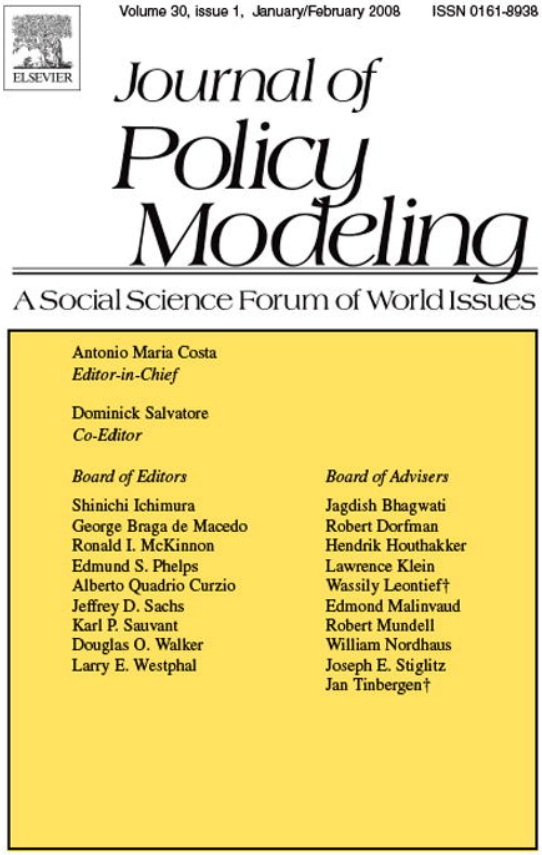

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ScienceDirect
Journal of Policy Modeling 30 (2008) 71–86
Journal of Policy Modeling
www.elsevier.com/locate/jpm

EU institutional reforms How do member states reach a decision?

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Received 1 January 2007; received in revised form 1 May 2007; accepted 1 July 2007
Available online 27 July 2007

Abstract

EU institutional reforms are far from trivial, as the recent rejection of the treaty establishing a Constitution for Europe by the French and Dutch electorate has demonstrated. With the exception of this treaty, all other treaties in the process of European institution building have been approved by the member states' governments. In this paper, we ask how these governments reach a decision on EU institutional reforms. Do they engage in coalition formation as is often observed in intergovernmental negotiations? It is our hypothesis that they do not necessarily engage in coalition formation but in peer coordination in policy networks to reach decisions in these multilateral, multiple issue, multi-stage negotiations. In order to test our theory we have implemented a simulation model which we apply to the EU Intergovernmental Conference of 1996 which led to the Amsterdam treaty. We conclude by discussing policy implications of our approach.

Keywords: EU; Institutional reforms; Intergovernmental negotiations; Bargaining theory; Policy networks; Peer coordination

1. Introduction

How do member states reach a decision in EU institutional reforms? How do they economize on transaction costs in intergovernmental negotiations that span over months and years and include many governments and many issues? Institutional reforms are important because they reset the institutional framework for all EU policy decisions, like EU social and labor policy regulations (Belke, Gocke, & Hebler, 2005), monetary policy (Breuss, Fink, & Haiss, 2004; Soukiazis & Castro, 2005), and Common Agricultural Policy (Rizov, 2004). EU institutional reforms also

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0161-8938/$ – see front matter
doi:10.1016/j.jpolmod.2007.07.005

codify general principles of and sometimes even very detailed regulations for certain EU policies, like the creation of an area of freedom, security and justice. What will the role of the European Parliament, of the European Commission, of the European Court of Justice be in EU policy decisions? This role is defined and redefined in the negotiations on EU institutional reforms. Therefore, in contrast to Pinto and Harrison (2003) and Redmond (2003) our aim cannot be to study a substantial policy, and demonstrate how one can integrate formal economic models of the impacts of policies with formal bargaining models of the negotiations over those policies. Rather, our aim is to understand how member states reach a decision in EU institutional reforms will help to reveal shortcomings in these formal economic approaches to policy modeling.

Coalition formation (Axelrod, 1970; De Swaan, 1973; Peleg, 1980, 1981; Riker, 1962; Saam, Thurner, & Arndt, 2004; van Deemen, 1997) or the formation of proto-coalitions (Grofman, 1982) is a standard answer on how governments reach a decision in intergovernmental negotiations. However, governments that want to bring about a certain preferred outcome need not necessarily form coalitions. Their concession behavior need not be based on an agreement on the part of two or more players to coordinate their actions. Particularly, in multilateral negotiations with many issues it seems unplausible that multiple coalitions form in an explicit way. Either there would be overlapping memberships in many issue-specific coalitions or there would be only a few coalitions that spread over several issues with several governments outside the coalitions. Both alternatives make bargaining rather more than less difficult.

