

The Micro-Dynamics of Coalition Formation

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Abstract

We present an experimental approach to study the micro-dynamics of coalition formation in an unrestricted bargaining environment. We first show that negotiators use a variant of proto-coalition bargaining to come to a multi-party agreement. We then investigate the hypothesis that coalition bargaining under majority rule may lead to inefficiencies as agents are unable to effectively commit to preliminary agreements and are therefore inclined to accept inferior allocations. The lack of commitment devices requires establishing mutual trust between the negotiators to reach a stable agreement. We conjecture that negotiators establish such trust through the use of various verbal and non-verbal messages. By manipulating the communication channels used during the negotiations we can show that restrictions in the communication channels undermines trust and leads to significantly less efficient outcomes.

KEY WORDS: Coalitions, Dynamics, Coalition Formation, Experiments

The Dynamic Approach in the Study of Coalition Formation - From Models to Micro-Dynamics

Over the last two decades the theoretical study of coalition governments has been transformed. While earlier approaches largely relied on models borrowed and adapted from cooperative game-theory¹, more recent approaches have used non-cooperative models instead (Baron 1989, Diermeier and Merlo 2000, Diermeier, Eraslan, and Merlo 2003, Morelli 1999).² From the beginning these models were dynamic in nature. That is, current agreements depended on expectations about future behavior.³ As a point of departure, consider the Baron-Ferejohn model (BF), the most widely used model of majoritarian bargaining. In all variants of the BF model, a proposer is selected according to a commonly known rule such a random selection proportional to seat shares. He then proposes a policy or an allocation of benefits to a group of voters. According to a given voting rule, the proposal is either accepted or rejected. If the proposal is accepted, the game ends and all actors receive payoffs as specified by the accepted proposal. Otherwise, another proposer is selected, etc.⁴ This process continues until a proposal is accepted or the game ends. The BF model predicts that the party with proposal power will propose a minimal winning coalition consisting of him/herself and the “cheapest” set of voters necessary to ensure acceptance. All other voters will receive a pay-off of zero. The amount given to the coalition partners (or continuation value) equals the coalition partners’ expected payoffs if the proposal is rejected and the bargaining continues. Proposals are thus always accepted in the first round. The proposing party will always choose as coalition partners the parties with the lowest

¹ See Laver and Schofield (1990) for a detailed review of this literature.

² See Diermeier (2006) for an account of these methodological developments.

³ Dynamic, non-cooperative models were subsequently also applied to the study of cabinet *stability*. Our main concern in this paper is the study of government formation, but our research design will take some ideas from the study of coalition dynamics. For example, Diermeier and Merlo (2000) conceptualize coalition governments as sustained equilibria in an underlying multi-stage bargaining game with random shocks to both electoral prospects and to the parties’ reservation values. Diermeier and Merlo show how minority and surplus cabinets can be sustained as stable governments in a dynamic equilibrium. Moreover, they are not rare exceptions, but may form for all parameter values. A key insight of their model is that during coalition formation party leaders form beliefs over the relative stability of possible coalitions and incorporate those beliefs into their bargaining strategies. Beliefs about coalition stability in turn incorporate expectation over how subsequent coalitions will be formed if the current coalition falls. The stability and the relative occurrence of different types of governments are thus *jointly determined in equilibrium*. Diermeier, Eraslan, and Merlo (2003) subsequently developed a structural estimation technique to incorporate these insights into the empirical study of coalition government.

⁴ A variant of this set-up allows (nested) amendments to a proposal before it is voted on. This is the case of an open amendment rule (Baron and Ferejohn 1989).

continuation values. The division of spoils will in general be highly unequal, especially if the parties are very impatient.⁵

This description of the Baron-Ferejohn makes it clear why the model has been popular in the study of coalition formation. The “proposer” can be interpreted as the formateur. The recognition rule corresponds to the explicit or implicit selection process used by a monarch, president, or informateur. This selection process is usually viewed as non-partisan.⁶ The “voters” in the model can be interpreted as party leaders engaging in negotiations over the formation of the next cabinet, and so forth. Note also that the “proposer premium” creates additional incentives for electoral competition as parties with higher seat shares may be more likely to be selected as formateur.⁷

The Baron-Ferejohn model was the first example of a dynamic bargaining model applied to coalition formation. It generated various important and novel insights into the specifics of coalition formation that had eluded previous models.⁸ First, it emphasized the value of proposal power. For example, it can be shown (Diermeier and Myerson 1994) that in a divide-the-dollar setting where a player has veto power, but lacks proposal power, while all other players have some proposal power, but no veto power, the veto player receives an equilibrium pay-off of zero. Second, the recognized proposer can increase their payoffs by exploiting the other players’ “impatience”. Interestingly, there are various sources for this effect. There can be heavy discounting of future pay-offs, an effect already identified in bilateral bargaining models (Rubinstein 1992). But in the majoritarian case the impatience to agree to a current deal is also driven by the “fear” of being left out of a future proposal.⁹ That is, if a party does not agree to the current proposal it may not be included in future ones (Eraslan and Merlo 2002).

⁵ In subsequent years Baron systematically applied the model to various aspects of government formation such as different voting and proposal rules (Baron 1989) or parties with spatial preferences (Baron 1993).

⁶ See Diemeier and Merlo (2001) for an empirical investigation of formateur selection rules.

⁷ See Baron and Diermeier (2001) and Baron, Diermeier, and Fong (2007) for models of strategic voting under proportional representation.

⁸ While these insights reappear in other forms of dynamic coalition bargaining models (to be discussed below) they are most easily illustrated in the context of the Baron-Ferejohn model.

⁹ The terms “impatience” and “fear”, of course, have psychological connotations. At this point we use them loosely to identify rational incentives, but we will later introduce a richer psychological framework.

Despite these successes the original Baron-Ferejohn model also had some draw-backs. First, the model is difficult to work with, especially if one leaves the purely distributive (“divide-the-dollar”) environment and includes policy preferences. In that case only the simplest environment of three symmetric parties with Euclidean preferences is reasonably manageable.¹⁰ Second, the model appeared to be unable to account for various important empirical features such as the existence of minority and super-majority governments and the proportional distribution of cabinet portfolios among the coalition parties. This led to the development of various alternative coalition formation models, each of them with their own dynamic bargaining structure.

Our focus in this paper is on *proto-coalition bargaining*, originally proposed by Baron and Diermeier (2001).¹¹ Their model focuses on an environment where parties bargain not only over distributive benefits, but also over (multi-dimensional) policy. The model proceeds as follows. A proposer party (“formateur”) is selected proportionally to seat share. That party then selects a “proto-coalition,” (Axelrod 1970) that is, a list of parties that agree to negotiate under unanimity rule. If the proposed coalitional agreement fails to win a majority in the chamber, either a new formateur is selected and the process continues or a caretaker government implements an exogenously given *status quo* policy. The pay-off associated with a particular proto-coalition is determined by bargaining within the proto-coalition. The bargaining protocol within a proto-coalitions is assumed to lead to efficient outcomes.¹²

Note that proto-coalition bargaining is quite different from the Baron-Ferejohn protocol. In their approach, a formateur not only selects a group of parties to “talk to”, but also at the same time a particular allocation of pay-offs among the parties. Therefore, proto-coalition and coalition coincide. In proto-coalition bargaining, on the other hand, first the proto-coalition is selected and then, in a separate step, the proto-coalition agrees upon a pay-off distribution.

¹⁰ See Austen-Smith (2004) and Banks (2005) and Banks and Duggan (2000, 2003) for a thorough analysis of the Baron-Ferejohn model. In the general case of convex preferences we also have to worry about multiple equilibria. See also Eraslan and Merlo (2002).

¹¹ See also Diermeier, Eraslan, and Merlo (2003).

¹² Other efficient bargaining models include Merlo and Wilson (1995), Diermeier and Merlo (2000), and Diermeier, Eraslan, and Merlo (2003).

One advantage of the Baron-Diermeier model is that, compared to spatial versions of the Baron-Ferejohn model, bargaining equilibria are always unique and easy to calculate. Diermeier and Merlo (2000), for example, use it in their model of cabinet formation and duration and show how a dynamic version of efficient bargaining can account for the existence of minority and super-majority governments in equilibrium. Diermeier, Eraslan, and Merlo (2003) use a similar model to structurally estimate the effects on constitutional features on selected cabinet type, government stability, and the time it takes to form the next government.

In summary the last two decades in the theoretical study of government coalitions has seen an explosion in the use of bargaining models. The key idea of dynamic bargaining models is to model coalition bargaining as a sequential move game. In equilibrium which coalition will be chosen and how stable it will be will depend on the expectations of the negotiating parties about what would happen in future negotiations. This approach has sufficiently progressed to allow researchers to model the institutional details of government formation such as formateur selection rules, constitutional constraints on selection time, investiture votes and so forth. Moreover, recent structural models have shown that it can serve as a tight theoretical foundation for empirical studies.

The proliferation of dynamic government formation models naturally poses the question on how we should select among the various contenders. While there are some empirical studies of cabinet formation processes (Diermeier and van Roozendaal 1998, Diermeier and Merlo 2001, and Martin and Vanberg 2003) their insights are limited by the available data. Much of coalition bargaining takes place behind closed doors which limits the use of field data to an analysis of formateur and proto-coalition selection.

To address these concerns a few recent studies have turned to laboratory experiments to study coalition formation (Diermeier and Gailmard, 2006; Frechette, Kagel, and Morelli 2005). From a methodological point of view the existing experimental studies in coalition bargaining follow the experimental design philosophy used in experimental game theory. The general approach is to design an experiment that is as close as possible to a fully specified formal model to test the model's implications. Experimentalists design ingenious mechanisms to control for risk aversion,

ensure anonymity, or to implement infinitely repeated games in finite time-periods. In dynamic contexts, for example, experimental subjects can only use the moves specified in the extensive form and so forth. This approach is necessary if we want to test existing formal theories (i.e. high internal validity), but it is potentially limiting if we want to understand some general features of bargaining that either have not been fully captured by formal models or are characteristic for a whole research approach (i.e. low external validity). This is the situation in most social psychology experiments where experimentalists are trying to test the validity of theoretical insights in the absence of a general mathematical model. In this paper we follow the later approach.

