Influence strategies in collective decision making

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Chapter 7
Summary and Conclusions

7.1 Influence Strategies and Models of Collective Decision Making

This research studied two influence strategies used in collective decision making: the *exchange strategy* and the *challenge strategy*. According to the exchange strategy, an actor (ego) can choose to behave according to another actor's (alter's) wishes in one instance, in exchange for alter acting according ego's wishes in another instance. According to the challenge strategy, actors try to force other actors into certain behavior by making use of their power, and the distribution of support for the various possible outcomes of the decision. Both influence strategies are directed towards the actions (i.e., voting behavior) of the other actor, and not at the other actor's preferences. Following Parsons' classification (Parsons 1963; see chapter 1), the challenge strategy is a typical coercion strategy, whereas the exchange strategy is an inducement strategy. In terms of the classifications proposed in social psychology, both the challenge strategy and the exchange strategy can be considered open and strong strategies. The challenge strategy is a unilateral strategy and the exchange strategy is a bilateral strategy. An exchange requires the support of both actors (this assumes a cooperative setting in which the actors can communicate and negotiate), whereas challenges assume that an actor can force another actor to behave against his preferences. The exchange strategy stems from the social exchange theory, the challenge strategy from the theory of conflict resolution.

In the existing literature, these strategies are analyzed and compared using simulation models based on one of the strategies. These simulation models provide simplified descriptions of complex collective decision making situations. The models identify the important factors in collective decision making situations (the actors' preferred positions, saliences, and capabilities), and contain assumptions on the behavior of the actors. Simulation models facilitate the study of the implications of assumptions on actor behavior and the effects of these assumptions on the collective outcome.

Simulation models can be used to test the theory they are based on. A test of simulation models on empirical data provides information on the validity of the model, and so on the validity of the theoretical assumptions the model is based on. Of course, relating these empirical results to the theory is not without problems. For example, the empirical tests of models of collective decision making in the existing literature (e.g. Bueno de Mesquita and Stokman 1994) are based on data at the collective level (the collective outcome). But even if the model predicts the same outcome as the actual outcome, this does not necessarily mean that underlying process that is modeled (based on the actor level assumptions) is the same as the actual underlying process.

Another benefit of analyzing simulation models is that this develops insight into the theory underlying the model. A prediction of a simulation model can be seen as a consequence of the modeled assumptions, and therefore of the theory used. If the results of the model are not consistent with theoretical expectations or empirical findings, this should lead to a reappraisement both of the theory and the model based on it. This means that simulation models can be a useful tool for theory building.

To study the effect of influence strategies in collective decision making, models are required in which actor behavior regarding influence attempts is modeled explicitly. For both influence strategies the existing literature provided a simulation model that meets this requirement: Stokman and Van Oosten's exchange model (1994a, 1994b) and Bueno de Mesquita's expected utility model (Bueno de Mesquita et al. 1985; Bueno de Mesquita 1994). Since the expected utility model and the exchange model are based on the same input variables and lead to the same output variables, comparing the empirical results of these models is straightforward. Both models, although based on different influence strategies, predict quite well (Bueno de Mesquita and Stokman 1994; Rojer 1996, 1999). However, the models do not always predict the same outcome. Furthermore, the prediction errors are not correlated (Bueno de Mesquita and Stokman 1994). This could indicate that there are certain conditions in collective decision making that determine the best influence strategy.

7.2 Research Questions

If two simulation models are to be used to compare two theories, the competing assumptions contained in these theories must be captured in the models. However, if the comparison is to be legitimate, this is not sufficient. It is also required that differences in the results of these models can only stem from differences in these competing assumptions, and not from differences in auxiliary assumptions.

In order to compare two theories using simulation models, a framework of fixed auxiliary assumptions is required in which the competing assumptions stemming from the two theories can be varied. Furthermore, input and output variables are needed that can serve as points of comparison. In the output variable we need a measure by which we can decide whether or not the models lead to different results (Achterkamp and Imhof 1999).

The first requirement can be compared to the requirement that in experimental research, experiments should be designed in such a way that assumptions are varied in a structured way. This requirement should also hold in research using simulation models. However, obvious as this seems to be, it is easily violated when competing theories are compared by using simulation models based on these theories, especially if the models are developed by different researchers. Even if the theories share a common framework, the simulation models based on the theories are likely to use different auxiliary assumptions. Furthermore, the implementation of the simulation models in computer programs, especially if this is done by different researchers, can lead to even more differences in the auxiliary assumptions.