In this paper, we present an alternative approach: peer coordination in intergovernmental policy networks, in which coalitions may emerge or not and their number may vary. We give a dynamical description of how a group of players change their negotiation positions through repeated interactions with neighbors 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 a quorum of 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. It is our *hypothesis* that this model, that economizes on transaction costs and lets efficient negotiation structures emerge, will ultimately prove better at predicting for negotiation outcomes of multilateral, multi-issue negotiations than alternative models. Our approach is supposed to contribute to positive bargaining theory.

Our paper is organized as follows. In Section 2, we present the approach of peer coordination in intergovernmental policy networks. The theoretical model is then further specified as a formal model, based on the opinion formation model and the adaptive play framework. In Section 3, we give a description of our empirical case, the EU Intergovernmental Conference of 1996 which was a multilateral, multiple issue, multi-stage and multi-level negotiation system that led to the Amsterdam treaty. In Section 4, we develop a simulation model of the EU Intergovernmental Conference of 1996 that is derived from our formal model of peer coordination in intergovernmental policy networks. We give a dynamic description of how a group of agents change their negotiation positions through repeated interactions with peers in their policy network. In our case, the 15 EU member states are represented as agents who have one of a number of discrete preferences with respect to the outcome of 46 issues which are negotiated in parallel. In order to evaluate the appropriateness of our simulation model we have calculated goodness of fit parameters (Section 5). These parameters are based on the correlation between the empirical outcome – the Amsterdam treaty, which has been operationalized – and the simulation model's prediction of the negotiation outcomes. We also test the robustness of our model by systematically changing parameter values and seeing how model outcome changes. Finally, we compare these goodness

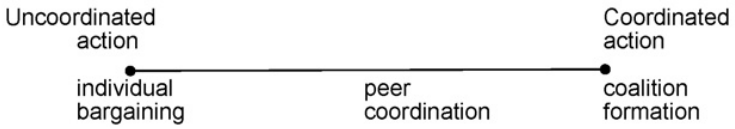

Fig. 1. Uncoordinated and coordinated action in multilateral bargaining.

of fit parameters with those of alternative theoretical models (the median voter-model, and the extended Zeuthen–Harsanyi-model). We conclude with a discussion of policy implications and shortcomings of our approach as well as perspectives for further research.

2. Peer coordination in intergovernmental policy networks

We perceive peer coordination as a type of coordinated action that is located between two extreme types, coalition formation as the extreme type of coordinated action and at the other extreme, uncoordinated action (see Fig. 1). The peer coordination type of multilateral bargaining relies on two lines of theory: theories of interorganizational network formation, and the policy network line of argument in political science.

2.1. Theories of interorganizational network formation

Relying on sociology of organizations, we perceive policy networks as a special type of interorganizational networks (Alter & Hage, 1993). Alter and Hage define networks as the basic social form that permit interorganizational interactions in exchange, concerted action, and joint production. Networks are unbounded or bounded clusters of organizations that, by definition, are nonhierarchical collectives of legally separate units. Networking is defined as the act of creating and/or maintaining a cluster of organizations for the purpose of exchanging, acting, or producing among the member organizations (Alter & Hage, 1993, p. 46).

Whetton (1987) has classified the extremely broad concept of coordination that ranges from simple ad hoc agreements to participation in formally organized coordination councils into three types: mutual adjustment, corporate, and alliance. They vary in intensity, form of social power, formalization, and scope of coordination activity. Mutual adjustment is the weakest form of coordination, while corporate is the strongest. Coalitions are an example of the alliance type of coordination. We will focus our attention on the mutual adjustment type of coordination. This type – which may also be interpreted as a strategy of interaction – provides the narrowest range of benefits but also the fewest costs. Complete authority is retained by the participating organizations. Interaction rules are developed as the need arises in the process of interaction. Their violation is not regarded as severely as in other coordination strategies, nor are the types of sanctions for violation as severe. There is no central unit to monitor or detect violations. As a consequence, there are almost no sanctions. The group of organizations that interact in a mutual adjustment type of coordination is referred to as a system of peers (Whetton, 1987, p. 244). Attempts to change the balance of power among organizations tend to be resisted. Social power is based on influence. Coordination is achieved by mutual adjustment. Differences of opinions regarding goals can be resolved only through negotiation between participants. The main difference to the alliance type of coordination is that in the latter power is exercised both by the system and by the members. Alliances are based on a written accord.

Interorganizational cooperation has both costs and benefits. The participation in interorganizational cooperation is based on a rational decision that has been described as “calculus of

interorganizatonal cooperation" (Alter & Hage, 1993, p. 35f). Organizations calculate that the benefit outweigh the losses before they concert their efforts with others. Examples of costs are loss of resources, e.g. time, money, information, loss of reputation, loss of autonomy and ability to unilaterally control outcomes, conflict over goals, and delays in solutions due to problems in coordination. Examples of benefits are opportunities to learn and adapt, gain of resources, gain of influence over domain, and gain of mutual support.