Specifically, in contrast to the recent experimental tradition we will intentionally *not specify* an exact sequence of moves, and subject will be free to apply various strategies to solve the coalition formation problem. Most importantly, we will allow subjects to *talk* to each other without any restrictions. In some set-ups they will be able to talk privately, ask other parties to leave the room and so forth. That is, our purpose is to (re-)create in the lab as rich a negotiation environment as possible. The idea is that such unrestricted settings allow us to study the micro-dynamics of coalition formation in more detail.

Our goal is two-fold. First, we want to assess whether in an unrestricted environment subjects naturally adopt certain bargaining patterns, e.g. BF-bargaining, exchange of demands or proposals, and proto-coalition bargaining. Second, we are interested in whether some of the common themes of the formal literature on dynamic coalition dynamics can be observed in an unrestricted bargaining context.

The Fear of Being Left Out

We can summarize the main finding of dynamic coalition formation models as follows: The expectation of which coalitions (or proto-coalitions) may form in the future if the current negotiation fails creates incentives for coalition members to extract favorable agreements from their current bargaining counter-parts. This is true for both a stage of government formation and in the context of cabinet stability when alternative coalitions serve as the “outside options” to the current agreement. These incentives can be nested and circular. That is, an agreement within

coalition A may depend on the expected agreement in coalition B which may depend on the expected agreement within coalition C and so forth. In other words, the nature and efficiency of any *current* agreement depends on the shared expectations about *future* agreements. Of course, these future agreements may never come to pass if the current agreement holds – they are counter-factuals or (in the language of game-theory) “off the equilibrium path”, but if they were not possible the actual agreement would be different as well.

Notice that such future agreements not only may be less favorable to current coalition partners due a shift in a bargaining strength (e.g. proposal power may shift to a different member of the coalition), but, most importantly, future coalitions may consist of *different* parties, relegating at least some of the current coalition members to the much less desirable role of opposition party. This is a defining characteristic of majoritarian bargaining: it is not necessary to reach consensus among all negotiating parties to come to an implementable agreement. The paradigmatic case, of course, is the divide-the-dollar framework where a simple majority can implement any allocation.

Interestingly, this “fear of exclusion” not only sustains current coalitions as equilibria, it may also lead negotiating parties to accept inefficient outcomes out of the fear that the current coalition will be replaced by a new one and that they may be left out of the final deal. This was formally shown by Eraslan and Merlo (2001). Eraslan and Merlo consider a divide-the-dollar problem with a stochastically changing cake. Intuitively, one may think about this problem as a “divide-the-yen” problem with a randomly changing exchange rate. In contrast to the simple fixed case bargaining problem which is purely distributional there is now also an efficiency problem in the case of a low value (i.e. a low exchange rate), as all parties would be better off to delay agreement until the exchange rate is higher. Merlo and Wilson (1995) have shown that with bargaining under unanimity the group will necessarily arrive at an efficient outcome. Also, recall that in the case of a (fixed) divide-the-dollar bargaining, i.e. the classic Baron-Ferejohn model, all agreements are trivially efficient. However, in the combined case, i.e. majoritarian bargaining with a randomly changing cake the efficiency results brake down: members that are included in the current coalition agree too early to a proposal as they cannot be sure to be included in the next agreements. In turn, proposers exploit this behavior in equilibrium and

capture a bigger share. The result is that agreement is reached “too early,” resulting in inefficient allocations.

This inefficiency result is an important and surprising implication of majoritarian bargaining models. While the Merlo-Eraslan result formally holds in the context of the Baron-Ferejohn bargaining protocol its underlying intuition is more general (e.g. Compte and Jehiel, 2007, Diermeier and Fong, 2007). Indeed, the possibility of being “left out” of a final agreement marks perhaps the most important conceptual difference between multilateral and bilateral negotiations. In turn, establishing empirically the existence of the “fear of exclusion” effect would constitute important validation for dynamic models of coalition formation. This is the goal of our paper. However, as discussed above, our goal is not to test a particular bargaining protocol but to try to establish this effect more generally.

To make these issues more concrete consider the following negotiation problem between three parties (A, B, and C).¹³ Depending on the agreement, different coalitions will receive fixed amounts of money that can be freely distributed among the parties.

Table 1: Pay-off Matrix

<u>Possible Agreements</u>	<u>Total Payoff (to be distributed among parties in agreement)</u>
A alone	\$0
B alone	\$0
C alone	\$0
A and B	\$118,000
A and C	\$84,000
B and C	\$50,000
A, B, and C	\$121,000

¹³ We used a modified version of the exercise published by the Kellogg Dispute Resolution Research Center, Northwestern University. This particular contextualization was chosen to ensure potential comparability with other studies using the same exercise. The form of the pay-off matrix is due to Raiffa (1982).

An agreement consists in an allocation of the respective amount among the parties involved in the deal. For example, any agreement between A and B alone would specify both A's and B's share of the specified \$118,000. If no agreement can be reached, each party receives a payoff of \$0.¹⁴

In this example, an efficient outcome involves the parties deciding to leave no resources unused, which implies that all parties need to be included in the deal. Of course, each party has different preferences over how the total pie should be split. What makes this problem difficult is that at least some parties (e.g. A and B) can form a fairly profitable agreement without including the third party (C). So, one possible intuition of how the negotiations may proceed is as follows. Parties A and B (or some other "proto-coalition")¹⁵ may form a preliminary agreement on how to split the pie already available to an AB coalition (here \$118 K) among themselves and then only need to negotiate over the remaining amount (\$3 K) with C. This scenario, however, is highly unfavorable to C who will thus try to break up any proto-coalition between A and B to avoid being left with a pittance. Given the negotiation's collective incentive structure, C can make an attractive offer to either A or B, regardless of how A and B have divided the \$118 K between themselves. For example, if A and B decide to split the money equally between themselves (i.e. \$59 K for each A and B), C can offer A at least \$60 K (while keeping \$24 K for herself). The same holds in any agreement where B gets more of the \$118 K, or, analogously, in the case where A receives more of the \$118 K, but less than \$78 K. If A receives \$78 K or more (and thus B \$40 K or less), C can offer B \$42 K and keep \$8 K for himself. If party C is successful in tempting either A or B to form a new proto-coalition, the whole process begins anew.¹⁶

The key insight is that an advantageous strategy for a player is to form a bond with one other player and then jointly take advantage of the weak bargaining position of the third. In the context of coalition bargaining such a bond corresponds to a proto-coalition. This approach is complicated by the fact that the third player can always make a sufficiently attractive offer to

¹⁴ We will use a contextualized version of this problem in our experiments. The table here represents our experiment's characteristic function.

¹⁵ See Axelrod (1970) for details on the concept of proto-coalitions. In our context, proto-coalitions refer to an agreement between two or more parties to talk.

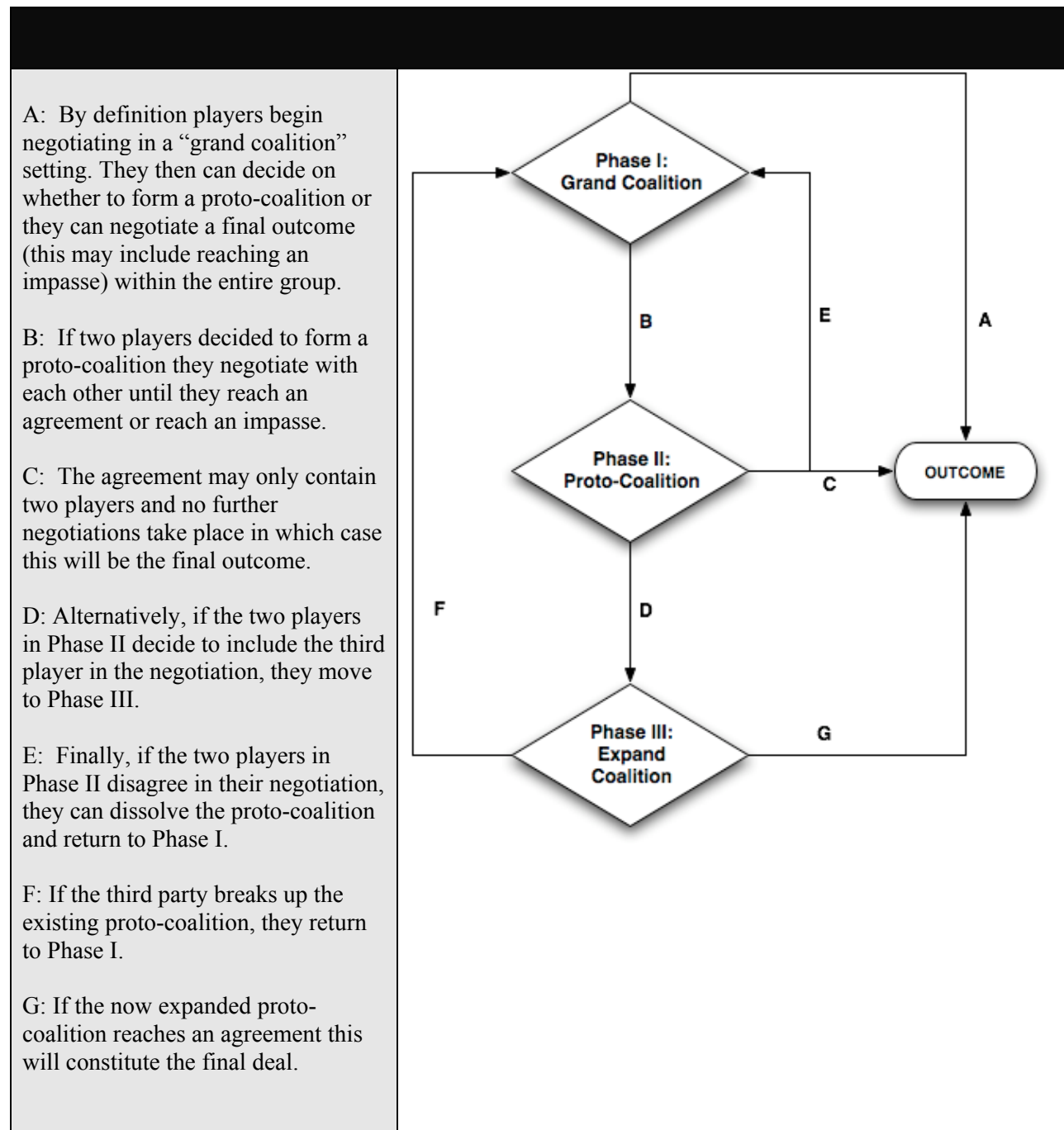
¹⁶ An analogous argument holds for the other proto-coalitions AC and BC. It illustrates the fact that this characteristic function has an empty core.