Bueno de Mesquita's expected utility model and Stokman and Van Oosten's exchange model do not meet this requirement, since the models differ in more respects than the applied influence strategy alone. Differences in the results of these two models might also stem from differences in, for example, the specification of the utility function or the specification of the expected outcome. This means that a comparison of the expected utility model and the exchange model does not equate with a comparison of two competing theories on influence strategies. Therefore, one task in this research was to modify the expected utility model and the exchange model in such a way that the modified models differ only in applied influence strategy. The modified models are called the *iterative exchange model* and the *challenge model.* The iterative exchange model and the challenge model share a framework of fixed auxiliary assumptions: the *general model.*

This research compares the challenge model and the iterative exchange model to investigate the conditions under which different assumptions about influence strategies lead to different collective outcomes, and the conditions under which one model provides better predictions than the other. However, there is a third question left. Both the social exchange theory and the theory of conflict resolution assume that the influence strategies the actors use change the collective outcome. But it could also be true that the collective outcome is already largely determined by the decision making situation (i.e., by the actors' capabilities, saliences, and preferences). It might hold that some actors always get their way, regardless of the strategy they use. This questions whether an influence process should be incorporated at all in a model of collective decision making. To answer this question, the social exchange theory and the theory of conflict resolution should not only be compared to each other, but also to a base theory that uses the same information about the decision making situation as the two models, but does not assume any influence.

The research questions formulated for this research are

1. *To what extent do the predicted outcomes of the iterative exchange model or the challenge model deviate from the predicted outcomes of a base model that assumes no influence strategy?*

2. *To what extent do the predicted outcomes of the iterative exchange model deviate from the predicted outcomes of the challenge model in different collective decision making situations?*

3. *Can sets of collective decision making situations be identified in which one of the three models (the base model, the iterative exchange model, or the challenge model) provides better predictions of the collective outcomes than the other two?*

7.3 The Iterative Exchange model and the Challenge model

Chapter 2 presented the general model of collective decision making: a framework of definitions and assumptions that hold for both the iterative exchange model and the challenge model. The general model needs only a limited amount of information on the actors involved in the decision making: their *preferred positions*, *saliences*, and *capabilities* with respect to the issues they have to decide upon. The preferred positions are measured on a unidimensional scale. This scale ranges from 0 to 1. Capabilities and saliences are also measured on scales that range from 0 to 1. If all actors involved voted according their own preferences, the outcome of the collective decision would be dependent on the actors' preferences in a straightforward way. However, the general model assumes that actors can influence the collective outcome by influencing each other. The main assumption of the model on the behavior of the actors is that actors try to influence the *voting positions* (i.e., the alternative they vote for) of other actors in such a way that the collective outcome of the decision comes closer to the outcome they prefer most.

The general model views collective decision making as a five-step process. The first two steps form the single actor level. In the first step (*actor identification*) the actors choose their preferred positions and saliences. This determines their utility functions over the issues (the utility of any possible outcome is dependent on the distance between this outcome and the actor's preferred outcome, and on the actor's salience). In the second step (*domain evaluation)* the actors obtain information on the utility functions of the other actors. They use this information to estimate the expected collective outcomes on the issues (by calculating the weighted means of the actors' voting positions, weighted by salience times capabilities) and their utility losses caused by these outcomes. The next two steps form the interaction level. These steps model the influence process. In step 3 (*influence attempts*), the actors decide which actors they should influence in order to obtain a collective outcome closer to their preferred position. They propose a change in voting position to these actors. In step 4 (*influence acceptance*), the actors evaluate the proposals they received in the previous step. They accept the proposals of which they expect the most positive (or least negative) effects on the collective outcome and change their voting positions according these proposals. The new expected collective outcome is estimated on the basis of the new voting positions. The interaction level, steps 3 and 4, are repeated until a model dependent criterion is fulfilled. Finally, the last step forms the collective action level. In this step (*decision taking*) the prediction of the collective outcome is determined (by calculating the weighted means of the actors' final voting positions, weighted by salience times capabilities).

The iterative exchange model and the challenge model only differ in the influence process, that is in steps 3 and 4 of the five-step scheme. These differences are described in chapter 3.