2.2. Policy networks

The term policy network has been used in different ways, e.g. as concept that describes negotiation relations between a plurality of state and private organizational actors that reach a collective decision in a common problem (Héritier, Knill, & Mingers, 1996), or as a quantitative sociological branch that stresses the relations between actors which are mapped as graphs or digraphs (Laumann & Knoke, 1987). Following Pappi and Henning (1998, p. 554) we refer to policy networks as social choice systems. A policy network denotes the relations between the actors in a policy domain, i.e. the social structural aspect of the domain. A policy domain is defined as the set of actors with major concerns about the substantive area, whose preferences and actions on policy events must be taken into account by other domain participants (Laumann & Knoke, 1987, p. 10). Policy domains are purposefully created by political actors.

Policy networks among member states prior to negotiations are ex-post interpreted as influence networks. Influence is conceptualized as an exchange of resources (Pappi & Henning, 1998, p. 558). Participation in policy networks presupposes the possession of resources on the side of the actors. Exchanges of resources are continuous in policy domain networks. It is the goal of the actors to bring specific policy decisions closer to their preferred outcome. It is important to note that not all network members are mobilized for all decisions (Pappi & Henning, 1998, p. 563).

2.3. An integrated perspective

Perceiving policy networks as a special type of interorganizational networks, we now relate both lines of theory. Peer coordination in intergovernmental policy networks is reconstructed as a mutual adjustment type of coordination in which governments which belong to a policy domain mobilize their peers in order to bring specific policy decisions closer to their preferred outcome. Peer coordination is a behavioral strategy of rational governments which are involved in multilateral bargaining. We hypothesize that governments optimize peer coordination in order to bring specific policy decisions closer to their preferred outcome.

In order to explain peer coordination in intergovernmental policy networks the following questions have to be answered: What determines that a government acts as a focal government? What determines that a government is perceived as a peer by a focal government? How many peers does a focal government on average relate to? How often is a peer mobilized in a process of multilateral bargaining by a focal government? What is exchanged in the pair-interactions between peer and focal government? What is the influence that peers have on the focal government? What kind of concession behavior is related to mutual adjustment?

In this paper, we can only hint to the answers to these questions. Originally, the concept of peers referred to the group of people of the same age. People of the same age were assumed to be exposed to and influenced by the same socio-economic and socio-cultural situation, as opposed to people of another age. This concept has been generalized and transferred. Today, it applies to individuals as well as organizations or governments. Government peer selection has to be

explained by several determinants, notably all forms of homophily between governments like the preference for the same negotiation outcome, the same political ideology of the political party in government, the same socio-economic and socio-cultural situation of the society, historical ties that relate to common historical experiences, etc. The really crucial question is whether a potential peer is selected if that government shares only some of these determinants with the focal government, while it differs in the others. There is not only a calculus of interorganizational cooperation, but also a calculus of peer selection. Governments with no position on an issue, i.e. governments that do not declare a preference for a position at the beginning of the negotiations, are not selected as peers. Furthermore, governments with no position on an issue never act as a focal government with respect to that issue.

Many peers cause high transaction costs to the focal government. They also bring cognitive overload. As a consequence, focal governments have to economize on peers. On the other side, a focal government has to relate to enough peers in order to get important information and support. We assume that not only the number of peers has to be optimized but also the frequency of interactions to each peer. Too many interactions will cause costs, but will not bring further information and support. However, losses in information and support may result from too few interactions.

In the pair-interactions between peer and focal government both exchange information, particularly, they exchange their present bargaining position. The bargaining positions will change throughout the negotiation process due to concessions of the governments. However, as concessions need not be declared in public they may be private knowledge. Private knowledge will be exchanged in the pair-interactions between peer and focal government. After a focal government has contacted several peers it has information on all present bargaining positions of its peers.

We assume that the focal government is not forced by the peer governments to move to the positions of the peers. Within the mutual adjustment type of coordination they do not have the power to induce concessions. Rather, focal governments describe and explain their view, and discuss and try to convince their peers. Concessions depend on the peers' positions and on the national interest of a focal government with respect to an issue under negotiation (salience, Coleman, 1966). The greater the national interest the less likely the nation is to be swayed by the opinion of others.

Each of these peers is also a focal government with specific peers. Altogether, the governments of a policy domain interact in partial networks of focal government and peer governments, which we call peer networks. The peer networks overlap. Particularly in multilateral, multiple issue, multi-stage and multi-level negotiation systems it is very improbable that there is any peer network that does not overlap with at least one other peer network. Concession behavior in these overlapping peer networks is described as mutual adjustment. Focal governments adjust to their peers (and only to them). Adjusting to peers may be reconstructed as rational behavior. Rather than loosing face on conceding to opponents, focal governments will increase their reputation among peers when adjusting to the present positions of the peers. The overall outcome of such a system of overlapping peer networks results from many incremental adjustment processes within the peer networks. An agreement is achieved when these incremental adjustment processes finally converge as a result of overlapping memberships of governments in many peer networks. If they do not converge the negotiations have failed. In this subsection, we just hinted at the action theoretical foundation of our approach. It has to be further elaborated.

