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Published in:
Journal of Theoretical Politics

DOI:
[10.1177/0951692898010004009](https://doi.org/10.1177/0951692898010004009)

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Document Version
Publisher's PDF, also known as Version of record

Publication date:
1998

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Stokman, F. N., & Berveling, J. (1998). Dynamic modeling of policy networks in Amsterdam. *Journal of Theoretical Politics*, 10(4), 577 - 601. <https://doi.org/10.1177/0951692898010004009>

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DYNAMIC MODELING OF POLICY NETWORKS IN AMSTERDAM

Frans N. Stokman and Jaco Berveling

ABSTRACT

This article evaluates two competing dynamic policy-network models and one static network model by applying them to local politics in Amsterdam. In the dynamic models an influence relation results from the acceptance of an influence request. The first model, Control Maximization, represents the view that politics are primarily power driven, and the second, Policy Maximization, policy driven. In the static model (the Two-Stage), network relations are empirically investigated as in other policy-network models and used as a benchmark for evaluating the dynamic models. Policy Maximization is shown to be the most accurate predictor of decision outcomes, better even than the static model, and to generate richer networks. However, both dynamic models generate networks that are too hierarchical.

KEY WORDS • collective decision-making • local politics • policy networks • process simulation

1. Introduction

In the Netherlands political decision-making is traditionally studied by carrying out (sometimes lengthy) descriptive case studies. Instead of this more 'traditional' method, we use a dynamic modeling approach in which actors try to establish influence relations with one another to obtain optimal policy outcomes. The actors build their own network as far as they are able to. The emergence of the access relations is simulated by the computer. The main focus in the present article lies in the comparison of two dynamic models of local politics in Amsterdam. These models have been developed by Stokman and Zeggelink (1996) and they reflect two different views of politics. In the first one, the Control Maximization (CM) Model, actors aim at influence relations with the most powerful actors. This model is therefore primarily power driven. In the second one, the Policy Maximization (PM) Model, actors evaluate influence relations on the basis of their expected effect on policy outcomes. This model is therefore primarily policy driven. The evaluation of the two competing models

We thank Frans Wasseur for the network analysis with GRADAP and UCINET. We thank Bob Lieshout and Don Westerheijden for their comments on the description of the dynamic access models.

involves a comparison both of predicted versus actual decision outcomes and of generated versus actual network structures on a large set of data (both in terms of issues and actors involved).

The results of the two dynamic models can be directly compared with those of the Two-Stage (TS) Model of Stokman and Van den Bos (1992). In contrast to the two dynamic models (where the network of influence relations between actors is generated by computer simulation), the network of influence relations among the actors in the TS model is externally determined and fixed. This holds for all other existing policy network models as well. The relations are obtained by interviewing the actors, asking them from whom they receive and/or to whom they give important information.¹ The TS model was rigorously tested on two policy domains in the city of Amsterdam (Berveling, 1994) using controversial decisions taken by the City Council on 'Urban Development' and 'Minority Policy'. Eight of the ten issues that were selected in the Berveling Amsterdam study will be used here. Of these issues we will predict the outcomes of ten decisions taken by the City Council.²

Successful prediction of outcomes of decisions and policy network structures by one of the dynamic models would give us considerable additional insight into the nature of local politics and the evolution of interaction processes in policy networks in Amsterdam (and probably elsewhere as well). It would imply that we have obtained a better understanding of the process and dynamics through which relations in policy networks are generated. Equally good or better predictions than the TS model would imply that extensive (and expensive) empirical information about network relations does not add precision.

This article is structured as follows. In Sections 2 and 3 we describe the dynamic modeling approach. In Section 4 we will briefly introduce the issues on both domains. After explaining how we operationalized the main elements of the models in Section 5, we turn in Section 6 to the predicted outcomes of the Council decisions in Amsterdam and the correspondence between the generated and empirical networks. We end with some concluding remarks.

2. Modeling Policy Networks

Some political theorists like Schumpeter (1943) identify democracy with formally correct decision-making. Other theorists, however, stress rightly

1. Some other early empirical applications can be found in Van den Bos (1991), Stokman and Van den Bos (1992) and Berveling and Van Roozendaal (1992).

