The Dynamics of Intergovernmental Negotiation Networks

Extended Abstract

Nicole J. Saam, Institut für Soziologie Ludwig-Maximilians-Universität München, Konradstr. 6 D-80801 München, Germany. Email: nicole.saam@soziologie.uni-muenchen.de

David Sumpter, Department of Zoology, University of Oxford, South Parks Road, OX1 3PS, Oxford. Email: david.sumpter@zoology.oxford.ac.uk

Abstract

Opinion formation models allow for a dynamical description of how a group of agents change their position through repeated interactions with neighbours in their social network (Weidlich 1994). In this lecture, we present an opinion formation model that simulates the dynamics of negotiation positions of an intergovernmental negotiation system. We apply this model to the EU Intergovernmental Conference of 1996 which led to the Amsterdam treaty. In order to evaluate the appropriateness of this model we compare its predictions of negotiation outcomes with predictions of other theory-based models: the median voter-model, mean voter-model, the Nash-bargaining solution, and an extended Zeuthen-Harsanyi-model as well as the empirical outcome - the Amsterdam treaty.

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1. Introduction

Intergovernmental negotiations span months of formal meetings and informal coordination between the states involved. The communication links within national governments and between ministries of different nations form a complex network (Pappi/Henning 1998). Decision-making with respect to intergovernmental policy necessarily involves dynamical flow of information and negotiation on these networks. During the process of arriving at coordinated policy: (1) national governments compete with each other, (2) national ministries compete with each other, and (3) coalitions of homologous ministries of different states form, as so (4) coalitions of homologous national governments.

Our research aim is to understand how coordinated unanimous decisions can be made within these complex networks. We investigate how and when coalitions form between nations, and how agreement is achieved through negotiation. We further investigate how network structure determines these dynamics and, ultimately, the negotiation outcome.

To address our research aim we develop an opinion formation model of the dynamics of a multilateral, multiple issue, multi-stage and multi-level negotiation system, the EU Intergovernmental Conference of 1996 which led to the Amsterdam treaty.

2. Comparative models

Despite the complexity of intergovernmental negotiations, there is considerable interest in the possibility of predicting their outcome using models. Two modelling approaches have been adopted in making these predictions. The first is based on bargaining theories, whereby negotiation outcome is predicted as a consequence of constraints with respect to rationality. The second approach is behavioural negotiation, whereby a set of rules are specified which the negotiating agents follow and outcome is predicted as an emergent property of these rules. These approaches are not necessarily contradictory, rather they differ in focus. In this section, we review some of the different approaches and in the next section propose our own behavioural approach.

Normative bargaining theory offers alternative model setups and derives general analytical equilibrium solutions to negotiation outcomes. E.g., it predicts that negotiations converge towards the non-cooperative result of the Rubinstein model (Rubinstein 1982) or the cooperative Nash-bargaining solution (Nash 1950). These models utilise agent rationality to make analytic prediction, but their model setup remains highly stylized. A comparative game perspective is restricted to the following question: If this or that condition is removed (or included), will the equilibrium solution that was derived before remain stable or will it change; if it changes, what is the difference between the old and the new solution?

A comparative game perspective in positive bargaining theory extends the number of questions that can be asked of bargaining models: What is the performance of alternative theory-based models in predicting empirical negotiations of certain types? How good are they in outcome prediction? What are the reasons for better predictions of one model in comparison to other models?
The main question of positive comparative game analysis however is not simply which model explains best negotiation outcomes. Negotiations are characterized by different degrees of complexity which shall be measured by the number of participants who have the right to vote and the number of issues as a first approximation. Reconsidering this, a sociologist will become aware that depending on these determinants of complexity, new structures will emerge in which the negotiations are organized. At low degrees of complexity – i.e. with few players and few issues – each player will negotiate with each other on each issue. At high degrees of complexity, this structure will become inefficient from a transaction cost economic point of view. With increasing number of players we therefore expect new types of social interaction, e.g. coalition formation and negotiation of coalitions. With increasing number of issues we expect initial issue-by-issue and final issue-crossing negotiation structures. These are only examples for emergent social structures – further examples could be the establishment of a powerful (not powerless) mediator position. Positive bargaining theory thus takes a step towards considering agent behaviour as well as rationality in determining.