Although from the analytical point of view, individual bargaining, peer coordination, and coalition formation may be looked upon as ideal types, from an empirical perspective the dichotomy between uncoordinated and coordinated action in multilateral bargaining may be interpreted as a

continuum. Then, individual bargaining may develop into peer coordination when focal governments start to realize that they have (or once have had) peers, and peer coordination may develop into coalition formation when governments realize that they and their peers have extremely overlapping memberships and that they could benefit from binding themselves into a more formalized mode of coordination, namely coalitions. In other words, coalitions may emerge out of peer cooperation. However, they need not do so. This is the charm of the peer coordination model in intergovernmental policy networks.

A comparison with the *player as agent with two preferences*-model of coalition formation shows some common features. Both models assume governments which have preferences for payoff structures and preferences for governments to coordinate. Both models assume that these types of preferences will interact with each other. Preferences for governments are supposed to be determined by the payoff preferences of the governments.

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 pre-negotiations within the so-called Westendorp 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 Westendorp 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 ordinally 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, Kroneberg, & Stoiber, 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.[1]

[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 and Thurner (2004).

3.1. Further backgrounds of theorizing

Our empirical example requires that we consider another branch of theory. In order to identify the players we need a theory that describes who these players are. It turns out that the players are determined by the decision rule on constitutional reforms of the European Union.

3.1.1. Intergovernmental negotiations under unanimity rule

Negotiations involving multiple parties take place under different decision rules. Parliamentary negotiations are often governed by voting rules, with simple majorities, two-thirds majorities, or even more complicated double-criteria. In intergovernmental negotiations, simple majority rule may apply. However, we also find unanimity rule very often, e.g. in the European Union, unanimity is necessary for decisions on constitutional reforms. Unanimous decisions are supposed to be efficient and to lead to an optimal aggregation of preferences (Buchanan & Tullock, 1997; Rae, 1975). However, with increasing number of agents the process of decision-making becomes more and more difficult. In recent years, the efficiency of unanimity rule has been questioned (Colomer, 1999; Guttman, 1998).

3.1.2. Liberal intergovernmentalism

Following liberal intergovernmentalism (Moravcsik & Nikolaïdis, 1999), we view European integration as a sequence of intergovernmental bargains on treaties with the governments continuing to be the 'Masters of the Treaty'. We do not rely to the multi-level governance approach (Hooghe & Marks, 2001) that proposes to take into account both domestic interests and institutions as well as international and supranational constellations. Our basic argument is that only the member states have a right to vote on constitutional reforms of the European Union.

3.2. Empirical data

We use a data set on the EU Intergovernmental Conference of 1996 (Thurner, Pappi, & Stoiber, 2002).[2] 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 actors of one member state have addressed actors of another member state; see Thurner et al., 2002, pp. 149–158). Policy networks among member states prior to negotiations are ex-post interpreted as influence networks.

[2] Many thanks to Paul W. Thurner for allowing us to use some of the data of this data set.

4. Structure of the model

Our formal model of peer coordination is based on the theoretical model which we have outlined above and builds on two formal models: the opinion formation model (Weidlich, 1994) that is capable of modeling the dynamics of interacting populations with discrete attitudes and the adaptive play framework (Young, 1993a, 1993b, 1998) that is capable of modeling peer selection.

We assume an international negotiation system consisting of 15 governments $i \in \{1, \ldots, 15\}$ negotiating over 46 issues $k \in \{1, \ldots, 46\}$. Let $O_k = \{1, \ldots, m_k\}$, where m_k is the number of negotiation options, be the set of possible outcomes for each issue k. Each issue's negotiation options are discrete, ordinally scaled and located in a Euclidian negotiation space. The options are known from empirical data (see Section 3). Define the legally defined status quo in the kth issue $SQ_k \in O_k$ and the Amsterdam negotiation result in the jth issue $AO_k \in O_k$. Call the announced ideal point of a government i in issue k $w_{ik^*} \in O_k$. Governmental preferences over the outcomes can be characterized by the following von Neumann–Morgenstein utility function $U_i(o_k, w_{ik^*}) = 1 - |w_{ik^*} - o_k|$. 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, $w_{ik}(0) = w_{ik^*}$, 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 λ_i, at which to 'poll the opinion' of other governments and consider a concession. λ_i is the average time between opinion polling. We set λ_i to be 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. Governments with no position, i.e. governments that have not declared a preference for a position at the beginning of the negotiations, never poll or affect opinion.

The simulation is then run in discrete time steps as follows. Start with $t = 0$.