The iterative exchange model assumes that actors try to influence outcomes by *exchanges of voting positions*. If an actor (ego) cares more about issue *a* than issue *b* (i.e., if ego's salience on issue *a* is lower than ego's salience on issue *b*), voting according to another actor's (alter's) wishes on issue *b* in exchange for alter voting according ego's wishes on issue *a* means a utility gain for ego. If alter's salience distribution is opposite to that of ego, this exchange is also profitable for alter. The issue on which ego is willing to give in is labeled ego's *supply issue*, and the issue on which ego hopes to gain from a shift by alter is labeled ego's *demand issue*. A combination of two actors (*i* and *j*) and two issues (*a* and *b*), with issue *a* actor *i*'s demand issue and issue *b* actor *j*'s demand issue, and where an exchange of positions is profitable for both actors, is called a *potential exchange*. The exact moves made by the actors are determined by the *exchange rate* used in the model. Chapter 3 distinguishes four exchange rates: the equal utility gain exchange rate, the exact positions exchange rate, the Nash exchange rate, and the relative equal utility gain exchange rate. The last three specifications are used in three versions of the iterative exchange model.

The iterative exchange model assumes repeated exchange rounds. In every round, the actors start by determining the potential exchanges they participate in (based on the expected outcomes), and by ordering these by utility gain. After this, every actor proposes the potential exchange that would provide him with the highest utility gain. If two actors proposed the same potential exchange to each other, this exchange is *executed* (i.e., the actors take their new voting positions). Since the iterative exchange model assumes *binding* exchanges, every actor can use an issue as supply issue in at most one executed exchange. Furthermore, actors are allowed only one executed exchange in each exchange round. This means that executed exchanges make other potential exchanges forbidden. The actors that did not exchange yet in this exchange round delete the forbidden potential exchanges from their list, and again propose the potential exchange on their list that would provide them with the highest utility gain. This is repeated as long as there are actors who are able to, and did not yet exchange in this round. After the exchange round actors move to new voting positions. This leads to new estimates of the collective outcomes (the weighted mean of the voting positions, weighted by salience times capabilities), which will be used in the following exchange round.

The influence proposal assumed in the challenge model is a *challenge* by ego of a voting position of alter. If ego challenges alter on issue *a*, this means that ego wants alter to take ego's voting position. Actors are assumed to calculate the expected utility of a challenge. This expected utility depends on the chance that the challenge will succeed, and on the utility received from the successful challenge. The challenge model is based on the assumption that actors will propose those challenges from which they expect utility gain (so-called *potential challenges*). If an actor is challenged on an issue, he has to decide whether to accept the challenge and give in completely to the challenger, to make a compromise and give in partially, or to withstand the challenge (i.e., enter a conflict situation).

The challenge model assumes repeated challenge rounds. In every round, the actors start by determining their potential challenges, based on the expected outcomes. The actors propose every potential challenge. After this, the actors evaluate the challenges they received. The challenges that generate conflicts do not produce changes in voting positions. These challenges are discarded. For each of the challenges to which an actor perceives he has to give in (partially or completely), he calculates his related utility loss. Subsequently, for every issue, he will compromise or give in to (i.e., *execute*) the challenge that requires the shift with the smallest utility loss. After the challenge round actors move to new voting positions. This leads to new estimates of the collective outcomes, which will be used in the following challenge round.

The challenge model and the iterative exchange model are not only compared to each other, but in order to answer the first research question, also to a base model that assumes no influence strategy at all. The base model used in this research defines the collective outcome as the weighted mean of the actors' preferred positions, weighted by capabilities times salience. If the influence process were left out of the iterative exchange model or the challenge model, the base model is what would be left. This means that the base model only contains step 1, 2 and 5 of the general model[1].

7.4 Analyzing Models of Collective Decision Making

Until now, models of collective decision making have been studied and compared by analyzing their results on empirical data. However, an investigation of the research questions by a comparison of the empirical results of the base model, the iterative exchange model, and the challenge model would be very limited by the lack of sufficient empirical data. Much effort has already been devoted to the collection of data on collective decision making situations. However, the available empirical data sets are not sufficient for elaborate and structured research on the question of in which collective decision making situations do the different assumptions on applied influence strategy lead to different predictions. To put this even stronger, it is practically impossible to

[1] Note that without an influence process, the actors' final voting positions equal their preferred positions, which means that in the base model step 5 equals step 2.

collect enough data to perform a structured search. Situations in which the two models lead to significantly different results might not be easily found in empirical situations as it is not clear which conditions are important. Furthermore, using empirical data, it is not possible to structurally test the effect of small changes in a collective decision making situation.