induce one of the members of the proto-coalition to defect from the preliminary agreement. Indeed, maintaining the current proto-coalition while negotiating with the third party over the remaining surplus constitutes the core difficulty of this bargaining problem. Inefficient outcomes may result if players are “too concerned” with maintaining the current proto-coalition to successfully come to an agreement with the third party. The result is an inefficient outcome: money will be left on the table. Moreover, the mere concern that the other party may defect may lead a party to abandon the current proto-coalition.¹⁷

The goals for negotiating parties are thus to (a) be included in the proto-coalition and (b) ensure that the proto-coalition is stable. Conversely, in contrast to bilateral negotiations the main risk is not an impasse, but being “left out” of the deal (i.e. either receiving nothing or only a pittance). According to our definition, inefficiency may mean an impasse (i.e. no agreement) or any two-party agreement.

The micro-dynamics of coalition bargaining can be summarized in figure 1.

¹⁷ Note that in our experiments we only specify the characteristic function of the bargaining problem. We do not presuppose a specific bargaining protocol. That is, rather than forming proto-coalitions negotiators may directly propose fully specified offers, as in Baron-Ferejohn bargaining, or they may exchange demands as in the framework proposed by Morelli.

Figure 1: Proto-Coalition Bargaining

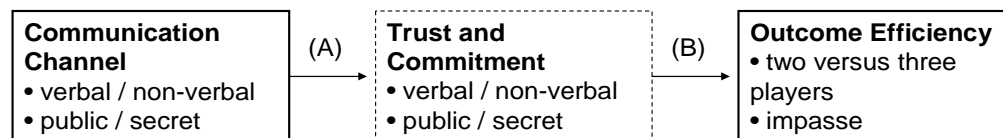
In the discussion of this phenomenon we have introduced psychological terms such as “fear” or “concern.” While they are foreign to the rational actor model used in game-theory we expect them to adequately describe the decision situation faced in real bargaining situations. The strategic requirement to build stable proto-coalitions corresponds to the need to form a trusted bond between the members of the proto-coalition as formally binding commitment devices or contracts are not available. In other words, the less trusted a proto-coalition, the more effort is necessary for its members to stabilize it and the less willing they are to include the third player in the discussions, always fearing that the third player may take advantage of the invitation to negotiate by breaking up the existing proto-coalition.

For stable proto-coalitions to occur, parties therefore must be able to establish a sense of commitment to their proto-coalition partners. Commitment may be demonstrated in different ways. For example, members of the proto-coalition may reject offers from the third party even though the share offered by the third party is *higher* than her current share in the proto-coalition agreement. Alternatively, members of the proto-coalition may agree to communicate only jointly with the third party.

These and other techniques to establish commitment depend on preconditions. For instance, players may rely on non-verbal communication to signal an agreement (i.e., they may seek eye-contact before speaking to the third party or may move together on the same side of the table). Thus, the degree to which non-verbal factors can be used (e.g. in a face-to-face versus computer-mediated negotiation) may influence the stability of proto-coalitions and whether or not someone is excluded from the final outcome. Also, the signaling effect of rejecting an attractive offer by the outside party presupposes that outside offers (and their rejection!) can be observed by all of the parties; they must be public. Similarly, agents may be concerned that their proto-coalition partner can secretly communicate with the third party, perhaps negotiating a more attractive deal on the side. Note that even the *possibility* of secret communication may undermine a party’s trust in the current proto-coalition.

This suggests that the communication channels parties have available strongly influence the stability of proto-coalitions and whether they can be expanded to fully efficient three player coalitions. In other words, rather than trying to measure or directly manipulate existing trust between proto-coalition partners, a rather difficult challenge under any circumstances, we can manipulate the communication channels that are used during the coalition negotiations. We can summarize our argument in figure 2.

Figure 2: Communication – Trust – Efficiency



Solid lines indicate attributes measured in our study

Notice that our approach depends on two crucial theoretical steps, here denoted (A) and (B). The relationship between commitment and trust follows directly from our discussion of the dynamic bargaining literature. It is the main object of investigation. But since we cannot measure trust and commitment within the (several) proto-coalitions directly, we use variations in the communication channel instead. But the validity of this approach depends on a separate hypothesis relating communication channels with negotiation behavior.

The Impact of Communication Channels

Communication channels vary in the amount of cues they may carry, which in turn may affect the success of communication processes (Daft & Lengel, 1986). This “channel richness approach” to media effects has been central to many theories, including Social Presence Theory (Short, Williams & Christie, 1976), Information Richness Theory (Daft & Lengel, 1986), the Cuelessness Model (Rutter, 1987), and the Reduced Social Cues Approach (Kiesler, Siegel, & McGuire, 1984). Although there are qualitative differences in the primary foci of these theories, all argue – in one way or another – that a medium’s capacity to convey several cues at the same time determines whether or not people are able to work effectively with one another. That is, the more cues the medium conveys, the more likely the interaction will be successful.

Some of the negotiation research supports the idea that negotiation outcomes may be a function of the amount of cues a medium conveys. Compared to text-based communication, for example, the presence of audio cues may contribute to fewer impasses (Mennecke, Valacich, & Wheeler, 2000; Purdy & Nye, 2000; Suh, 1999; Valley, Moag, & Bazerman, 1998). Also, the concurrent presence of audio and visual cues during face-to-face negotiations has contributed to more efficient outcomes than text-based communication (e.g. Croson, 1999; Naquin & Paulson, 2003; Rangaswamy & Shell, 1997) or audio only communication (e.g. King & Glidewell, 1980; Morley & Stephenson, 1969; 1970; Short, 1974). The underlying reason suggested in this body of research is that the presence of more cues reduces ambiguity and positively relates to one’s ability to exert influence, making the interaction process more “human” and inherently more social. Although this research suggests that similar effects are to be expected in coalition formation, this remains an open question as prior research exclusively focused on bilateral interactions. We capture this approach by comparing face-to-face with computer-mediated communication which is entirely text-based.

But the channel richness approach has not been without challenges. One line of argument has argued that capacity approaches ignore the importance of other contextual factors underlying media use (Walther, 1996). Contrary to capacity approaches, these “contextual perspectives” argue that media effects are largely shaped by technology, people, experience and the interaction between them (see for example Carlson & Zmud, 1999; Fulk, 1993). According to this

perspective, group processes and outcomes are determined by the *setting* in which communication takes place, rather than by technological factors alone.

Recent findings from the negotiation literature support this contextual perspective. For example, a recently conducted meta-analysis on the impact of communication channels on negotiations shows that the contribution of multiple cues to negotiation outcomes is influenced by a negotiator's relationship with the counterpart or the experience one has with the technology (Swaab, Medvec, & Diermeier, 2007). An additional contextual factor often ignored in this literature is the extent to which communication settings allow people to be aware of the communication content. Little is known about the effect of this awareness on group processes in general and multiparty negotiations in particular. This is somewhat surprising given the consequences that awareness of the conveyed message may have for decision-making groups who may strongly depend on having an idea of who is communicating with whom. For example, during multiparty face-to-face interaction, negotiators can monitor the communication occurring between various parties. Either the communication is public and all of the parties present hear the discussion, or if private communication takes place during the meeting, the parties generally know that this is occurring (they see two parties whispering to each other, hear them speak in a foreign language or unknown code, or know that two parties left the room together).¹⁸

In summary, we expect that outcome efficiency can be affected by the communication channel (i.e. face-to-face or computer mediated) as well as the communication setting – the extent to which the content of the communication is accessible to all involved – may set the stage for qualitatively different processes and outcomes. That is, we predict the following:

- (T1) Compared to computer mediated communication, face-to-face communication will lead to more efficient outcomes in multiparty negotiations.
- (T2) Compared to private communication settings, public communication settings will lead to more efficient outcomes in multiparty negotiations.

¹⁸ Of course, if parties have the ability to adjourn the meeting various other communication channels may be used, including phone calls, secret meetings etc. Negotiations with adjournments are difficult to replicate in a laboratory setting. However, as we will see below, as we will see below computer-mediated communication allows us to fail us to faithfully implement secret communication.

Experiments: Design and Results

We examine these predictions in three experimental studies. The first study examines the differences between face-to-face and computer-mediated negotiations. The second study is designed to replicate the effects of the first study and to examine the impact of public versus private communication settings on outcome efficiency and on how negotiators frame their discussions (e.g. in terms of group versus sub-group interests). The third study isolates the effects of this second factor and disentangles the differences between private and secret communication settings in outcome efficiency and communication framing. We will use the same negotiation scenario described in the introduction as well as a common research design throughout the three experimental studies.