(1) *Selecting the focal government*: The government with lowest value of $\tau(i)$ is selected to be the focal government for this time step.
(2) *Peer selection*: Focal government i picks a set S, of size s,[3] of other governments randomly according to connectedness weightings in the intergovernmental network (empirical data, see Section 3). This set of governments are those that the focal government polls the opinions of. The focal government receives information on each peer's actual bargaining position.
(3) *Concession behavior*: We assume that governments make incremental concessions. From their present bargaining position they move either one position to the left or to the right. The probability that the focal government moves its position to the left increases with the number of polled governments with a position to the left, and likewise the probability it moves right increases with the number of polled governments with a position to the right. Specifically, if $R = |\{j \in S, : \ w_{jk}(t) > w_{ik}(t)\}|$ is the number of polled governments with a position to the right of the focal government, then the probability that the focal government moves right is

$$\frac{\exp(\alpha R)}{\exp(\alpha R) + \exp(\alpha q)} \tag{1}$$

[3] s is equivalent to Young's sampling ratio r (see Section 2.3).

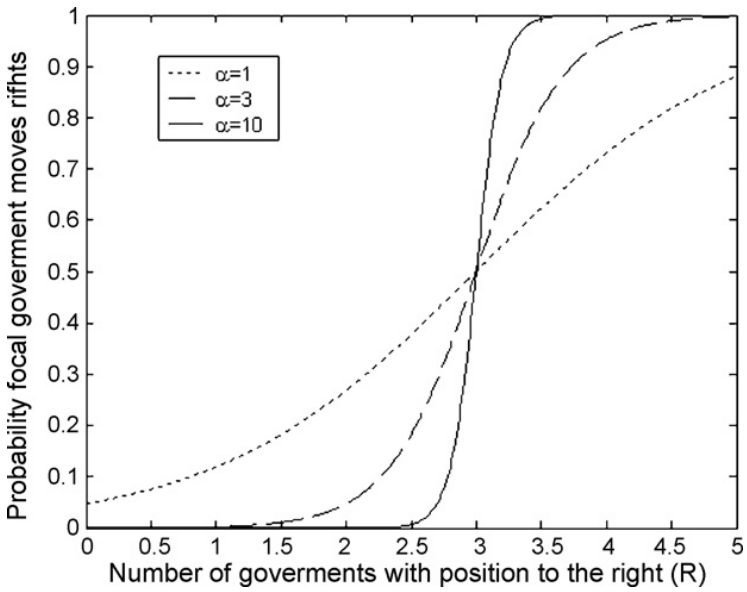

Fig. 2. Examples of Eq. (1), plotted for various values of α, with $q = 3$.

where q is the threshold at which the probability that the government moves right equal 1/2 and α determines the steepness of this threshold. Fig. 2 plots this threshold function for various values of α. As can be seen from Fig. 2, α dramatically changes the probability that a focal government moves. Whereas there is a smooth increase in the probability to move when α is small (e.g. $\alpha = 1$), there is an abrupt increase when α is high (e.g. $\alpha = 10$).

We thus select a uniformly distributed number between 0 and 1, and if it is less than Eq. (1), the focal government moves one step to the right, i.e. $w_{ik}(t + \tau(i)) = w_{ik}(t) + 1$. Similarly, if L is the number of governments with a position to the left, then

$$\frac{\exp(\alpha L)}{\exp(\alpha L) + \exp(\alpha q)} \tag{2}$$

is the probability that the focal government moves one position left.

(4) We update $w_{ik}(t + \tau(i)) = w_{ik}(t)$ for all governments, j, not equal to i; $t = t + \tau(i)$ and $\tau(i) = \tau(i) + \lambda_i$ and return to stage 1.

For an overview on all variables and parameters of the model see Table 1.

The simulation ends when all governments have adopted the same position or if no unanimous decision is reached, alternatively when 16 months, have passed the status quo option is adopted (i.e. the negotiations have failed). The mean value of λ_i over all issues was 0.1616 polls per month.

5. Model results

We have implemented this model, run experiments and finally checked for the robustness of the simulation results.

5.1. Experiments and results

Our experiments concentrated on sample size and quorum. The model was run repeatedly to give a probability distribution of possible outcomes. It turned out that five governments (sample

Table 1
Variables and parameters of the formal model

	Interpretation	Initialization
Variable		
w_{ikt}	Bargaining position of government i with respect to issue k at t ($t>1$)	–
Parameter		
K_k	Issues ($k=1$–46)	Empirical data
m_k	Number of different declared positions with respect to issue k	Empirical data
G_i	National government ($i=1$–15)	Empirical data
w_{ik*}	Declared initial bargaining position of government i with respect to issue k	Empirical data
λ_{ik}	Salience of issue k for government i	Empirical data
s	Sample size: number of governments that a government polls the opinion of	$s=5$
q	Quorum: threshold value at which the probability that a government moves equal 50%	Varied in experiments: $1.0 \leq q \leq 4.5$
α	Steepness of threshold value	Varied in experiments: $1 \leq \alpha \leq 10$

size $s=5$) is the optimal number of governments that a focal government pools the opinion of. The optimal number of governments to the left (or to the right) of the focal government at which this focal government's probability to move to the left (or to the right) equal 50% turned out to be three or more (quorum $q \geq 3$). We have calculated correlation coefficients to measure the match between simulated negotiation outcome (we use the mode of predicted model outcomes over 500 simulation runs) and empirical negotiation outcome. At best, Pearson's correlation coefficient is 0.74 (model parameters are $s=5$, $q=3.5$, and $\alpha=5$ or $\alpha=6$, or $s=5$, $q=4$, and $\alpha=3$, see Table 2).

