-cooperative games of coalition formation have been extensively studied in recent years. However, there are often difficulties in achieving efficient outcomes. In the sequential coalition formation games with a fixed protocol of moves by players, as described in Bloch (1996), the Markov perfect equilibrium may fail to exist; in these games where Markov perfect equilibrium does exist, inefficient coalition structure can arise in equilibrium. Later, researchers have made three main adjustments to Bloch's sequential coalition formation games. First, the fixed protocol of moves by players is replaced by a randomization mechanism (see, e.g., Montero (1999), Hyndman and Ray (2004)), with which each player has an equal chance to propose. Another adjustment is that money transfers among players are allowed in order to relax the fixed payoff division assumption (see, e.g., Gomes and Jehiel (2005)). Furthermore, instead of assuming all agreements are irreversible, deviations and renegotiation (i.e., breaking-up and merging of coalitions) are considered (see, e.g., Hyndman and Ray (2004) and Gomes and Jehiel (2005)). However, the inefficient equilibrium outcomes cannot be ruled out in their games. It would seem, therefore, that further studies are needed in order to solve these inefficiency problems.

As in Bloch (1996), we assume that coalitions form sequentially and once a coalition forms, it cannot dissolve nor can its members forge new coalitions with the rest of the players. However, we depart from Bloch's assumptions that players move following an exogenously given order and no transfer payment is possible in the process of coalition formation. In particular, we study two types of bidding mechanisms. In one type of the bidding mechanism, players bid for the right to propose. In the other type of the bidding mechanism, players bid for proposals, each of which comprises a coalition that is to form and transfers among the players.

Three of our mechanisms are introduced as follows: The first mechanism includes a type-one bidding stage (bidding for the right to propose) and a bargaining stage, where the winner in the first stage makes a proposal and the potential members of the proposed coalition sequentially accept or reject the offer. The second mecha-

nism has three stages: an exiting-option stage and a type-two bidding stage where the winning proposal is generated, and a responding stage where the members of the potential coalition in the proposal respond sequentially. The third mechanism contains a sequential bidding stage where each player submits his/her bids for all potential coalitions following a given protocol, and a responding stage. We prove that the sequential coalition formation game associated with each of our mechanisms admits a Markov perfect equilibrium, in contrast to Bloch (1996) where a Markov perfect equilibrium may fail to exist. Moreover, each of our games has a dynamically efficient equilibrium that maximizes the total present value. Especially, in the sequential bidding mechanism, we prove that the equilibrium payoff division is unique. Furthermore, we apply the third mechanism to a symmetric Cournot oligopoly game. We show that not only the efficient grand coalition always forms in equilibrium, but also all members share equally.