To conclude, the available empirical data are not sufficient to study research questions 1 and 2. However, the available data are used to answer research question 3 (about the relative predictive power of the base model, the challenge model, and the iterative exchange model). Furthermore, three alternative exchange rates were specified for the iterative exchange model, and empirical data were also used to determine which specification leads to the best predictions. The best one was chosen as the exchange rate in the version of the iterative exchange model that is used to investigate research questions 1 and 2.

To study research questions 1 and 2, the present research uses tests of the simulation models not on empirical data, but on 'simulated data'. This means that simulation comes in at two parts of this research: not only in the simulation models to simulate the process of collective decision making, but also in the simulated data to test these models. A methodological contribution of this research is to illustrate the benefits of using computer simulations with simulated data. Computer simulation can be used both to study the implications of the different assumptions of two competing theories and to locate areas in the input space in which these competing theories lead to different predictions. This research, next to the work of, for instance, Cohen et al. (1972), Axelrod (1987), and Zeggelink (1994, 1996), shows that computer simulations using simulated data generate more insights into the consequences of model assumptions. Simulated data facilitates a much more structured analysis of the effect of input variables on model outcomes than empirical data can. Therefore, it can show certain patterns and effects, that could not be found if results on empirical data alone were available.

However, running a model on simulated data can never function as a test of the validity of the model, since there is no actual outcome that can serve as a reference point. Results of analyses on simulated data can only provide insights into the simulation model, and therefore into the theory, but never about reality. The results should be viewed as hypotheses, that still have to be tested on empirical data. Only after confirmation of these hypotheses, has support of the validity of the model and the theory been obtained. If the hypotheses are rejected, the theory and the model should be improved. The present research showed, for instance, that a consequence of the assumptions of the iterative exchange model is that actors on opposite extremes are likely to exchange with each other. Whether this holds in reality, can only be tested by collecting empirical data on the actors that execute exchanges. If these data reveal, for example, that actors on opposite extremes hardly ever execute exchanges (it is imaginable that extreme left-wing parties and right-wing parties refuse to talk to each other), then the assumption that all actors can exchange with each other should be reconsidered.

This makes clear that for research using computer simulations to be useful, the design of the simulations should be structured by theory. Theoretical expectations or empirical results are needed to guide the analysis and to interpret the results. To perform a structured comparison of the base model, the challenge model, and the iterative exchange model using simulated data, a simulation design had to be developed. To answer the questions on how the actors' attributes affected the models' outcomes, a structured search through the input space was needed. The concept of *issue profiles*[2] was developed to structure the input space. Furthermore, the explanatory variables used to analyze the simulation results were based on theoretical assumptions and on the results of analytical deductions of the effects of the model assumptions in small decision making situations.

7.5 Results of the Analyses

Tests on Empirical Data

Chapter 4 presents an empirical test of the challenge model, the three versions of the iterative exchange model, and three base models. Base models 1 and 2 are very simple models. Base model 1 defines the collective outcome as the (non-weighted) mean of the actor's preferred positions, and base model 2 defines the collective outcome as weighted mean of the preferred positions, weighted only by the capabilities. Base model 3 defines the collective outcome as the weighted mean of the actors' preferred positions, weighted by capabilities times salience. The results of the iterative exchange model and the challenge model were also compared to the results of Stokman and Van Oosten's exchange model and Bueno de Mesquita's expected utility model, where these result are available.

The models are tested on four data sets: Bueno de Mesquita and Stokman's data on European Community decision making (Bueno de Mesquita and Stokman 1994), Rojer's data on collective agreement negotiations in the Netherlands (Rojer 1996, 1999), Payne's data on the decisions on the reform of the Structural Funds involving Ireland (Payne et al. 1997, Payne 1999), and König's data on social political decisions of the European Union (König 1997).

[2] Note that in the computer simulations using simulated data, the word 'issue' does not indicate a substantive decision, but only a configuration of simulated data, that is the values of the actors' preferred positions, saliences and capabilities.