We now consider five alternative behavioral negotiation models:

The median voter model suggests the statistical median as negotiation outcome and assumes issue-by-issue bargaining (Black 1958, for its applicability to intergovernmental negotiations cf. Bueno de Mesquita 2003). This model makes no assumption or prediction for a special type of emergent negotiation structure. The mean voter model uses majority rule as decision rule. It assumes a fictitious two-step process and issue-by-issue bargaining. As a first step, a finite number of offers are made. In a second step, one offer is selected and is put to the vote against the status quo. The selected offer is the weighted mean of all offers. Weights are the negotiation power of the states (Pappi/Henning 1998). As the two-step process is fictitious, this model makes again no assumption or prediction for a special type of emergent negotiation structure.

The enhanced Zeuthen-Harsanyi model (Saam/Thurner/Arndt 2004) is a two-stage incomplete information model which assumes issue-by-issue bargaining. As a first step, all players play a coalition game in which they decide to join one of two coalitions that form at the extremes of the negotiation space of each issue. As a second step, the coalitions play a negotiation game, a dynamic Zeuthen-Harsanyi game (Harsanyi 1956, 1977) which is a battle of sexes until an agreement has been found. This model includes constraints that influence the subjective probability of conflict of each player, like the degree of domestic and international conflict, and the cumulated bargaining power of the players. The negotiation process is reconstructed as a process of successive concessions of boundedly rational coalitions of players.

There are several exchange models which derive from the Coleman model (Coleman 1973) which applies Walras’ model of economic exchange on a perfectly competitive market to more general exchange processes in decision making. Actors are hypothesized to exchange control over events in which they are less interested for control over events in which they are more interested. Coleman’s exchange model is very simple for divisible and private events. It has been extended to indivisible goods in collective decision making. The model assumes issue-crossing bargaining: The Henning model assumes issue-crossing bargaining on base of an micro economic-like political exchange market that results in a Walrasian equilibrium. All negotiators are at the same time suppliers and demanders. They exchange partial control on issues with less relative interest in the outcomes against partial control on issues with more relative interest in the outcomes. However, whereas Coleman had assumed a dichotomous outcome space, probabilistic decision rule, proportional allocation of resources and a Cobb-Douglas utility function, Henning assumes a continuous outcome space, uses the mean voter as decision rule, assumes individual rationality and a two step utility function (Henning 2000).

In the Stokman/van Oosten model actors do not exchange control, but rather exchange voting positions. All negotiators are at the same time suppliers and demanders of issues. In this logrolling model exchange is based on pairwise exchanges between two actors on two decisions. In a larger system of $N$ actors and $M$ decisions, each actor investigates his or her potential exchanges with all other actors on any pair of decisions. Each actor is assumed to realize his or her best potential exchanges. The results of the exchange process can be represented as a network between actors. After exchanges have finished, the mean voter-model is applied to predict the outcome of the negotiations on each issue (Stokman/van Oosten 1994). The authors eschew the approach of formulating equations on the resulting equilibrium at the macro level. The final outcome may not be Pareto optimal for the set of all actors.

Whereas the median voter and the mean voter model make no assumptions or predictions for a special type of emergent negotiation structure, the enhanced Zeuthen-Harsanyi model assumes coalition formation, and both exchange models assume pair interactions. However, even in these latter models new structures in which the negotiations are organized will not emerge. The assumption of coalition formation and pair interactions can be criticized from different points of view: Whereas pair interactions lead to incredibly high transaction costs in case of negotiations with many players and many issues, coalition formation economizes on transaction costs. However, to presuppose coalition formation is quite inflexible and might by a heroic assumption. As a consequence, we look for a model that is more flexible: it should economize on transaction costs and let negotiation structures emerge. It should not presuppose them. Therefore, we suggest the opinion formation model. The opinion formation model (Weidlich 1994) assumes issue-by-issue negotiations and allows for a dynamical
description of how a group of players change their negotiation positions through repeated interactions with neighbours in their social network. Players are assumed to have groups of peers whose negotiation positions are observed and evaluated. Players make concessions into the direction of their peers given that all selected peers have a different opinion in the same direction. In this model, pair interactions are assumed and coalitions may emerge. Players economize on transaction costs because they only consider the negotiation positions of their peers. Although this approach is not explicitly game theoretical, it can be contrasted with the adaptive play framework of bilateral bargaining (Young 1993) - an evolutionary bargaining model.