Study 1

Study 1 is designed to test the impact of synchronous text-based computer-mediated versus face-to-face communication on outcome efficiency in a multiparty negotiation. Based on previous computer-mediated communication research that focused on group decision making (Baltes et al., 2002) and dyadic negotiations (e.g. Arunachalam & Dilla, 1992; Croson, 1999; Morris, Nadler, Kurtzberg, & Thompson, 2002; Naquin & Paulson, 2003; Rangaswamy & Shell, 1997; Suh, 1999), we hypothesize that the multitude of cues present in face-to-face communication makes it easier to sustain trust in the other member of the proto-coalition. This will make it more likely that the members of the proto-coalition will risk expanding the coalition compared to computer-mediated communication (CMC).

Hypothesis 1: Groups using computer-mediated communication are less likely to reach efficient outcomes than groups communicating face-to-face.

Method

Participants and design. Eighty-seven students participated in this study as part of an executive business administration negotiations course at a Midwestern business school. The participants were randomly divided into 29 three-person groups.

The experiment was a between-subjects design with communication medium (face-to-face vs. CMC) as the independent variable.

Task. The students participated in a three-party negotiation case entitled “Social Services.”¹⁹ In this negotiation simulation participants were randomly assigned to the role of a representative for one of three different social services agencies (Allied, Benevolent, and Caring). The agency representatives were offered the opportunity to receive funds from a government agency, provided at least two of the three firms formed a consortium. Each representative was given the goal of obtaining as much funding as possible for their organization. The students were told they needed to agree on the parties to the consortium and the distribution of the resulting funds. The amount of resources available for any grant varied based on the agencies involved (See Table 1 for the Payoff Matrix). All of the participants received the same case materials and saw the same payoff matrix. This fact was publicly announced at the beginning of the exercise. As customary in psychology experiments, participants were confronted with a hypothetical choice situation (e.g. Kahneman and Tversky 1979, Arkes, Herren, and Isen 1988). Following this approach participants were not paid and did not receive special course credit contingent on negotiation success. There was no future or follow-up interaction after the participants completion of the negotiation.

Procedure. Ten of the groups were told they would complete this exercise face-to-face, and the remaining 19 groups were told they would complete the exercise in an online chat room (the MC condition). The online chat room allowed for synchronous, public communication among all three parties. Both media also allowed for private communication between any two of the three parties. In the face-to-face treatment, parties could ask one person to leave the room to conduct a private conversation. In the case of computer-mediated communication, students could also send each other instant messages without the knowledge of the third party. The online exercise was conducted using the software package, Ayeware.²⁰

¹⁹ We used a modified version of the exercise published by the Kellogg Dispute Resolution Research Center, Northwestern University. This particular contextualization was chosen to ensure potential comparability with other studies using the same exercise.

²⁰ The software was developed at Northwestern University by Daniel Diermeier, Timothy J. Feddersen, and members of Northwestern’s Academic Technology group. The AyeWare website can be found at <http://ayesite.northwestern.edu/ayeware2/index.html>. A power point presentation describing the capabilities of

The participants were allowed 10 minutes to read the exercise and 45 minutes to negotiate.²¹ The face-to-face negotiations were videotaped, and we obtained the transcripts from the computer-mediated negotiations (including instant messaging transcripts). After completing the negotiation, participants returned to the classroom and were debriefed as part of the course lecture (Loyd, Kern, & Thompson, 2005).

Communication channel manipulation. Two forms of communication medium were used: face-to-face communication and computer-mediated communication. Participants in the face-to-face condition were assigned to breakout rooms with their respective group members. They were told not to communicate with any other groups. Participants in the CMC condition were assigned to individual computers in small breakout rooms where they logged on to *Ayeware*. They were not allowed to verbally communicate with anyone while engaged in the online negotiation and there were no other members of their negotiating group in their breakout room.

Efficiency. We measured efficiency as the maximal use of the total resource pool (\$121,000). In order to fully distribute the available pool, all three group members would need to agree to the deal. Efficiency was operationalized as a dichotomous variable – the agreement was either coded as being efficient or inefficient.²² This is without loss of generality. There were no groups that agreed on a three-player coalition but then decided to only partially allocate the additional surplus.

Results

All analyses were conducted at the group level. Hypothesis 1 predicted that groups would be more likely to reach efficient outcomes when communicating face-to-face than in chat rooms. We ran chi square analyses comparing the efficiency of CMC to face-to-face negotiations to test this hypothesis. Supporting Hypothesis 1, groups negotiating face-to-face were significantly more efficient than groups negotiating via CMC, Mann-Whitney $U = 38.50$, $Z = -3.23$, $p = .001$.

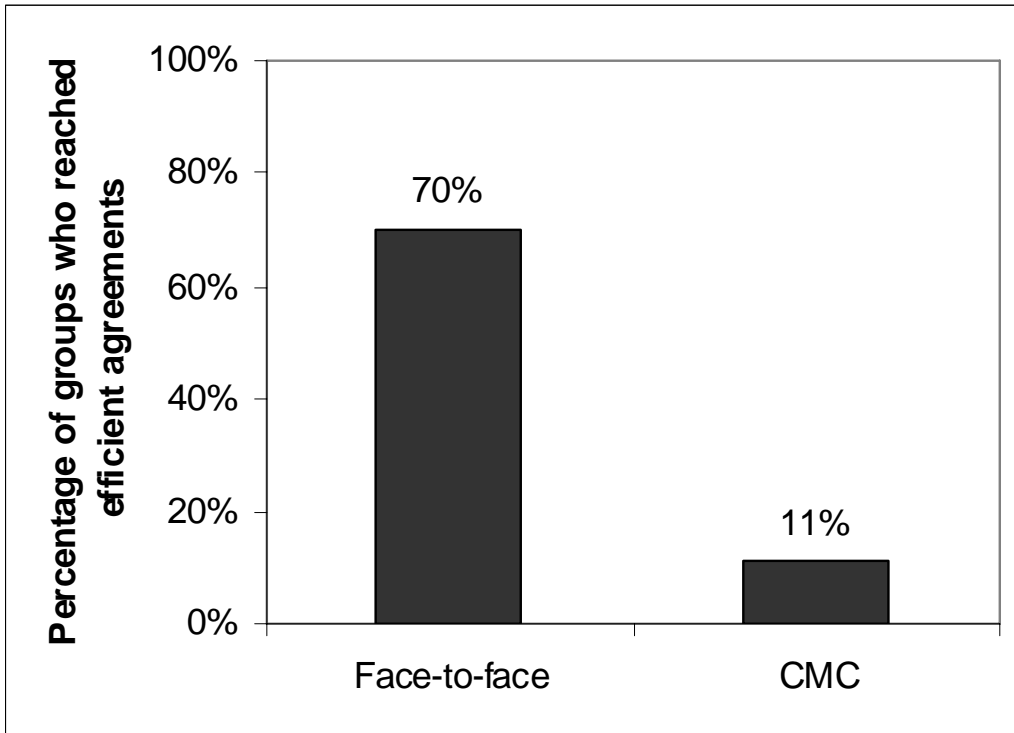
Ayeware and its use in a class-room environment can be found at <http://ayesite.northwestern.edu/ayeware2/presentation-may-2004.ppt>. A live-demonstration and overview of the software can be viewed on streaming video at <http://2east.northwestern.edu/pres6.html>.

²¹ Pretesting indicated that this was sufficient time to prepare and negotiate.

²² There were no cases where a coalition failed to fully allocate its available amount.

In the face-to-face condition, 70 percent of outcomes were efficient, as compared to only 11 percent in the CMC condition.

Figure 3. Efficiency of Multiparty Negotiation Outcome



These results are not due to a high frequency of negotiation impasses. Indeed, out of 29 negotiations, only 1 resulted in an impasse (in the CMC condition). Rather, in the CMC condition, participants were almost always able to form two-party coalitions, but failed to reach three-party agreements.²³

Discussion

As we predicted, groups reached more efficient outcomes when negotiating face-to-face than in a computer mediated chat room. The increased efficiency in face-to-face negotiations may be due

²³ We also ran the analysis for face-to-face versus CMC excluding the one group that reached an impasse. The statistical significance of the results did not change ($\chi^2(1) = 10.22$; $p < .001$).

to a number of different factors. For example, when negotiating face-to-face, parties can witness and manage the formation of coalitions; they can see when a coalition partner might defect and they can anticipate potentially getting shut out of a final agreement. In addition, it may be more difficult to monitor the other parties' interactions in the CMC negotiation setting. This may make it more challenging to reach an efficient outcome as members of an existing proto-coalition may be reluctant to communicate with the remaining party out of a concern that this interaction may disrupt the existing agreement. Finally, is the impact of face-to-face communication the result of channel richness (P1), communication context (P2) or both?

Moreover, while the difference in outcome efficiency is consistent with the basic assumptions of proto-coalition bargaining, it does not provide direct evidence that participants behave as postulated in proto-coalition bargaining models. For example, do they consistently first form two-player coalitions that are either maintained or expanded to include a third player which may eventually lead to efficient outcomes?

Let us first consider the potential impact of communication. To distinguish between channel richness and communication context we need to focus on some of the more subtle differences between computer-mediated and face-to-face interaction. One important difference between the face-to-face and CMC negotiations in Study 1 was that face-to-face communication not only allowed non-verbal communication, but also *precluded* a particular form of private communication. The lack of non-verbal cues relates to the channel richness hypothesis (T1). To see effect of communication context (T2) recall that in the CMC negotiations parties could communicate via instant messaging. While it is an important feature of real-life online communication, it does add another, potentially important dimension to the problem. When Party A sends an instant message to Party B (but not to Party C), not only is the content of Party A's message to Party B unknown to C, but Party C *does not even know that Parties A and B have communicated privately*. That is, both the content of the communication and the fact that communication took place is private information held only by the communicating parties (here A and B). We refer to this form of communication as "secret". Hiding the *fact* that private communication is taking place, however, is impossible in face-to-face communications. The only way for A and B to communicate privately during a face-to-face meeting is for both of them to

leave the room, to ask C to leave the room, or to whisper to each other in front of C²⁴. In other words, while the *content* of private communication is hidden to C, *the fact that A and B are communicating is common knowledge among all three parties*. For simplicity, we will call this form of communication “private.”