The empirical tests clearly support the iterative exchange model. The Nash exchange rate gives the best overall results, and therefore the Nash-iterative exchange model was used in the computer simulations of chapter 5. With regard to the challenge model, the situation is less clear. The challenge model produces results far worse than the iterative exchange model, especially on Rojer's and Payne's data collections. However, Payne's one-issue data sets supported the challenge model, and Rojer's collective decision making situations can be viewed as typical exchange situations.

Base model 3 produces remarkably good overall results. This supports the assumption that collective decision making situations can be described very well using only the information on the actors' preferences, saliences, and capabilities. This also indicates that the predictive power of the iterative exchange model and the challenge model is at least partly based on good input data. However, the Nash-iterative exchange model's predictive power is higher than base model 3's predictive power. Therefore, good assumptions on exchange strategies make a difference. The challenge model's predictive power is worse than base model 3's predictive power. However, the higher predictive power of the expected utility model as found in other research (Bueno de Mesquita et al. 1985; Bueno de Mesquita 1994) shows that good assumptions on challenge strategies also lead to better results than the base model.

Base model 3 is the base model whose results were compared to the results of challenge model and the iterative exchange model, in order to answer research questions 1 and 3.

The empirical tests show that the predictions of Stokman and Van Oosten's exchange model and Bueno de Mesquita's Expected Utility model are not as similar as suggested in other research (e.g., Bueno de Mesquita and Stokman 1994). This holds even stronger for the iterative exchange model and the challenge model. Therefore, it is useful to identify the collective decision making situations in which the models differ most. The present research focuses only on conditions that can be found in the configurations of the input data of the models (i.e, in the distributions of the actors' preferences, saliences, and capabilities). However, the empirical results also point towards conditions based on the embeddedness of the decision making in a larger setting. The good results of the exchange models on Payne's and Rojer's data for instance, suggest that exchanges are very likely in situations in which a number of decisions are decided upon at the same moment, by actors that will meet again in forthcoming negotiations. It would also be interesting to study these kinds of conditions.

Analytical deductions

Analytical deduction and computer simulations on simulated data were used to address the first two research questions. The analytical deductions as presented in chapter 5 were focused on the conditions for potential challenges and exchanges. These model-dependent conditions are too complex to provide much insight into the effects of the actors' preferred positions, saliences and capabilities on their offering of proposals. To gain more insight, the conditions were rewritten and compared. Table 1 summarizes the results of chapter 5.

Table 1. Results of Analytical Deductions

Challenge model	Iterative Exchange model
• The challenge model requires at least three actors (who take different positions) and one issue for any potential challenge. • The conditions for potential challenges lead to a lower bound for the influencer's salience and an upper bound for the influenced actor's salience: these boundaries depend on all actors' positions, saliencies, and capabilities on the issue. Ego challenges alter to move alter's position towards ego's position if and only if ego's salience is larger than the upper bound and alter's salience is lower than the lower bound. • In most two-against-one situations (with respect to the configuration of the actors' preferred outcomes) the single actor has to give in to the challenges of the other actors.	• The iterative exchange model requires at least two actors (who take different positions) and two issues for any potential exchange. • The conditions for potential exchanges lead to an upper bound on the ratio of the influencer's and influenced actor's salience: this upper bound depends only on the influencer's and influenced actor's saliences on the other issue in the exchange. An exchange between ego and alter, with this issue as alter's supply issue (i.e., where alter moves his position towards ego's position), is only possible if the ratio of ego's salience and alter's salience is larger than this upper bound.

Table 1 shows that the conditions for potential exchanges and potential challenges are similar in certain respects. However, even if the iterative exchange model and the challenge model predict proposals that require the same actor to shift his position, it is possible that the iterative exchange model predicts a small move whereas the challenge model predicts a complete acceptance of the challenger's position. Moreover, whether the potential challenges and exchanges are accepted and executed by alter is dependent on the proposals alter receives from other actors. However, this is too complex to analyze analytically.

The results of the analytical deductions were used in the design of the computer simulations, and in the choice of explanatory variables of the regression analyses on the results of the simulations.

Computer Simulations using Simulated Data

The analyses of the outcomes of the computer simulations using simulated data were focused on (the differences between) the outcomes predicted by the challenge model and the iterative exchange model. Chapter 6 presents the design and the results of the simulations. The design had to structure the search through the possible input configurations. Since it is not feasible to test every possible configuration, a structured limitation of the input space was needed. The first limitation concerns the number of actors and issues. Only three, four, and five-actor situations, involving two or three issues were used in the analyses. The positions these actors could take were limited using the concept of *power blocks* and *issue profiles*.