The research question of this article is how can the opinion formation model be adapted to describe a specific instance of international negotiations and how good is it at predicting the negotiation outcome. It is our hypothesis that this model, that economizes on transaction costs and lets emerge efficient negotiation structures, will ultimately prove better at predicting for negotiation outcomes than alternative models.

3. The EU intergovernmental conference 1996

The Intergovernmental Conference 1996 constituted another step – like Maastricht or Nice – of an institutional reform contributing to the constitutionalization of the European integration. Hitherto, EU constitution building proceeds gradually, i.e. member states consented on voluntarily incomplete contracts. The Amsterdam conference took place from April 1996 to June 16/17, 1997. The Intergovernmental Conference 1996 had the purpose of fulfilling Political Union, of (re-) balancing the division of power, but especially of preparing the institutional setting for an EU enlargement. Already the Maastricht Treaty contained provisions for the amendment of the constitutional framework of the EU. These provisions included the date of reconvening as well as particular issues to be negotiated.

During prenegotiations within the so-called Westendorf reflection group, an intergovernmental preparation of the Intergovernmental Conference 1996 took place from June 1995 to December 1995. This group of delegates of the member states reached an agreement on the agenda, i.e. with regard to the issues to be negotiated. The report of the Westendorf group provided a set of roughly formulated issues, i.e. it delivered broad political goals and guidelines. The Service Juridique of the Council of the European Union processed these global issues into 30 precise issues with hard legal options. Each issue included an explicit status quo with indications on its legal status. Legal options were ordinal arrayed going from the least integrationist to the most far-reaching option. This prestructuring of issues and options demonstrates the enormous institutionalization of this negotiation system.

National delegations negotiated during 16 months in Brussels. They tried to find out each other’s ranges of maneuver and their discretionary leeways in order to maximize their own governments’ expected utility of a negotiation outcome taking into account the implied internal and intergovernmental transaction costs. Through bilateral and multilateral communication, negotiators tried to find out simultaneously their domestic as well as their external restrictions (Thurner et al. 2003, Thurner 2004). This process led to a preliminary settlement of a part of the issues in the Dublin II report (December 1996). The final game reached its climax at the Amsterdam summit. The resulting Amsterdam Treaty was formally implemented through a ratification process under specific constitutional provisions in each member state.

We use a data set on the EU Intergovernmental Conference of 1996 (Thurner/Pappi/Stoiber 2002). Data collection combined analysis of documents and standardized interviews of top-level bureaucrats in EU member states. The survey is centered around 30 documents, so-called fiches, (CONF 3801/96 to CONF 3830/96) as prepared by top lawyers of the Council’s Service Juridique. The documents are conceived as constituting a multi-dimensional issue space. Each of these issues is considered to constitute a one-dimensional negotiation space with ordinally arrayed options.

The data set includes quantitative data on preferences of the involved governmental actors prior to negotiations, transnational networks among governmental actors as well as negotiation outcomes. Especially, we use data on:

1. the status quo, negotiation options, and empirical negotiation outcome on each issue;
2. the national interest of each member state with respect to each issue (derived from the answers of the ministry of foreign affairs);
3. weights that measure the connectedness of each member state with each other during the pre-negotiation phase (based on how often national ministries/actors of one member state have addressed national ministries/actors of another member state; see Thurner/Pappi/Stoiber 2002: 149-158).