2. In Berveling (1994) decisions by the Mayor and Aldermen and some Commissions of the Council were also taken into account.

that formally correct decision-making is necessary but not sufficient for democracy (Bachrach and Baratz, 1962; Lukes, 1974). They stress that the content and quality of the decision itself are essential elements in the evaluation of the democratic character of decisions. In this line of reasoning, a decision has to be based on a 'balanced' weighting of different interests in society. To arrive at such a balanced weighting, democracies assign the right of organization and manifestation to societal actors and often require consultations and hearings to promote their involvement. Particularly within this normative framework, we may expect that public authorities receive social recognition for properly weighting the intensity of interests and relative power of different societal actors into the decisions to be taken. Mistakes, particularly frequent mistakes, will result in serious social conflicts and failing implementation. This will have negative consequences for the likelihood of re-election of the public authorities themselves. The power of actors in social systems is, therefore, not solely based on (final) voting power, but also on the ability of actors to include their interests in decision outcomes. We denote the latter by *influence*. Influence is strongly determined by *access* to decision-makers and *resources* to convince or enforce the inclusion of their interests in the outcome (Mokken and Stokman, 1976). The three essential power elements in collective decision-making are therefore (final) voting power, timely access, and resources.

Voting power, access, and resources determine the *power* or *clout* of actors. Actual mobilization of power in decision-making depends on three other elements. It depends on the *interest* of the actors in the decisions to be taken. The two other elements that enhance mobilization of power in decision-making processes are expectations on the *deviance of the outcome from their preferred one* and on the positive *effects* of participation (Zelditch and Ford, 1994; Stokman and Stokman, 1995; König, 1997). This implies that power becomes visible in decision-making processes only if actors have diverging policy stances on decision outcomes of sufficient interest to them. It implies that models of collective decision-making need to include not solely the three power elements. They also need to include the interest of the actors in the decisions and their preferences regarding decision outcomes.

Within a collective decision-making setting, differences of instrumental goals among actors result in two types of relations between actors and decisions. First, what is important for one actor might well be irrelevant for the realization of the ultimate goals of another actor. Second, differences in instrumental goals result in diverging policy stances of actors. The importance of a decision for an actor is denoted by the *salience* the actor attaches to the decision. The outcome on a decision that an actor desires is denoted by his³ *policy position* on the decision. The policy position expresses the

3. Or her, throughout this article.

policy preference of the actor, while the salience expresses the relevance of the decision compared to other (perhaps unspecified) issues (Bueno de Mesquita and Stokman, 1994: 68).

In the 1970s and 1980s several models for collective decision-making were published. Some of them are extensions of Coleman's exchange model of control (Coleman, 1972). The extensions aim to include preferences of actors in favor of or against proposals. Other extensions connect Coleman's model to political networks (Marsden and Laumann, 1977; Marsden, 1981; 1983; Pappi, 1984; Pappi and Kappelhoff, 1984; Pappi and Melbeck, 1984; Laumann et al., 1987; Coleman, 1990; Pappi et al., 1995). Other models stem from political scientists who perceive politics as conflict resolution, fundamentally different from the exchange processes in economics on which Coleman based his exchange model (Bueno de Mesquita et al., 1985; Bueno de Mesquita and Lalman, 1986; 1992; Bueno de Mesquita, 1994).