Power blocks are defined as groups of actors that have very close preferred positions on an issue. There are a few distinguishable cases: (1) the case in which one power block has almost all the exercised power, (2) the case of only two competing power blocks, (3) the case of three competing power blocks (this allows the formation of coalitions between two power blocks), and (4) cases with more than three powerful groups. The most important features (competing power blocks, coalition formation between power blocks) are captured in cases with three power blocks. Although the addition of more power blocks increases the possibility of interactions between power blocks, the computer simulations are limited to issues with maximally three power groups. Since issues with all actors in one power block are not interesting (the collective outcome is by definition equal to the preferred outcome of the power block), the simulations are limited to issues involving two or three power blocks. It is assumed that the extreme preferred positions (0 and 1) are always taken by at least one actor. Therefore, two-power-block issues have one left power block (on position 0) and one right power block (on position 1). The three-power-block issues have a left, a middle and a right power block. In the simulations, the middle power block was positioned at the value 0.40. This position is far enough from both extreme positions to be recognized as a separate power block.

Two kinds of power blocks are distinguished: (1) *non-divisible power blocks* consisting of only one actor, and (2) *divisible power blocks* consisting of a group of actors. In the simulations, maximally three actors are part of a power block.

The idea of divisible and non-divisible power blocks, with the limitation of a maximum of three power blocks on an issue, and the requirement that three, four or five actors are involved, leads to the design of a limited number of issue profiles. An *issue profile* describes the distribution of the actors' positions over the two or three power blocks. Chapter 6 uses three different issue profiles for three-actor situations, six different issue profiles for four-actor situations, and eight different issue profiles for five-actor situations (see table 1 of chapter 6).

The issue profiles determine only the actors' preferred positions. The input space contains not only the preferred positions, but also the actors' saliences and capabilities. The selection of a fixed set of possible saliences and capabilities provided another limitation on the input space: both saliences and capabilities can only be either low (0.50) or high (1.00).

Chapter 6 distinguishes two roles that an actor may have: a fixed role, which means an actor has the same position on all issues in an exchange (i.e., on all issues the actor has either the left extreme, middle, or right extreme position), and a mixed role, which means that an actor can have an extreme position on one issue and a middle position on another issue in the exchange.

Even with these restrictions, the issue profiles lead to a vast number of possible issue configurations. Therefore, a random selection was made. The simulations were restricted to situations in which all actors are involved in all issues. As a result, the sets of three-actor issue profiles, four-actor issue profiles, and five-actor issue profiles were treated separately.

The results of the simulations were analysed by means of linear regression analyses. The explanatory variables used were based on the results of the analytical deductions of chapter 5, and on expectations about the effects of different issue profiles. This led to two kinds of explanatory variables: measures of the expected directions of challenges and exchanges, and transformations of the actors' saliences and capabilities into variables that distinguish (1) the position of the middle actor, (2) whether an actor is an extreme actor, and (3) whether the actor is part of a single-actor or a multi-actor power block. One more explanatory variables was added to these: the outcome of the base model (i.e., the weighted mean of the actors' preferred positions, weighted by salience times capabilities). The use of the base model's outcome as an explanatory variable allows the study of the question of the extent to which the outcomes of the iterative exchange model and the challenge model differ from the base model (research question 1).

Table 9 of chapter 6 summarizes the results of the three-actor, two-issue analyses under the assumption of fixed roles. Some of the results are weaker if more actors or issues are added, or if mixed roles are assumed. Table 2 provides an overview of the results of the computer simulations using simulated data (based largely on table 9 of chapter 6). Note that the result on a specific explanatory variable is obtained controlling for the other variables.