5.2. Sensitivity analysis

In order to test whether the model outcomes were simply an artifact of some particular parameterization, we performed a parameter scan of the model. We set $s=5$ and changed q between 1 and 4.5, and α between 1 and 10. We did 500 simulation runs for each combination of parameters. Fig. 3 and Table 2 show how model performance changed with these parameter values.

In Fig. 3, model performance is measured by the number of issues where the most common outcome of simulation runs (the mode of 500 simulation runs) was equal to the empirical Amsterdam outcome. Obviously, q and α interact. We find combinations of q and α in which the model performance is better (darker shading) all over the scanned parameter space except for combina-

Table 2
Results of sensitivity analysis

q	α									
	1	2	3	4	5	6	7	8	9	10
1	0.16	0.12	0.48	0.64	0.66	0.65	0.69	0.68	0.66	0.67
2	0.35	0.70	0.72	0.72	0.73	0.72	0.71	0.72	0.72	0.70
3	0.69	0.72	0.73	0.71	0.73	0.74	0.73	0.72	0.72	0.73
4	0.73	0.71	0.73	0.72	0.72	0.73	0.73	0.73	0.71	0.72

Model performance as a function of parameters, q and α ($s=5$). The table shows the correlation between simulated negotiation outcome (mode of predicted model outcomes over 500 simulation runs) and empirical Amsterdam negotiation outcome (Pearson's correlation coefficient).

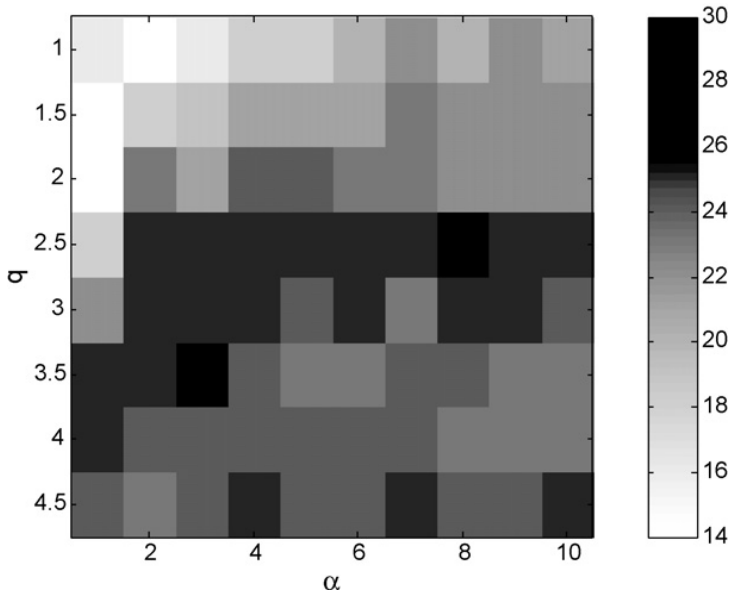

Fig. 3. Results of sensitivity analysis. Model performance as a function of parameters, q and α ($s = 5$). The figure shows how the number of issues where the most common outcome of simulation runs (mode of predicted model outcomes over 500 simulation runs) was equal to the empirical Amsterdam outcome changes with the parameter values. Darker shading indicates better model performance.

tions in which both q and α are small. The best performance is obtained if quorum $2.5 \leq q \leq 3$ and $\alpha > 1$. The model then predicts at least 24 out of 46 issues correctly. This suggests that the model is more sensitive to changes in the threshold q than the steepness of threshold value α. Since the agents sample $s = 5$ other agents opinions, the threshold quorum that performs best equal to slightly greater than 1/2 the agents sampled. So if a majority hold a particular position then the focal government will change position towards that majority.

In Table 2, model performance is measured by Pearson's correlation coefficient. We correlate the most common outcome of simulation runs (the mode of 500 simulation runs) with the empirical Amsterdam outcome. We set $s = 5$ and changed q between 1 and 4, and α between 1 and 10. For all combinations of q and α with both $q < 1$ and $\alpha > 1$ correlation coefficient r is located between 0.70 and 0.74. A comparison between the scanned parameter space in Table 2 and Fig. 3 shows that the correlation coefficients are more robust than the shading in Fig. 3. Measuring model performance by the number of issues that are forecasted correctly is obviously a stricter and more sensitive measure than relying to the correlation between simulated and empirical negotiation outcome.