None of these models explicitly represents all power elements. The network models solely incorporate access relations in their models, neglecting differences in the resources and voting power of actors. All other models use only one total score for the potential power of actors regarding each decision. This implies that the formal decision-making process is not represented in these models. This obscures the fundamental differences between voting and influencing (Mokken and Stokman, 1976). In the voting stage, the process involves the selection of one alternative (among many) as the collective outcome. The determinant at this stage is the voting power of actors, which depends on voting weights and the voting rule. The influence process co-determines the positions actors with voting power take in the vote. In the influence process, actors' actions are primarily oriented towards each other's positions. All these models assume that the policy positions of actors are given and constant. Actors are willing to exchange control, willing or forced to support other voting positions, but their preferences over policy outcomes (policy positions) remain constant. In later phases of the decision-making process the latter is often a valid assumption, but many actors lack sufficient information in earlier phases to form firm policy positions on their own. They use and need information from others to determine which outcome they should aim for. This is often particularly true for politicians who need information from their constituency to determine their policy stances. It is this process of policy position formation that is central in the TS model and the dynamic models we evaluate here. Studies on the management of meaning within organizations also stress the importance of the process by which policy stances are formed to arrive at consensus within organizations (O'Reilly, 1983; Weick, 1979; Bouwen, 1993).

The TS model of Stokman and Van den Bos (1992) includes both policy-position formation and explicit representation of voting and influencing as separate processes. They integrate the previous network models with models

of voting power (Hoede and Bakker, 1982) and represent a political process as an iterative process of two stages.⁴ In the influence stage, actors adapt their policy positions. They take into account the policy positions of actors who have access to them. Their salience to the decision and resources determines the weight given to their own position relative to those of others. After one or more influence rounds, actors with voting power vote based on their positions formed during the influence process. In this second stage, nothing else but the voting power of an actor determines his weight. The TS model is, however, no more than a system of equations and fails to include a micro process in which actors optimize their decision-making situation. Moreover, the TS model shares with the other network models that its network of access relations is static and exogenous.

In the dynamic models of Stokman and Zeggelink (1996), the main points of interest are the *establishment and shifts of access relations and their consequences for outcomes of decisions*. Unlike other policy network studies, they do not take the network and its access relations as given. In their models, *network formation* is connected with *position formation* as one of the main characteristics of the influence process. After that, final voting based on fixed positions takes place. They therefore explicitly represent influencing and voting as separate processes. Actors can influence each other's policy positions only through access relations. Access relations are therefore instrumental in obtaining policy outcomes as close as possible to their own policy positions. Access relations arise when access requests are accepted by other actors. As the maintenance of access relations requires time and resources, they assume that actors can request and accept only a restricted number of access relations. Actors optimize access requests simultaneously. They show that even for small social systems actors are unable to calculate the effects of access relations on outcomes and to estimate their likelihood of success. They therefore assume that actors use simple heuristics and adapt their behavior by backward learning. These heuristics represent different views on politics.

The first view assumes that actors are primarily *power driven*. This view of politics has long been dominant in foreign policy-making and international politics (among others Morgenthau, 1948; Kaplan, 1975; Waltz, 1979). It was also explicitly or implicitly adhered to by many scholars who have studied national and local power structures (Mills (1956) and Hunter (1953) are well-known representatives). Although this school of thought has partially passed away, we still find scholars who adhere to and build upon these ideas (for an overview: Knoke, 1990; Mizruchi and Galaskiewicz, 1993). Typically, they concentrate on power structures as their main

4. Also later policy network models represent the formal process more explicitly (König, 1992; 1997; Kappelhoff, 1995).

object of study. They link very broad common interests to these power structures (see e.g. Domhoff, 1983). In accordance with this view, Stokman and Zeggelink (1996) elaborated the *Control Maximization (CM) Model* as the first base model. In this model, actors aim at access relations with the most powerful actors in the field. Actors estimate their likelihood of success by comparing their own resources with those of the target actors. Power also determines the order in which actors accept requests.

The second view assumes that actors are primarily *policy driven*. This view also has long-standing roots in international politics and foreign policy-making (Allison, 1971) and political science (Dahl, 1961). In this view, analysis of power should be combined with an analysis of policy stands and the interactions between the two. A combined analysis of power, communication, and policy stands very soon revealed the mechanisms and importance of selective exposure to information (see Bauer et al., 1963: 467).