Table 2. Results of Linear Regression Analyses on the Computer Simulations using Simulated Data

Challenge Model • The *larger* the base model's outcome, the *closer* the challenge model's outcome is to the right extreme. • The *more* the expected direction of a challenge is towards the right extreme, the *closer* the challenge model's outcome is to the right extreme. • For all actors part of an (extended) multi-actor power block, it holds that the *larger* the actor's salience, the *more* the challenge model is pulled towards the (extended) multi-actor power block extreme. Furthermore, the adjusted saliences of extreme actors have more impact than those of middle actors (if they are part of an (extended) multi-actor power block). The same relations hold for the actors' (adjusted) capabilities, but to a lesser degree.
Iterative Exchange Model • The *larger* the base model's outcome, the *closer* the iterative exchange model's outcome is to the left extreme. • The *more* the direction of an exchange between extreme actors is towards the right extreme, the *closer* the iterative exchange model's outcome is to the right extreme. • For all actors it holds that the *larger* an actor's capabilities, the *less* the outcome lies towards the extreme closest to the actor. The adjusted capabilities of extreme actors have more impact than those of middle actors. The capabilities of the middle actors have almost no impact if these actors are single actors. • For extreme actors it also holds that the *larger* an actor's saliences, the *less* the outcome lies towards the extreme closest to the actor, but to a lesser degree than for the actors' capabilities. The pattern is less clear for middle actors: for three-actor simulations it holds that the *larger* the middle actor's saliences, the *more* the outcome lies towards the extreme closest to the actor, but for four-actor and five-actor simulations the opposite holds. All situations show that the saliences of middle actors have almost no impact if these actors are single actors. • Under the assumption of mixed roles, not only the direction of exchanges beween actors at extreme positions (on the tested issue, not necessary on the issue on which it is tested against) is important, but also the exchanges involving actors at middle positions (who may take extreme positions on the second issue) play a role.

<u>Deviation between Iterative Exchange Model and Challenge Model</u>

- The *larger* the base model's outcome, the *more* the challenge model's outcome lies further to the right than the iterative exchange model's outcome.
- The *larger* the difference between the expected direction of a challenge and the direction of an exchange between the extreme actors, the *larger* the deviation between the iterative exchange model's outcome and the challenge model's outcome.
- The *larger* the actors' saliences and capabilities, the *larger* the deviation between the iterative exchange model's outcome and the challenge model's outcome.
- Actors have more impact if they are part of a multi-actor power block, than if they are single actors.
- Extreme actors have more impact than middle actors.

The large regression coefficients associated with the variable containing the base model's outcome in the regression analyses of the simulation results show that the outcomes of the challenge model and the iterative exchange model are captured for a large part by the outcome of the base model. This shows that good input variables (the actors' preferred positions, saliences and capabilities), and the expected outcome based on the weighted mean of the (initial) voting positions, weighted by exercised power, explain a substantial part of collective decision making. Both the base model's variables and the base model's specification of the expected outcome are also used in the challenge model and iterative exchange model. To conclude, they play an important part in the predictive power of these models. However, not only the base model's outcome had high regression coefficients. The expected directions of challenges and exchanges, and, to a lesser degree, the actors' capabilities and saliences also play a major part in explaining the outcomes of the challenge model and the iterative exchange model. This indicates that the influence processes change the collective outcome. Therefore, it can be concluded that the incorporation of an influence process in models of collective decision making does make a difference.

The computer simulations showed clearly the importance of the directions of challenges and exchanges in explaining the results of the challenge model and the iterative exchange model, and the importance of the difference in these directions in explaining the deviations between these models. What kinds of collective decision making situations lead to different directions of challenges and exchanges? The challenge model predicts that the outcome moves towards the extreme of the (extended) multi-actor power block. Remember that all actors in an issue configuration are designed to have either high or low saliences and capabilities (randomly chosen). Therefore, an (extended) multi-actor power block is likely to have more exercised power than a single-actor power block. The analyses show that the model predictions differ most if actors in the most powerful power block (i.e., actors in the most powerful coalition) use the issue as a supply issue. This happens in two kinds of collective decision making situations. In the first kind, the high exercised power of the most powerful coalition is due to the high capabilities of its members, but not to high salience. Here, the challenge model predicts, on the basis of the high exercised power (due to the high capabilities), that the powerful coalition wins the issue, whereas the iterative exchange model predicts, on the basis of the low salience, that actors in the powerful coalition give in on the issue. In the second kind of collective decision making situations, the same actors are part of the most powerful coalition on all issues. According to the challenge model, these actors win on all issues. However, according to the iterative exchange model, these actors still make concessions on issues that are of less (and possibly only a little less) interest to them.