In sum, the sensitivity analysis shows that both parameters are important. Until now, we do not have empirical data on these parameters, and more importantly, our theory does not even give a sociological interpretation to parameter α. Which are the social processes that determine the steepness of the threshold value? This question has to be answered in further studies in order to improve the understanding of the model and its results. Reassuringly, however, our model is rather robust to changes in α, so our results do not depend critically on the particular implementation.

5.3. Comparison to an alternative theoretical model

How does our current model's performance compare to that of previous models? In this article, we want to compare the performance of our opinion formation model to that of the enhanced

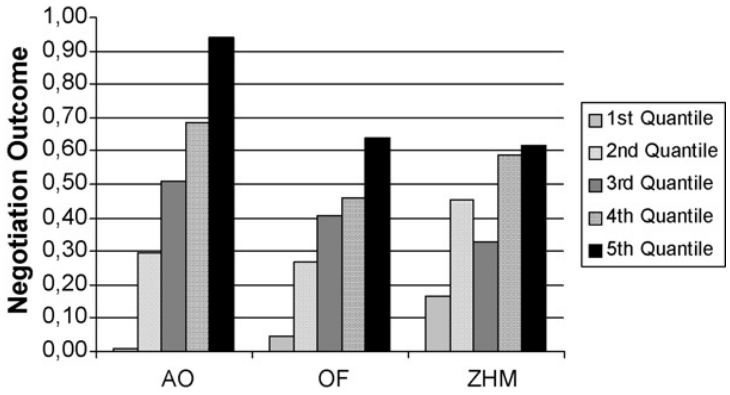

Fig. 4. Grouped negotiation outcome for empirical negotiations (Amsterdam outcome, AO), and alternative simulated negotiations (opinion formation model, OF; enhanced Zeuthen–Harsanyi model, ZHM), $n = 46$ issues.

Zeuthen–Harsanyi model.[4] Both models were optimized on base of 17 randomly chosen issues. Forecasts were then calculated for all 46 issues. As stated above, the Zeuthen–Harsanyi model assumes coalition formation, whereas in the opinion formation model coalitions may emerge. We have calculated correlation coefficients to measure the match between simulated negotiation outcome (we use the mode of predicted model outcomes over 20 simulation runs) and empirical negotiation outcome for both models. For the best opinion formation model, Pearson's correlation coefficient is 0.73 or 0.74 (see Table 2). For the best enhanced Zeuthen–Harsanyi model, Pearson's correlation coefficient is 0.61 (model parameters are $a = 1$ and $x = 0.2$). The opinion formation model has the best overall performance.

However, both models differ in predicting normal game issues and final game issues. An issue is called a final game issue if it has not been settled until the first 'single negotiation text' as proposed by the Irish presidency. Then, it had to be settled during the Netherland presidency, notably at the 2-day final conference of the prime ministers and presidents in Amsterdam at the end of that presidency. The opinion formation (model parameters are $q = 3$, $\alpha = 2$ and $s = 5$) is tremendously better at forecasting the final game issues ($r_{OF} = 0.81$; $r_{ZHM} = 0.16$) but worse at forecasting the normal game issues ($r_{OF} = 0.70$; $r_{ZHM} = 0.76$; model parameters of the ZHM are $a = 1$ and $x = 0.2$).

In Fig. 4, we present the grouped predictions for both models in comparison to the empirical Amsterdam outcome. The negotiation space is subdivided into five quantiles with negotiation outcomes between [0.0, 0.2), [0.2, 0.4), [0.4, 0.6), [0.6, 0.8), and [0.8, 1.0]. Both formal models have the same problem in forecasting the fifth quantile correctly. The opinion formation model is better at forecasting the ascending order of the quantiles. However, it is too pessimistic in the forecast for issues that settle far from the status quo (which is located at 0.0 for almost all issues).

In sum, this result verifies our hypothesis. Peer coordination in intergovernmental policy networks in which coalitions may emerge, but need not do so, ultimately proves better at predicting

[4] The enhanced Zeuthen–Harsanyi model (Saam et al., 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.

for negotiation outcomes of multilateral, multi-issue negotiations than a model that assumes coalition formation. With respect to normal game issues, the opinion formation model turns out to be a good approximation of the performance of the enhanced Zeuthen–Harsanyi model that assumes coalition formation. With respect to the final game issues, the opinion formation model clearly outperforms the enhanced Zeuthen–Harsanyi model.