The combined focus on communication structures and issue stands crystallized into the concept of policy networks. The concept refers to the symbiotic relationship of state and society (Hanf and Scharpf, 1978; Heclo, 1978; Katzenstein, 1978). Policy networks typically refer to political problems involving complex political, economic and technical task and resource interdependencies (Knoke, 1990; Kenis and Schneider, 1991; Jansen and Schubert, 1995). The selective communication finding of Bauer et al. (1963) was corroborated in later and more detailed policy network studies (Heinz et al., 1993). Our second base model, the *Policy Maximization (PM) Model*, reflects this view and findings. Actors roughly estimate the effects access relations might have on the outcomes of decisions. Actors accept requests selectively to 'bolster' their own preference as much as possible.

3. Dynamic Access Models

Within a policy domain, the highest goal of actors is assumed to be the attainment of policy outcomes that are as close as possible to their own preferences (policy positions).⁵ These outcomes are determined by the

5. We consider a domain of n actors ($i, j, k = 1, \dots, n$) and m decisions ($a, b, c = 1, \dots, m$). We assume *unidimensional decisions*. In other words, the preferences or policy positions of the actors on a decision can be represented as points on a one-dimensional continuum. x_{ia} denotes the preference of actor i on decision a ($0 \leq x_{ia} \leq 1$). On each decision a , actors have *single-peaked preference functions*. The utility loss of a certain point on decision a (x_a) for actor i is a function of the interest of the actor in the decision, s_{ia} ($\sum_i s_{ia} \leq 1; s_{ia} \geq 0; i \in 1, \dots, n$), and the distance between that point and the policy position of actor i on decision a at time t :

$$L^i x_a^t := s_{ia} |x_a - x_{ia}|^q, q > 0$$

The total utility over all m decisions for actor i is assumed to be the sum of his utilities over all decisions (cf. Baron, 1991):

$$L^i x' := \sum_a L^i x_a^t$$

public actors with voting power on the decisions.⁶ In the access models it is also assumed that these public actors, like other actors, shape their own policy positions at the influence stage. The sole means by which relevant private actors are able to realize a more favorable outcome of a decision consists of trying to shift the policy positions of public actors. At the influence stage, optimal shaping of policy positions of other actors can therefore be seen as an important intermediate goal. Success depends on whether the actor has timely access to other actors, and on his ability to mobilize important resources to shape the policy positions of these others.⁷ As such, the appropriate model in this stage is more akin to a *marketing* model than to an exchange model.

Each actor has only limited resources. Access relations require time and effort (such as information to be gathered and ordered). Consequently, an actor is unable to establish and maintain access relations to all other actors. Each actor has to make a choice which access relations he wants to establish. How are access relations established in the dynamic models? An access relation from actor i to actor j is created if a *request* for access by actor i is *accepted* by actor j . The network of access relations is established in different iterations. Each iteration comprises three steps. In the first step actors make requests for access to one another. Quite often, choices have to be made because actors are allowed to make only a limited number of requests. In the second step, actors accept requests. Again choices have to be made, at least if an actor receives more requests than he can handle. *Accepted requests become directed access relations*. In the third step, the influence process takes place. Each actor gets a new preference (policy position), being the weighted mean of his own preference and that of the actors with access to him. This influence process is modeled as in the TS

6. The expected outcome of decision a at time $t(O_a^t)$, is assumed to be the mean policy position of the public actors, weighted by their voting power:

$$O_a^t := \sum_i x_{ia}^t v_{ia}$$

For each issue a :

$$\sum_i v_{ia} = 1, v_{ia} \geq 0; a \in 1, \dots, m$$

7. The resources actor i can mobilize in the influence stage are denoted $r_i (r_i \leq 1)$. Resources often result from long-term investments. For that reason, resources of actors are presently not seen as time dependent. Access relations seem to be more flexible than power resources. This is reflected in the considerably greater difficulties in obtaining reliable empirical data on access relations than on power resources in ongoing empirical network studies. Access relations, therefore, are time dependent in our models. If actor i has access to actor j at time t , $a_{ij}^t = 1$. If not, $a_{ij}^t = 0$. It is assumed that actor i has full access to himself ($a_{ii}^t = 1$). All access relations in an issue domain are contained in the adjacency matrix A^t .

model.⁸ Subsequently, all actors adapt their 'cognitive image' of the policy domain. They recognize the new policy positions of the actors and adapt their estimates of the expected outcomes of the decisions, the power of the actors and the probabilities of acceptance of future requests. At each iteration each access relation is re-evaluated. Each access relation can therefore disappear if no new request is made or if the new request is no longer accepted. After a number of iterations, the decision-makers vote with their current preference.