The conceptual difference between secret and private communication allows us to study some fairly subtle aspects of the communication context approaches. Conceptually, the difference between public, private, and secret communication is what aspect of communication is *common knowledge* among the participants: the fact the private communication took place or the content of the communication setting. This is summarized in the following table.

Table 2: Communication Context and Common Knowledge

		Fact of that private communication took place is common knowledge	
		Yes	No
Content of private communication is common knowledge	Yes	Public Communication Condition (only common chat room)	<i>Not possible</i>
	No	Private Communication Condition (private chat room available)	Secret Communication Condition (instant messaging is available)

This insight is of importance for the interpretation of our findings. Research in game-theory (Aumann 1976, Rubinstein 1989, Morris and Shin 1999) has demonstrated that communication environments that prevent the establishment of common knowledge may make coordinated, risky action impossible.²⁵ In other words, secret communication may further reduce efficiency compared to private communication, since with secret communication proto-coalition members

²⁴ Participants were not allowed to use blackberries or cell phones (for text messaging).

can never be sure that they are not (secretly) being double-crossed. This is likely to further undermine trust in the proto-coalition coalition partner and make the two parties in a proto-coalition even more reluctant to continue to negotiate with the third party once they have achieved an acceptable agreement between themselves. Thus, we would expect multiparty CMC negotiations with secret communication available (such as instant messaging) to result in less efficient outcomes than multiparty CMC negotiations with only private communication available (private chat rooms). In reverse, we predict that the efficiency will be highest when only public communication was allowed (public chat rooms).

Note, however, that according to the channel richness hypothesis (T1), even when controlling for private communication, multiparty face-to-face negotiations would still result in lower rates of outcome efficiency than any multiparty CMC negotiations. To analyze these various hypothesis in detail we conducted two studies. Study 2 will allow us to directly test the channel richness and the communication context theories in separately and also to assess their possible interaction. Study 2 will also allow us to operationalize the concept of proto-coalitions more directly. Study 3 will then compare private chat rooms with instant messaging to study the effects of lack of common knowledge (i.e. private versus secret communication) in more detail.

Study 2

Study 2 is designed to separately test (a) the effects of the channel richness and communication context hypothesis, (b) investigate the proto-coalition bargaining structure in more detail. Both goals are accomplished by restricting communication to either a public room (a chat room in the CMC case, a meeting room in the face-to-face condition) or allowing for private rooms (a private chat room or, in the face-to-face condition, the ability to ask the third party to leave the meeting room and wait outside). The 2 x 2 design will also allow us to study potential interaction between the two hypotheses.

²⁵ Rubinstein's telling example is the "email game" where there is some (small) probability that a message will be lost. The classic example is two generals that need to coordinate on an attack and send messages back and forth. The key is that the generals will only attack if their strategic assessment of the situation is common knowledge.

So, we expect that the availability of private chat rooms will decrease efficiency. The intuition is that proto-coalitions that lack sufficient trust in each other can now essentially shut out the third party by staying in the private chat room. Although this is true in both face-to-face and computer-mediated communication, we expect this effect to be weaker in face-to-face settings because it may be harder to exclude someone from a face-to-face meeting than from a discussion cloaked by the screen of the internet. This leads to the following hypotheses. Note that hypothesis 2 is identical to hypothesis 1. However, in study 2 instant messaging was not permitted.

Hypothesis 2: Computer-mediated communication will lead to less efficient outcomes compared to face-to-face communication

- *Hypothesis 2a:* Computer-mediated communication will lead to less efficient outcomes compared to face-to-face communication if only public communication is permitted.
- *Hypothesis 2b:* Computer-mediated communication will lead to less efficient outcomes compared to face-to-face communication if private communication is permitted.

Hypothesis 3: Private communication will lead to less efficient outcomes compared to public communication

- *Hypothesis 3a:* Private communication will lead to less efficient outcomes compared to public communication in computer-mediated negotiations.
- *Hypothesis 3b:* Private communication will lead to less efficient outcomes compared to public communication in face-to-face negotiations.

The availability of private (chat) rooms also allows us to more directly assess the proto-coalition bargaining hypothesis. In study 1, it was difficult to assess whether negotiators did indeed follow the pattern summarized in figure 1, i.e. move from a grand coalition setting to a proto-coalition setting and then possible expanding the coalition again. In study 2 we can think of private chat rooms as a proxy for proto-coalition. That is, since proto-coalitions are nothing else but

agreements to talk to each other (but not to parties not in the proto-coalition!) it is natural to assume that newly formed proto-coalitions would take advantage of a private chat room if such a room was indeed available. While it is certainly possible to form proto-coalitions in a purely public setting, most drastically by ignoring the third party, there is little to be gained from staying in a public setting if a private setting is available.

Hypothesis 4: Two-person proto-coalitions are more likely to occur when the communication setting allows for private communication.

- *Hypothesis 4a:* In computer-mediated communication two-person proto-coalitions are more likely to occur when the communication setting allows for private communication.
- *Hypothesis 4b:* In face-to-face communication two-person proto-coalitions are more likely to occur when the communication setting allows for private communication

Method

Participants and design. One hundred fifty-six students comprising 52 groups participated in this study as part of a negotiations course exercise in a Masters of Business Administration program. The experiment was a 2 x 2 between-subjects design crossing communication medium (face-to-face vs. CMC) with communication setting (private communication vs. public communication).

Procedure. The task was identical to that used in Study 1. Individuals were informed they would be participating in a negotiation in which each of them represented a social services agency. Seventeen of the groups were told they would complete this exercise face-to-face, and the remaining thirty-five groups were told they would complete the exercise in an online chat room. To control for whether the opportunity for secret communication played a role in the results of Study 1 we used a feature of the Ayeware technology that allows the experimenter to set up various “private chat rooms,” i.e. chat rooms which only a subset of the negotiators can access. Intuitively, any two parties could leave the “public chat room” and continue their negotiation in a “private chat room.” However, if any party leaves a chat room, the message “[Screen Name] has left the chat” appears on each party’s computer screen. Ayeware also permits us to disable

instant messaging. These features allowed us to replicate a key feature of face-to-face negotiations in the online environment: if any two parties leave the public chat room, the content of their communication may be private, but the fact that they have left is common knowledge (exactly as in the face-to-face condition).

Private communication was enabled for half of the participants in the face-to-face and CMC conditions. In the face-to-face condition, participants with the ability to communicate privately were allowed to ask the third party to leave the room, while in the CMC condition participants with the ability to communicate privately could go to a private chat room (i.e. a chat room for A and B only, a chat room for B and C only, or a chat room for A and C only). However, parties were not able to send instant messages. The other half of the participants in each condition were only able to communicate publicly.

The negotiation task was presented to the participants and included background information and the payoff matrix. Participants were advised that all information was commonly-shared. The participants were told that they would receive no funding if they did not form a consortium with at least one other agency.

The participants were allowed 10 minutes to read the exercise and 45 minutes to negotiate. The face-to-face negotiations were videotaped, and we obtained the transcripts from the CMC negotiations. After completing the negotiation, participants returned to the classroom to be debriefed.

Communication channel manipulation. As in Study 1, two forms of communication medium were used: face-to-face communication and computer-mediated communication.

Communication setting manipulation. Half of the groups in the face-to-face and CMC conditions were allowed to communicate privately.

In the face-to-face communication context, they were told:

“If two of the three organizations wish to speak privately, the third organization may be asked to leave the room.”

In the CMC conditions, the groups were told:

“You have two opportunities to communicate with the other representatives – you can chat in the common public chat room, or you can chat in a private chat room with either one of the two other agencies. To access the private chat room (if two of the three representatives wish to speak privately), go back to your “My Ayeware” page by hitting either the “Back” button or the “My Ayeware” button. Click on the specific subgroup to talk to either of the other two representatives. (For example, if you are Allied and would like to talk to Benevolent, go to the subgroup labeled “AB”. If you are Caring and would like to talk to Benevolent, go the subgroup labeled “BC”.) The third party will not have access to the information exchanged in this private chat room.”

Those groups in the face-to-face condition who were not allowed private communication were told that all three parties must remain in the room at all times. In the CMC condition, those parties who were not allowed private communication were not given access to any private chat rooms, so all of their communication took place in the public chat room.

Efficiency. Efficiency was measured exactly in the same way as in Study 1.

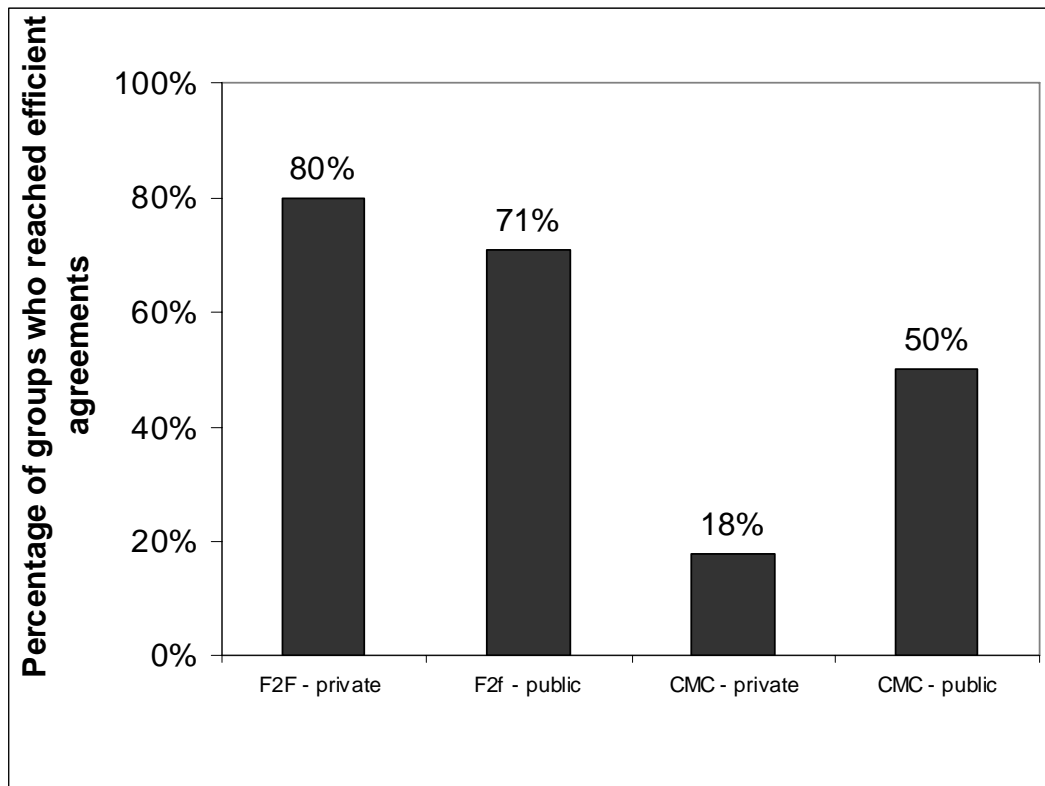
Proto-coalition activity. In order to assess proto-coalition activity, we coded video tapes and transcripts for whether or not parties engaged in private conversations (1) or not (0).