4. Structure of the model

We assume an international negotiation system consisting of 15 governments i.e. \{1, ..., 15\} negotiating over 46 issues \(k \in \{1, ..., 46\}\). Let \(O_k\) be the set of possible outcomes for each issue \(k\). Define the legally defined status quo in the \(k\)-th issue \(SQ_k\in O_k\) and the Amsterdam negotiation result in the \(j\)-th issue

1 An exhaustive identification of formal ex-post ratification requirements as well as discretionary agenda setting powers of all involved EU member states is provided by Stoiber/Thurner (2004).
2 Many thanks to Paul W. Thurner for allowing us to use some of the data of this data set.
AOk ∈ Ok. Call the announced ideal point of a government i in issue k \( w_{ik}^* \in Ok = \{1, \ldots, mk \} \) where \( mk \) is the number of options. We assume issue-by-issue negotiations, i.e. each issue is negotiated separately. Negotiations take place during a time span of 16 months. For a particular issue, each individual government \( i \), starts with a negotiation position, \( w_{ik}(0) \in Ok \), at negotiation step 0. This position is known from empirical data (see section 3). Initially, each government selects a random time \( \tau(i) \), according to an exponential distribution with parameter \( \lambda_i \), at which to ‘poll the opinion’ of other governments. \( 1/\lambda_i \) is the average time between opinion polling. We set \( \lambda_i \) to be inversely proportional to the national interest with respect to that issue. Thus governments to which an issue is important will poll opinion, and thus change opinion, less often than those to which an issue is less important. The simulation is then run in discrete time steps as follows. Start with \( \tau = 0 \).

1. The government with lowest value of \( \tau(i) \) is selected, i.e. \( i = \{ j : \min(\tau(j)) \} \) to be the focal government for this time step.
2. Government i picks a set \( Q_\text{of} \) size \( q \), of other governments randomly according to connectedness weightings in the transnational network (see section 3) and finds out their position. If for all \( j \in Q \), \( w_{jk}(t) > w_{ik}(t) \) then \( w_{ik}(t+1) = w_{ik}(t)+1 \), i.e. if all sampled governments have positions to the right of the focal government, the focal government moves one step to the right. Likewise, if for all \( j \in Q \), \( w_{jk}(t) < w_{ik}(t) \) then \( w_{ik}(t+1) = w_{ik}(t)-1 \), i.e. if all sampled governments have positions to the left of the focal government, the focal government moves one step to the left.
3. We update \( w_{ik}(t+1) = w_{ik}(t) \) for all governments, \( j \), not equal to \( i \); \( \tau(i) \) = \( \tau(i) + (\lambda_i) \) and return to stage 1.

The simulation ends when all governments have adopted the same position or if no unanimous decision is reached, alternatively when some certain amount of time has passed.

5. Model Results

![Figure 1: Starting positions (bars), probability distribution of predicted model outcomes over 100 simulation runs (solid line) compared to the actual outcome (x), the median voter model and Zeuthen-Harsanyi model (o). Model parameters are as described in the text with \( q=2 \). The model can be run repeatedly to give a probability distribution of possible outcomes. An example probability distribution is shown in figure 1 for issue 29, compared to distribution of initial positions, the Amsterdam outcome and two alternative models: the median voter model and Zeuthen-Harsanyi model. In the example, our model predicts the actual outcome as having the highest likelihood, 52%. Interestingly, the actual outcome and the predicted outcomes are more extreme than the mean initial position. Such tendency to extremities is a general prediction of opinion formation models where non-linear interactions between agents lead to rapid cascades to more extreme positions. Our preliminary results, and we should emphasise that the example we give here is only illustrative of a plausible theory, indicate that such a process could begin to explain the outcome of the Amsterdam treaty.

Bibliography

Author biographies

Nicole J. Saam, PD Dr. phil., has been temporary professor at the universities of Mannheim, Leipzig, and Marburg/Germany. At present she works as an assistant professor at the Ludwig-Maximilians Universität München. Research fields: Social theory, especially rational choice theory; social science methodology, especially social simulation; sociology of organization, political sociology.

David Sumpter’s research focuses on understanding the organisation of biological and other complex systems, often through the use of mathematical models.