We first consider the restrictions actors are confronted with. Subsequently we specify the alternative dynamic models. These models differ from one another in three main elements. The first is the estimate of the utility of alternative requests for access. The second is the estimate of the likelihood of success, i.e. the likelihood that the other actor will accept the request. The product of the two determines the *expected utility* of alternative requests and the rank order in which the actor makes the requests. The third element concerns the rank order in which actors accept requests. Alternative specifications of these elements result in two basic models, corresponding to two opposing views on politics. In the CM model, actors base all these elements on their perception of how powerful actors are. In the PM model, actors make rough calculations on the consequences of access relations for the outcomes of the decisions to be taken. The CM model reflects the idea that politics is primarily power-oriented, the PM model that politics is primarily policy-oriented.

3.1. Restrictions with Respect to Access Relations

The establishment and effectiveness of access relationships require time and other resources. Consequently, we assume that the maximum number of access relations an actor can deal with depends on his resources. Also, incoming influence requires the allocation of time and other resources to these activities. If actors were solely oriented towards advancing their own

8. The potential influence of an actor over another actor in the influence stage depends on the relative size of the actor's own resources over those of the target actor and of the other actors with access to the target actor at time t . In the social network literature, the matrix of potential influence relations is denoted the *control matrix* with elements (Hoede, 1978):

$$c_{ij}^t := r_i a_{ij}^t / (\sum_k r_k a_{kj}^t)$$

The control relations determine the abilities of actors to induce changes in policy positions of other actors if they deviate from an actor's own policy position, while the salience of the decision determines the willingness of an actor to put such abilities into effect. If we assume that the influence processes take place simultaneously, the policy position of an actor at time $(t + 1)$ can be seen as a weighted sum of his own policy position and that of other actors at time t . The weights are determined by his own and incoming control at time t , as defined earlier, and the saliences of the decisions for the actors:

$$x_{ia}^{(t+1)} := \sum_j x_{ja}^t c_{ji}^t s_{ja} / (\sum_j c_{ji}^t s_{ja})$$

policy positions, they would spend all their time and resources on outgoing access relations, and refuse incoming influence. If all actors in an issue domain act in this way, no influence would be realized at all. What, then, determines whether or not an actor will accept an incoming access request? Incoming relations are important for an actor, because they provide him with information on the relevant actors in the policy network and, in this manner, help him to shape his own policy position. Moreover, an actor's claim that his policy position is based on information provided by many other relevant actors, contributes to his influence on the other actors. In other words, incoming relations contribute to an actor's resources. Next, in any society, but particularly in a democratic society, it is a drawback for a powerful actor to be seen as unwilling to accept influence from other actors. Finally, actors often seek information (and consequently accept influence) from actors other than those they themselves are trying to influence. For example, in preparing an interview with a member of parliament, an actor may consult different experts to ground his preferred positions on sound arguments. We incorporate these mechanisms into our model by applying the principle of *generalized reciprocity*. This principle is well known in personal network theory (Alexander, 1987; Boyd and Richerson, 1989). Translated to issue domains, the generalized reciprocity principle implies that *outgoing control or voting power should be balanced by incoming control*. As an example, the White House is allowed extensive control over other actors and considerable voting power if and only if it is responsive to other societal actors, balancing their interests, policy positions, and power resources.