The actor's saliences have more impact on the challenge model, whereas the actors' capabilities have more impact on the iterative exchange model. But of course, in the latter case, the actors' saliences are already captured in the measures of the expected directions of exchanges. Therefore, it can be concluded that in both models the actors' saliences matter more than their capabilities. This means that it is not an actor's potential power, but the effort he makes to affect the collective outcome that determines how much an actor influences the collective outcome.

Furthermore, the saliences and capabilities of actors have more impact if the actors are part of a multi-actor power block (i.e., if they are part of more powerful coalitions), or if the actors take extreme positions.

The analyses of actors with mixed roles showed that the iterative exchange model predicts that influencing the outcome by exchanging is especially profitable for actors who are on opposite extremes on all issues, or at least on a large number of issues.

The explained variance of the analyses of the iterative exchange model in two-issue situations is very high, but the addition of extra issues leads to a sharp reduction of the explained variance. Adding extra issues does not influence the explained variance of the challenge model, but adding an extra actor does lead to a lower level of explained variance. This means that the small decision-making situations, the outcomes of the iterative exchange model and the challenge model can be predicted quite well using the regression equations based on the explanatory variables. However, in larger decision making situations, the models become too complex to approximate their results by a simple linear regression.

Relating simulated data results to empirical data results

The computer simulations using simulated data analyzed only small situations (three to five actors, two or three issues). To test whether these results can be generalized to larger, empirical settings, chapter 6 performed a similar regression analysis on a subset of Rojer's data. Some of the effects found on the simulated data also show up in the empirical data. The base model's outcome is still an important variable, as are the actors' saliencies and capabilities. Again, the multi-actor power block actors have most impact. The analyses of the iterative exchange model again show that the capabilities of extreme actors have a larger impact. However, other effects are not confirmed in the empirical analyses. Furthermore, the measure of the direction of exchanges as used in the analyses on the simulated data could not be used in the test on the empirical data. Therefore, a new measure of the expected direction of exchanges had to be developed. Nevertheless, this new measure also shows the importance of the expected direction of exchanges on the iterative exchange model, and the importance of the difference between the expected directions of challenges and exchanges on the difference between the model results.

7.6 Concluding Remarks

The present research had two objectives. First, research questions were formulated concerning deviations in the results of a model based on the exchange strategy, a model based on the challenge strategy, and a base model that assumes no influence process at all. Second, the value of research using computer simulation, by using simulation models and testing these models an simulated data, was questioned.

The results of the tests on empirical data and simulated data provide answers to the three research questions. Summarized, the answers are as follows. (1) Although the predictions of the challenge model and the iterative exchange model are captured for a large part by the base model's predictions, the incorporation of an influence strategy does make a difference. (2) The deviation between the predictions of the iterative exchange model and the challenge model can be explained to a substantial extent by the differences in the (expected) directions of challenges and exchanges, and by the actors' saliences and capabilities, especially if these actors are part of a multi-actor power block, or if they take extreme positions. (3) The iterative exchange model with the Nash exchange rate showed the best overall predictive power. The base model showed remarkably good overall results, while the results of the challenge model were poor.

What can be said about the value of research based on computer simulation? The simulation models used in this research facilitated a structured comparison of the different assumptions on influence strategies used in the models. Furthermore, the use of simulated data allowed a structured search of the input space, which led to insights into the iterative exchange model and challenge model that could not have been deduced if empirical data alone had been used.

However, this research also showed that research based on computer simulation is only useful under certain conditions. First of all, it should be stressed that a comparison between simulation models is only useful if the models meet a number of requirements, including the requirement that the models may differ only in the competing assumptions, and not in other auxiliary assumptions. In the present research, this meant that two existing simulation models based on competing assumptions on influence strategies could not be used directly. First they had to be modified in such a way that the modified models only differed in the influence strategy applied.

Furthermore, computer simulation allows a search through the input space. It is important that a design is developed to structure this search, and to structure the analysis of the data obtained. Without such a design, the search result in a mountain of data that is problematic, or even impossible, to analyze. Both the structuring of the input space and the analysis of the data should be guided by theory. In the present research, the concept of issue profiles was used to structure the input space. Theoretical expectations (partly based on analytical deduction) were used to develop the explanatory variables used in the regression analyses of the simulation results.

Of course, the results of simulation models on simulated data can only provide insights into (differences between) the theories. The results are theoretically founded hypotheses, but only tests of these hypotheses on empirical data can provide insights into the validity of the underlying theories.