Results

As in Study 1, we found a very large difference in outcome efficiency between face-to-face and CMC conditions, supporting Hypothesis 3 (Mann-Whitney $U = 172.00$, $Z = -2.83$, $p = .005$). That is, across the two face-to-face conditions, 76 percent of the outcomes were efficient as compared to 34 percent across the CMC conditions. Since instant messaging was not available in the Study 2 we can conclude that efficiency will decrease if private communication is possible, even if the fact that such communication took place is common knowledge. No support was found for Hypothesis 2a. That is, the difference in efficiency between the public face-to-face condition (71 percent) and the public CMC condition (50 percent) was not significant (Mann-Whitney $U = 49.50$, $Z = -.95$, *ns*). Hypothesis 2b, however, was supported. Efficiency was higher in the private face-to-face condition (80 percent) than in the private CMC condition (18 percent), (Mann-Whitney $U = 32.00$, $Z = -3.13$, $p = .002$).

Although there was a trend that private communication (49 percent) led to lower outcome efficiency than public communication (61 percent), this difference was not significant ($p=.14$), leading us to reject Hypothesis 3. On closer inspection, however, in the case of computer-mediated communication, and consistent with Hypothesis 3a, the availability of private chat rooms *did decrease* efficiency in the CMC condition. That is, CMC groups with private communication allowed reached efficient outcomes only 18 percent of the time whereas groups with only public communication reached efficient outcomes in 50 percent of the cases (Mann-Whitney $U = 103.50$, $Z = -1.99$, $p = .047$). This finding is in contrast with the face-to-face condition where allowing for private communication did not have a significant effect ($p = .69$), which led us to reject Hypothesis 3b.²⁶ Figure 4 illustrates our findings.

Figure 4. Efficiency of Multiparty Negotiation Outcome



²⁶ There were two impasses in the CMC-public communication condition and three impasses in the CMC-private communication condition. There were no impasses in the face-to-face conditions. Excluding all impasses from the analysis had no statistically significant effects.

Hypothesis 4 was also supported. Whereas proto-coalitions did not occur (0 percent) in the public communication conditions, they occurred in 74 percent of the groups in the private communication conditions (Mann-Whitney $U = 87.50$, $Z = -5.43$, $p < .001$). We also found support for Hypothesis 4a. That is, two-person proto-coalitions were significantly more likely in the CMC private condition (100 percent) than in the CMC public condition (0 percent) (Mann-Whitney $U = .00$, $Z = -5.83$, $p < .001$). Hypothesis 4b was not supported. Although two-person proto-coalitions were descriptively more likely in the face-to-face private condition (30 percent) than in the face-to-face public condition (0 percent), this effect was not statistically significant, (Mann-Whitney $U = 24.50$, $Z = -1.55$, $p = .12$).

Discussion

As in Study 1, we found that face-to-face negotiations resulted in more efficient outcomes than computer-mediated negotiations. This provides additional evidence to the channel richness hypothesis in a more controlled setting. Study 2 also revealed that private communication further decreased in CMC negotiations, but not in face-to-face interactions. Importantly, Study 2 established that this difference not only occurs due to the suspicion of ongoing secret negotiations in CMC induced by instant messaging, but even when the fact that private communication is taking place becomes common knowledge.

In the face-to-face setting, however, we could not identify a significant decrease in efficiency due to the availability of private communication. We also found less willingness to exclude the third party from the negotiations. There are various possible explanations for why such an effect could not be observed. One possible explanation is that when communication is face-to-face, participants may become more reluctant to exclude others from the communication process. In face-to-face setting the physical presence of the left-out party may put pressure on the members of the proto-coalition to continue negotiating with him or her. In this setting, the left-out party is either sitting across the table or waiting outside the room, and the party's presence is salient and creates social pressure. However, in the online setting, the left-out party does not have the ability to "remind" the proto-coalition that they are present. Thus, the effect of physical presence suggests that in face-to face interactions, the proto-coalition members will be embarrassed to

“shut the door” on the third party permanently, as this may be considered socially unacceptable behavior. This sense of reluctance or restraint, however, may be much less constraining in online settings. While the explanation certainly sounds plausible, previous research also suggests that computer-mediated interactions can be highly social and subject to pressures similar to those we experience in face-to-face communication (e.g. Swaab, Medvec, & Diermeier, 2007).

We can test this explanation in the following hypothesis using the data from study 2.

Hypothesis 5: Two-person proto-coalitions are more likely when communication is computer-mediated communication compared to face-to-face communication

- *Hypothesis 5a:* Computer-mediated communication will lead to more two-person proto-coalitions compared to face-to-face communication if only public communication is permitted.
- *Hypothesis 5b:* Computer-mediated communication will lead to more two-person proto-coalitions compared to face-to-face communication if only public communication is permitted.

Hypothesis 5 was indeed supported. Two-person proto-coalitions were more likely in computer mediated communication (49 percent) than in face-to-face communication (19 percent), Mann-Whitney $U = 205.50$, $Z = -2.13$, $p = .03$. Hypothesis 5a was not supported. That is, two-person proto-coalitions did neither occur in the CMC public condition (0 percent) nor in the face-to-face public condition (0 percent), $p = 1$. However, we did find support for Hypothesis 5b such that two-person proto-coalitions were more likely in the CMC private condition (100 percent) than in the face-to-face private condition (33 percent), Mann-Whitney $U = 25.50$, $Z = -3.93$, $p < .001$.

To further assess the validity of this approach we returned to study 1 to test the analogous hypothesis in that setting. Recall that in study 1 both private and secret communication was permitted. We then have the following hypothesis

Hypothesis 6: Two-person proto-coalitions are more likely to occur when communication is computer mediated than when it is face-to-face.

Hypothesis 6 was also supported. Proto-coalitions occurred more often when communication was computer mediated (100 percent) than when communication was face-to-face (30 percent), Mann-Whitney $U = 28.50$, $Z = -4.11$, $p < .001$

Overall, this suggests that public communication conditions (whether in the CMC or the face-to-face setting) strongly discourage the development of two-person coalitions. However, if private communication is possible (e.g. by the availability of a private room), negotiators will take advantage of it. However, this tendency will be mitigated by the social pressure not to exclude a person in a face-to-face setting. This implies that psychological mechanism (here the aversion of social exclusion in the physical presence of a negotiator) mitigate the strategic incentives.

Study 3

In order to understand the role that the communication setting plays in online interactions, Study 3 attempts to isolate the effects of private and secret communication. Study 1 showed the independent effects of secret communication in the online setting, while Study 2 showed the effects of private communication; in Study 3 we will compare these effects.

Recall that in order to move toward a three-party agreement, members of existing proto-coalitions need to be willing to interact with the third party. But that willingness will be undermined by a concern that the third party may want to sabotage the existing agreement. We hypothesize that the extent of this concern depends on the ability of proto-coalition members to monitor ongoing communication. When secret communication is possible, parties are completely unaware of interaction, and therefore unable to monitor communication that is taking place between other parties. Importantly, the mere suspicion that secret communication is taking place may completely undermine the willingness to continue negotiating with a third party once an initial proto-coalition agreement has been formed. In private communication, on the other hand, while the content of the communication remains unknown, the fact that parties are communicating is common knowledge and therefore easier to monitor and potentially counteract.

Hypothesis 7: Outcome efficiency will be lower in groups negotiating via CMC with the ability to communicate secretly than in CMC groups with the ability to communicate privately.

Method

Participants and design. Seventy-five students comprising 25 groups participated in this study as part of a negotiations course exercise in a Masters of Business Administration program. The experiment was conducted entirely online and manipulated the type of private communication allowed (secret versus private).

Procedure. The task was identical to that used in Studies 1 and 2. Participants were informed they would be involved in a negotiation in which each of them represented a social services agency. All 25 groups completed the negotiation online using Ayeware. Communication was enabled in one of two methods. Some of the groups were offered the opportunity to use secret communication (via instant messaging), where they could send inconspicuous messages to the other parties while also negotiating in the public chat room. Other groups were provided with private chat rooms, where they could meet with one other party. However, to access a private chat room, the individual had to leave the public chat room, and this departure would be commonly known by all parties.

Communication setting manipulation. Eleven groups had access to instant messaging and 14 groups had access to private chat rooms.

The eleven groups with access to instant messaging were told:

“You have two opportunities to communicate with the other representatives – you can chat in the common public chat room, or you can send an inconspicuous message to another party while remaining in the common chat room using Instant Messages. To access the instant messaging feature (to send an inconspicuous private message to another party), click on the “Instant Message” button on the lower left-hand corner of the screen and select the party you wish to send a message to – the third party will not have access to the information exchanged, nor will they know that an instant message was sent or that an instant message was received by any other party.”