6. Discussion

In this paper, we presented a new approach that explains how member states reach a decision in EU institutional reforms. Member states engage in peer coordination in intergovernmental policy networks. In this context, policy networks refer to relations between the member states in a policy domain. A policy domain is defined as the set of actors with major concerns about an institutional issue under negotiation. The social relations between policy domain actors are crucial for explaining how member states reach a decision. Member states change their negotiation positions through repeated interactions with neighbors in their social network. Member states are assumed to have groups of peers whose negotiation positions are observed and evaluated. Member states make concessions into the direction of their peers given that a quorum of selected peers have a different opinion in the same direction. In this model, pair-interactions are assumed and coalitions may emerge or not, and their number may vary. Member states economize on transaction costs because they only consider the negotiation positions of their peers. We have developed the peer coordination type of multilateral bargaining relying on two lines of theory: theories of interorganizational network formation and the policy network approach. The theoretical model was further elaborated by specification of a formal model which is based on the opinion formation model and the adaptive play framework.

In the field of policy modeling the influence of peers on each other tends to be ignored: Social relations among member states are ignored by general equilibrium models (Pinto & Harrison, 2003; Redmond, 2003). But policy outcomes do not just depend on members' preferences. They also depend on relations among peers, i.e. on the social networks in which they are embedded. Multilateral bargaining games consider strategic interaction of players. However, strategic interaction is a direct consequence of the distribution of preferences among players. Strategic interaction ignores relations among peers. We opted to include them in policy modeling. As our model has demonstrated, considering social relations among players is no problem in quantitative framework. Formal modeling techniques serving the purposes of decision-making are capable of integrating relations among peers. Furthermore, it appears our model is a good a predictor of negation outcome as a complex model based on coalition formation.

What then are the policy implications for peer-based interactions? As stated above, institutional reforms are important because they reset the institutional framework for all EU policy decisions. EU institutional reforms also codify general principles of and sometimes even very detailed regulations for certain *substantial* EU policies. Although there is no direct relation to the outcome in single substantial policies, our analysis redirects our attention from individual member state's preferences (the economic approach to policy modeling) to the connectedness of member states (the sociological approach to policy modeling). Peer-based interactions are the basis of a wide range of models of social norms (reviewed by Ehrlich & Levin, 2005). The models may one day provide us with insight into creating negotiation structures that ensure a maximal flow of information about policies.

We conclude with a discussion of shortcomings of our approach and perspectives for further research.

Relying on a data set on the EU Intergovernmental Conference of 1996, we succeeded in verifying our hypothesis that this model ultimately proves better at predicting for negotiation outcomes of multilateral, multi-issue negotiations than alternative theory-based formal models. However, we do not yet know exactly the causal explanation for those issues that our model makes bad predictions for. Some of these issues have been described as being strongly bipolar and often asymmetric, with only one or two nations initially having the position that became the final outcome. However, the reason might not be bipolarity or asymmetry. With respect to our model it could also be possible that the empirical intergovernmental networks prior to the negotiations reflect not only peer networks, or that they do not or not always reflect homophily (most important: same preference). The pre-negotiation networks instead could reflect quasi-institutionalized contacts between states of high centrality based, e.g. on their generally perceived power. Then, these pre-negotiation networks would not induce the focal government to move to his/her peers but to behave in a different way. In the most simple case, a focal government could just stay where it is. Take, for example Great Britain that has contacted Germany and France, but does not look upon them as peers and therefore will not move to Germany's or France's positions although it pools the opinion of both. So, it might be that we make good predictions where the pre-negotiation networks reflect homophily, whereas we make bad predictions where they reflect quasi-institutionalized contacts. Here, further research is needed. We need to know more on the causal reasons for establishing network relations. These causal reasons may differ between different types of member states. We need to know more on the mechanisms of peer selection. In Saam and Sumpter (in press) we test alternative mechanisms of peer selection.

Although our approach is based on theories of interorganizational network formation and the policy network approach, we are still in lack of a full action theoretical foundation of our approach. Peer coordination has been described as a behavioral strategy of rational governments which are involved in multilateral bargaining. We have hypothesized that governments optimize peer coordination in order to bring specific policy decisions closer to their preferred outcome. However, we have not even tested *this* hypothesis because our theoretical model is not yet precise enough to make predictions on peer selection that could be refuted. Our answers to the following questions have to be further elaborated: Which are the determinants of peer selection? Where does the number of peers of a focal government depend on? What is exchanged in the pair-interactions between peer and focal government? How can the influence that peers have on the focal government be explained? How can the concession behavior that is related to mutual adjustment be explained? When will coalitions eventually emerge? How do we know that coalitions have emerged?

In its present form, the formal peer coordination model which we derived from integrating the opinion formation model and the adaptive play framework includes one parameter which has not yet been given a sociological interpretation: It is α which we have introduced as parameter that indicates the steepness of the threshold q at which the probability that the government moves right (or left) equal 1/2. α determines whether the probability of the focal government to move increases smoothly or abruptly near the quorum. But, what is α? Is it a behavior of a focal government? Is it a situational constraint? Does α depend on the peer network? Does it depend on the whole intergovernmental network? We do not yet know. The theoretical framework of our peer coordination model has to be further elaborated to give α a sociological interpretation.

Acknowledgement

D.S. is funded by the Royal Society.

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