These considerations result in the following specifications regarding the maximal number of requests actors are allowed to make and the number of requests they have to accept. *The maximal number of requests an actor is allowed to make at time or iteration $(t + 1)$ is a function of the resources of an actor and the number of incoming relations at time t . The larger the resources, the voting power, and the number of outgoing relations of an actor, the more requests the actor has to accept at time $(t + 1)$.*⁹

9. The following functions were specified for the simulations in this article:

$$(od_i^{(t+1)})_{\max} = [0.5nr_i + 0.5id_i^t]$$

and

$$(id_i^{(t+1)})_{\max} = [0.25(nr_i + n\sum_a v_{ia}/(\sum_a v_{ia})_{\max}) + 0.5od_i^t]$$

in which

$(od_i^{(t+1)})_{\max}$ denotes the maximal number of access requests actor i is allowed to make at time $(t + 1)$ and $(id_i^{(t+1)})_{\max}$ the maximal number of access requests actor i has to accept at time $(t + 1)$;

od_i^t denotes the number of outgoing relations of actor i at time t and id_i^t the number of incoming relations of actor i at time t .

The symbol $[]$ denotes the value rounded to its nearest integer.

3.2. *Estimation of Utility of Requests*

First, we specify the information actors are assumed to possess about an issue domain. Since institutional arrangements are in the public domain, we assume that actors have full information on the distribution of voting power over the actors in the issue domain. Moreover, we assume that actors are able to estimate the policy positions, saliences, and resources of all actors in the domain. With respect to the control (influence) network, we assume that an actor is unable to observe the precise control relations from and to actors. Knowledge of these relations would imply access to very sensitive information on all informal meetings and bilateral contacts between actors. They are able, however, to make an estimate of the total amount of control by and on each actor in the issue domain.

On the basis of his partial information, each actor is able to compute the expected outcomes of the decisions at the different points in time. However, actors are unable to calculate both the effects of access relations on shifts in policy positions by target actors and their subsequent effects on the decisions taken. An actor i does not know who else is exerting control on actor j , let alone in which direction they try to move actor j . Moreover, he does not know the identity of the actors who are under the control of actor j . He is therefore unable to estimate the final effect of a successful access relation on the policy positions of actors with voting power. He only knows the total amount of control actor j is able to exercise in the issue domain.

The two basic models differ from each other in the actor's estimates of the utility of alternative access relations. In the CM model actors base their utility estimates on the power actors have in the policy domain. Since the actors in the issue domain know the total control and voting power of each actor, actors may decide to optimize their control over powerful actors in the issue domain. The importance of each voter for actor i is determined by the voter's voting power. Besides, the importance of every other actor in the influence process is determined by the other actors' total control. In addition, actor i needs to estimate how much control he is able to exert over the others. Under the assumption that other access relations do not change, actor i is indeed able to estimate his control over actor j . It is equal to his own resources divided by the total amount of resources that is effective on actor j (i.e. the resources of actor j and the resources of all actors with access relations to j). The rank ordering of the alternative access relations for actor i is based on the sum of the two power components multiplied by the estimated control of actor i over the other actor.¹⁰ Stokman and Zeggelink (1996) denote this estimate the '*Control*

10. The approximation of the utility of the different access relations under this specification is equal to:

Figure 1. Expected outcome (O_a) and policy positions of three actors on decision a

Request specification (CR)'. Note that actors do not take the policy positions of other actors into account at all.

In the PM model, actors use their knowledge of the policy positions of other actors and the expected outcome of the decision. In this more sophisticated specification, actors still focus their efforts on the actors who have great control and voting power in the issue domain. However, they also consider in which direction the policy position of the target actor will possibly move as a result of an established access relationship. This factor determines whether a subsequent shift in the expected outcome will have positive or negative consequences for the actor. This is illustrated in Figure 1. We assume that actor i wants to optimize his access relations at time t , and that actor j has a more extreme policy position than actor i on the same side of the expected outcome. An access relation from i to j would result in a less extreme position of actor j at time $(t + 1)$, and would result in a shift of the expected outcome of the decision in the wrong direction (away from the policy position of actor i). Consider instead a successful access relation by actor i to actor k . Such an access relation would result in a shift by actor k in the direction of the policy position of actor i , and, consequently, to an expected outcome closer to actor i 's policy position. *Thus, in general, influence on actors with a more extreme policy position on their own side of the expected outcome is counterproductive.* Access relations to other actors with exactly the same policy positions have no direct effect (at most they can outbalance effects of other actors). In all other cases, an access relation has a potentially positive effect. This effect will increase with the distance between the policy positions of the two actors. If more decisions are involved, access relations gain importance if they affect outcomes of decisions on which the distance between the expected outcome and the policy position of the actor is large. Moreover, the utility gain is higher for more salient decisions. If we incorporate these elements in the estimate of the utility of the CM model,¹¹ the utility estimates of the PM-model result.