The fourteen groups with access to private chat rooms were given the exact same manipulation as in Study 2. Outcome efficiency was measured the same as in Study 1 and 2.

Results

Hypothesis 7 predicted that groups with access to secret communication (i.e. instant messaging) would be less likely to reach efficient outcomes compared to groups who only had the ability to communicate privately, and this prediction was supported, Mann-Whitney $U = 49.50$, $Z = -2.17$, $p = .03$. In the experiment not a single group was able to reach an efficient outcome compared to 36 percent of the groups allowed private communication.

Discussion

The ability to communicate secretly had by far the largest negative effect on outcome efficiency in multiparty negotiation. Secret communication led to significantly fewer efficient outcomes compared to private communication. The results from the first study are consistent with this finding: only two groups in the CMC condition in Study 1 (which used instant messaging), and none in Study 3, reached an efficient outcome. So, whereas Study 2 revealed that public communication settings resulted in less outcome efficiency compared to private communication, Studies 1 and 3 showed that inefficient outcomes are highly likely when secret communication is allowed. This suggests that outcome efficiency is not only influenced by the communication channels (face-to-face vs. computer mediated) being used (as shown in Studies 1 and 2), but also by contextual factors such as whether public, private, or secret communication is possible.

Implications

In this paper, we examined potential influencers on outcome efficiency in multi-party negotiations. Multiparty negotiations are frequently viewed as straightforward generalizations from bilateral negotiations. However, if subsets of the negotiation parties can agree on partial agreements, even three-party agreements become far more complex. One of the key insights from the theoretical analysis of multiparty decision-making is the importance of proto-coalitions. Negotiators frequently first agree on bilateral deals (perhaps to reduce the apparent complexity of the multiparty setting) and then attempt to negotiate as a unit with the remaining party. For this strategy to work, however, proto-coalitions need to be stable.

In our analysis we have separated various factors that influence proto-coalition formation by systematically varying the communication channels the parties may use. We investigated the influence of the ability to communicate publicly, privately, and secretly on the efficiency of negotiated outcomes and proto-coalition activity. Across three studies we find that outcome efficiency in multiparty negotiation is a function of the available communication channels and the setting of the communication process itself. More specifically, we found that face-to-face negotiations led consistently to more efficient outcomes than CMC negotiations. Similarly, groups who were forced to communicate publicly were able to reach more efficient outcomes than groups with opportunities to communicate privately. Allowing participants to communicate secretly further increased outcome efficiency until almost all negotiations involved two-way deals. Moreover, we found a very similar pattern for proto-coalition activity in Study 1 and 2, which was lower when groups negotiated face-to-face or in public.

Other Domains

Our original intent in the study was to assess the ability of the proto-coalition bargaining model to account for the micro-dynamics of coalition negotiations. We reasoned that the ability to maintain mutual trust in the preliminary agreement would be a critical variable in explaining the ability to expand to three player coalitions. Then we conjectured that the ability to maintain trust would be influenced by the communication channels available to the negotiators. In other words, rather than *asking* people whether they trusted the other party, a very difficult design and measurement challenge, we *experimentally manipulated* the decision context that is expected to enhance or undermine trust. To be sure, our approach depends on these two steps to hold, and it is possible to consider other possible explanations for the varying coalition behavior that do not involve trust. Nevertheless, the presented evidence provides surprisingly strong evidence for the logic of proto-coalitions.

While our focus in this study was on coalition micro-dynamics, our experimental strategy to experimentally manipulate the communication context has provided insights that should be of interest beyond the coalition formation context. Specifically, our results point to the importance of two independent communication effects on group decision-making in general. International negotiations in international over peace treaties or the Doha Round of the World Trade

Organization (WTO) are well-known examples. In the case of the WTO negotiations, for instance, all members of the WTO needed to agree on changes to the mutually binding existing trading regime; yet if no global agreement is possible, subsets of the countries involved can choose to adopt regional or limited multilateral agreements instead. In the domestic regulatory context, a case that demonstrates the complexity of multiparty negotiations is the 1997 national tobacco settlement negotiations between the six largest U.S. tobacco companies, negotiations included attorney generals from more than twenty states, a group of trial lawyers including the so-called “Castano Group,” who were representing smokers in the class action lawsuit *Castano v. American Tobacco Company*, and the anti-smoking advocacy group National Center for Tobacco-Free Kids (e.g. Derthick, 2002; Pertschuk, 2001). Other key players (though not formally part of the negotiations) included the FDA (under David Kessler), and anti-smoking advocates such as C. Everett Koop, the former U.S. Surgeon General, and Stanton Glantz, a university professor and key figure in California’s Non-Smoker Rights movement. The eventual agreement included all six tobacco manufacturers and most of the other parties. Minnesota’s attorney general, Hubert H. Humphrey III, however, refused to join the agreement and eventually went to court. This lowered the value of the agreement to the tobacco companies because it only partially shielded them from legal liability. Moreover, since the settlement needed an act of Congress, the larger the number of parties who formally endorsed the agreement, the more likely it would be enacted into law. Eventually, the settlement died in Congress, in large part because of vocal opposition to the agreement by Kessler, Koop, and Glantz.²⁷ In 1998, the attorney general and the tobacco companies agreed to a scaled-down agreement, the Master Settlement Agreement (Derthick, 2002). Though the agreement was less comprehensive,²⁸ it also required a far smaller coalition to be enacted.

Our findings on the importance of communication channels therefore also would apply to decision-making situations to those or related examples. First, we found the type of channel to have a significant impact on efficiency. Second, our data revealed a strong and significant effect of the private versus public setting on how people communicated and whether or not they were able to reach efficient outcomes. These also constitute interesting findings and important

²⁷ For detailed accounts of the tortuous defeat of the settlement see e.g. Derthick (2002) and Pertschuk (2001).

additions to the literature on negotiation, group decision-making, and CMC more generally since they add to our understanding that online social interaction is not merely a function of the type of channel being used and a so-called “fit” between those channels and a group’s task (see for example Daft & Lengel, 1986; McGrath & Hollingshead, 1993). Rather, online behavior and corresponding outcomes are a result of an interaction between people using technology and the contextual forces they are subject to (see also Carlson & Zmud, 1999; Swaab, Medvec, & Diermeier, 2007 for similar arguments). Future research should focus more precisely on the interplay between technological (e.g. communication channels) and contextual (e.g. communication settings) forces in determining media effects on group decision-making and negotiation outcomes.

Examining the impact of computer-mediated communication is also important for practical reasons (e.g. many organizations rely on computer-mediated technologies in decision-making, though their serious use in political decision-making is still limited.²⁹) because it provides a mechanism for disentangling different dimensions of the communication context. In CMC we can more precisely determine the communication options parties have available; for example, whether they are able to send each other private messages during the negotiation and whether the fact that these messages are sent or their content are common knowledge. That is, rather than asking individuals what aspects of the situation mattered (e.g. certain visual cues or the extent to which they believe they could monitor the situation), we were able to manipulate their decision environment to assess the importance of external factors on negotiation outcomes.

Also, our findings argue that in isolating processes underlying outcome efficiency, examining *within* media differences may be more adequate and precise than examining *between* media differences. In other words, rather than making comparisons between the impact of a variety of channels such as telephone and email on decision making outcomes, we chose to focus on one specific aspect underlying human communication behavior (i.e. the publicness of communication). Although this restricts our ability to generalize our findings to the use of other

²⁸ The agreement, for example, did not touch upon the role of the FDA or protection from future liability.

²⁹ See for example: Carnevale, Pruitt, & Seilheimer, 1981; Kahai & Cooper, 1999; Lewis & Fry, 1977; Lim & Benbasat, 1993; Overly, 1999; Poole, Shannon, & DeSanctis, 1992; Swaab, Postmes, Neijens, Kiers & Dumay, 2002; Nadler, Kurtzberg & Thompson, 2001; Valley, Moag, & Bazerman, 1998; Wichman, 1970.

media, this approach does control for a range of other factors that typically disturb findings in comparative research (e.g. the influence of synchronicity, textual communication, visual and audio cues). Furthermore, it can be argued that our studies were constrained by a one-time interaction with a set number of negotiating parties, potentially threatening our external validity. Indeed, work by Mannix (1994) suggests that anticipating future interaction has an important effect on the current negotiation, and future research may thus take such factors into closer consideration.

Taken together, the results of three studies provide evidence for the idea that coalition bargaining under majority rule can lead to inefficiencies as negotiators become unable to commit to preliminary agreements. Moreover, the research shows that the mutual trust needed to establish stable agreements is strongly influenced by the communication channel that is used as well as the opportunity to communicate in public or not.

References

- Arkes, H.R., Herren, L.T. and Isen, A.M. (2000). The role of potential loss in the influence of affect on risk-taking behavior. *Organizational Behavior and Human Decision Processes*, 42, 191-193.
- Arunachalam, V., & Dilla, W. N. (1992). Computer-mediated communication and structured interaction in transfer pricing negotiation. *Journal of Information Systems*, 6, 149-170.
- Aumann, R. 1995. "Backward Induction and Common Knowledge of Rationality", *Games and Economic Behavior* 8: 6-19
- Aumann, Robert. 1976, "Agreeing to Disagree", *Annals of Statistics* 4, 1236-9.
- Axelrod, R. (1970). *Conflict of interest*. Chicago: Markham.
- Bacharach, S., & Lawler, E. (1981). *Bargaining: Power, tactics, and outcomes*. San Francisco: Jossey-Bass.
- Baltes, B. B., Dickson, M., Sherman, M. P., Bauer, C. C., & LaGanke, J. S. (2002). Computer-mediated communication and group decision making: A meta-analysis. *Organizational Behavior and Human Decision Processes*, 87(1), 156-179.
- Baron, D. P. and Diermeier, D. (2001) Elections, governments, and parliaments in proportional representation systems. *Quarterly Journal of Economics*. 2001. (August): 933-967.
- Baron, David P., Diermeier, Daniel and Fong, Pohan, "Policy Dynamics and Inefficiency in a Parliamentary Democracy with Proportional Representation" (February 2007). Stanford University Graduate School of Business Research Paper No. 1960
- Baron, D. P., & Ferejohn, J. A. (1989). Bargaining in legislatures. *The American Political Science Review*, 83(4), 1181-1206.
- Baron, J. (1995). Blind justice: Fairness to groups and the do-no-harm principle. *Journal of Behavioral Decision Making*, 8, 71-83.
- Bazerman, M. H., Mannix, E., & Thompson, L. (1988). Groups as mixed-motive negotiations. In E. Lawler & B. Markovsky (Eds.), *Advances in group processes: Theory and research* (pp. 195-216). Greenwich, CT: JAI Press.
- Carlson, J. R. & Zmud, R. W. (1999). Channel expansion theory and the experiential nature of media richness perceptions. *Academy of Management Journal*, 42(2), 153-170.
- Carnevale, P. J., Pruitt, D. J., & Seilheimer, S. (1981). Looking and competing: Accountability and visual access in integrative bargaining. *Journal of Personality and Social Psychology*, 40, 111-120.
- Croson, R. T. (1999). Look at me when you say that: An electronic negotiation simulation. *Simulation and Gaming*, 30, 23-37.
- Daft, R. L., & Lengel, R. (1986). Organizational information requirements, media richness and structural design. *Management Science*, 32, 554-571.
- Derthick, M. A. (2002). *Up in smoke: From legislation to litigation in tobacco politics*. Washington, DC: CQ Press.
- DeSanctis, G., & Poole, M. S. (1994). Capturing the complexity in advanced technology use: Adaptive structuration theory. *Organization Science*, 5, 121-147.
- Diermeier, D. (2006). Coalition government. In Barry Weingast and Donald Wittman, eds. *Oxford Handbook of Political Economy*. 162-179. Oxford University Press.
- Diermeier, D., & Morton, R. (2004). Proportionality versus perfectness: Experiments in majoritarian bargaining. In D. A. Smith & J. Duggan (Eds.), *Social choice and strategic behavior: Essays in the honor of Jeffrey S. Banks*. Berlin: Springer.

- Diermeier, D., Merlo, A. and Eraslan, H. (2003). A structural model of government formation. *Econometrica*, 71(1):27-70.
- Diermeier, D. and Merlo, A. (2000). Government turnover in parliamentary democracies. *Journal of Economic Theory*, 2000, 94: 46-79.
- Diermeier, D. and Myerson, R.B. (1999). Bicameralism and its consequences for the internal organization of legislatures. *American Economic Review*, 89, 5, 1182-1196.
- Eraslan, H., & Merlo, A. (2001). Majority rule in a stochastic model of bargaining, *Journal of Economic Theory*, 103, 31-48
- Frechette, G., Kagel, J.H. and Morelli, M. (2005). Behavioral identification in coalition bargaining: An experimental analysis of demand bargaining and alternating offers. *Econometrica* 73, 6, 1893-1937.
- Fulk, J. (1993). Social construction of communication technology. *Academy of Management Journal*, 36(5), 921-950.
- Kahai, S. S. & Cooper, R. B. (1999). The effect of computer-mediated communication on agreement and acceptance. *Journal of Management Information Systems*, 16(1), 165-188.
- Kahan, J. P. & Rapoport, A. (1984). *Theories of coalition formation*. New York: Erlbaum.
- Kahneman, D. and Tversky, A. (1979). Prospect theory: An analysis of choice under risk. *Econometrica*, 47, 2, 263-291.
- Kiesler, S., Siegel, J., & McGuire, T. W. (1984). Social psychological aspects of computer-mediated communication. *American Psychologist*, 39, 1123-1134.
- Kim, P. H. (1997). Strategic timing in group negotiations: The implications of forced entry and forced exit for negotiators with unequal power. *Organizational Behavior and Human Decision Processes*, 71(3), 263-286.
- King, D. C., & Glidewell, J. C. (1980). Dyadic bargaining outcomes under individualistic and competitive orientations. *Human Relations*, 33(11), 781-803.
- Komorita, S. S., & Kravitz, D. A. (1983). Coalition formation: A social psychological approach. In P. B. Paulus (Ed.), *Basic group processes* (pp. 179-203). New York: Springer-Verlag.
- Laver, M. & Schofield, N. (1990). *Multiparty government: The politics of coalition in Europe*. Oxford: Oxford University Press.
- Lewis, S., & Fry, W. (1977). Effects of visual access and orientation on discovery of integrative bargaining. *Organizational Behavior and Human Performance*, 20(1), 75-92.
- Lim, L. H., & Benbasat, I. (1993). A theoretical perspective of negotiation support systems. *Journal of management information systems*, 9(3), 27-44.
- Loyd, D. L., Kern, M. C., & Thompson, L. (2005). Classroom research: Bridging the ivory divide. *Academy of Management Learning & Education*, 4(1), 8-21.
- Mannix, E. A. (1994). Will we meet again? The effects of power, distribution norms, and the scope of future interaction in small group negotiation. *International Journal of Conflict Management*, 5, 343-368.
- Mannix, E. A., & Loewenstein, G. F. (1993). Managerial time horizons and interfirm mobility: An experimental investigation. *Organizational Behavior and Human Decision Processes*, 56, 266-284.
- McGrath, J. E., & Hollingshead, A. B. (1993). Putting the "group" back into group support systems: Some theoretical issues about dynamic processes in groups with technological enhancements. In L. M. Jessup & J. S. Valacich (Eds.), *Group support systems: New perspectives* (pp. 78- 79). New York: Macmillan.

- Mennecke, B. E., Valacich, J. S., & Wheeler, B. C. (2000). The effects of media and task on user performance: A test of the task-media fit hypothesis. *Group Decision & Negotiation*, 9(6), 507-529.
- Morley, I. E., & Stephenson, G. M. (1969). Interpersonal and interparty exchange, a laboratory simulation of a negotiation at the plant level. *British Journal of Psychology*, 60, 543-545.
- Morley, I. E., & Stephenson, G. M. (1970). Formality in experimental negotiations: A validation study. *British Journal of Psychology* 61(3), 383-384.
- Morris, M., Nadler, J., Kurtzberg, T. & Thompson, L. (2002). Schmooze or lose: Social friction and lubrication in e-mail negotiations. *Group Dynamics*, 6(1), 89-100.
- Murnighan, J. K. (1986). Organizational coalitions: Structural contingencies and the formation process. In Lewicki, R., Sheppard, B., and Bazerman, M. (Eds.), *Research on Negotiations in Organizations* (pp. 155-173). Greenwich, CT: JAI Press.
- Myerson, R. B. (1991). *Game theory: Analysis of conflict*. Cambridge: Harvard University Press.
- Naquin, C. E. & Paulson, G. D. (2003). Online bargaining and interpersonal trust. *Journal of Applied Psychology*, 88(1), 113-120.
- Overly, M. R. (1999). *E-policy*. New York: Amacom.
- Pertschuk, M. (2001). *Smoke in their eyes: Lessons in movement leadership from the tobacco wars*. Nashville: Vanderbilt University Press.
- Poole, M. S., Shannon, D. L., & DeSantis, G. (1992). Communication media and negotiation processes. In L. L. Putnam & M. E. Roloff (Eds.), *Communication and negotiation* (pp. 46-66). Newbury Park, CA: Sage.
- Purdy, J. M., & Nye, P. (2000). The impact of communication media on negotiation outcomes. *International Journal of Conflict Management*, 11(2), 162-187.
- Rangaswamy, A., & Shell, G. (1997). Using computers to realize joint gains in negotiations: Toward an "electronic bargaining table". *Management Science*, 43(8), 1147-1163.
- Rubinstein, A. (1989). The electronic mail game: Strategic behavior under almost common knowledge. *American Economic Review*, 79, 385-391.
- Rutter, D. (1987). *Communication by telephone*. Oxford: Pergamon.
- Short, J. A. (1974). The effect of medium communication on experimental negotiation. *Human Relations*, 27, 225-234.
- Short, J. A., Williams, E., & Christie, B. (1976). *The social psychology of telecommunications*. New York: John Wiley & Sons.
- Suh, K. S. (1999). Impact of communication medium on task performance and satisfaction: An examination of media-richness theory. *Information & Management*, 35, 295-312.
- Swaab, R.I. Medvec, V., & Diermeier, D. (under review). *Communication media and negotiations: Meta-analyses on processes and outcomes*.
- Swaab, R. I., Postmes, T., Neijens, P., Kiers, M. H., & Dumay, A. C. M. (2002). Multiparty negotiation support: The role of visualization's influence on the development of shared mental models. *Journal of Management Information Systems*, 19(1), 129-150.
- Swaab, R. I., Postmes, T., & Spears, R. (2004). *Attraction, identification and motivation in small group negotiations*. Manuscript presented at the International Association for Conflict Management, Pittsburg, USA.
- Thompson, L. (2001). *The mind and heart of the negotiator*. Upper Saddle River, NJ: Prentice-Hall, Inc.

- Valley, K. L., Moag, J., & Bazerman, M. (1998). "A matter of trust": Effects of communication on the efficiency and distribution of outcomes. *Journal of Economic Behavior and Organization*, 34, 211-238.
- Van Beest, I., Van Dijk, E., & Wilke, H. (2003). The excluded player in coalition formation. *Personality and Social Psychology Bulletin*, 29, 237-247.
- Walther, J. (1996). Computer-mediated communication: Impersonal, interpersonal, and hyperpersonal interaction. *Communication Research*, 23, 3-43.
- Wichman, H. (1970). Effects of isolation and communication on cooperation in a 2-person game. *Journal of Personality and Social Psychology*, 16(1), 114.
- Wong, W. & Wolverson, T. (2000). *Instant messaging latest trend in e-commerce software*. <http://news.com.com/2100-1017-238944.html?legacy=cnet>.