$$U^{*i} a'_{ij} = \hat{c}'_{ij}(c'_j + \sum_{a=1}^m (v_{ja}s_{ia}))$$

in which $\hat{c}'_{ij}$ is i 's estimate of c_{ij} and

$$c'_j = \sum_{k=1}^n c'_{jk}$$

11. That is $\sum_a s_{ia}(x_{ia}' - O_a')(x_{ia}' - x_{ja}')$

Stokman and Zeggelink (1996) denote this estimate the '*Policy Request specification (PR)*'.

The choice of access requests does not depend only on the utilities, but also on the likelihood of success. This likelihood of success depends on the order in which actors accept access requests. For that reason we first consider the alternative specifications for the acceptance of access requests before we deal with alternative specifications for the estimation of the likelihood of success.

3.3 Acceptance of Requests

If an actor receives more requests for incoming access relations than he is allowed (or needs) to accept, he has to decide which requests to accept and which to refuse.

In the CM model, actors have to accept requests in the order of the resources of the proposing actors ('*Control Acceptance specification*' or CA). If a choice has to be made between actors with equal resources, a random choice is made. Under this specification, the choice between incoming access requests is independent of the policy positions of actors. In the example of the alderman in Amsterdam, it is unthinkable that the alderman should refuse incoming influence requests of powerful actors on the grounds that he has already been influenced by less powerful actors. In the PM model, on the contrary, the order of acceptance depends on the proximity of the policy positions of the other actors and is completely independent of the resources of the actors (*Policy Acceptance specification (PA)*). The reader should realize, however, that an issue domain only consists of actors with positive resources. Within this boundary, however, the only factor that counts is distance. The greater the distance between the policy positions of actors, the more reluctant they will be to accept influence from one another.¹² For example, an extreme left-wing actor might gain a lot by influencing an extreme right-wing actor. Most of the time, however, the right-wing actor will not be receptive to extreme left-wing influence, particularly if it concerns decisions that are highly salient to the right-wing actor. Moreover, we assume that proximity matters. In other words, actors care more about differences in preferences among actors they feel similar to. Different preferences between distant actors matter less. This acceptance rule of access requests makes actors as immune as possible against changes in their own policy positions. While trying to influence distant actors, they try to uphold their own policy position by giving priority to influence from like-minded actors. Only if these are not present in the issue domain or make no access requests to them, are actors

12. As such, each actor i orders the incoming access requests according to the following:

$$\sum_a s_{ia} (1 - (|x_{ia} - x_{ja}|))$$

forced to adapt their own preferences. This acceptance rule incorporates the frequent conclusion that decision-makers engage in 'bolstering', giving too much attention to sources that share the decision-maker's own predispositions (Calvert, 1985; Kollman, 1997). We can even state that the rule explains 'bolstering' as rational behavior to prevent the expected outcome from shifting in the wrong direction. Moreover, this acceptance rule reflects the finding from many policy network studies that political actors interact primarily with others who share their policy preferences (Bauer et al., 1963; Heinz et al., 1993) and that serious conflicts often arise among actors over slight differences of opinion.

3.4. Estimates of the Likelihood of Success

We now return to the actor's estimate of the likelihood that an access request will be accepted. Under the CA specification, actors realize that the likelihood of acceptance of their access requests depends on their relative amount of resources. Requests of actors with large resources are more likely to be accepted. Moreover, actors also realize that actors with large resources will probably be attractive targets for many actors in the policy network. Accordingly, powerful actors will have to refuse more access requests than less powerful actors. Under the PA specification, actors realize that the likelihood of acceptance of their access requests depends on the proximity of their own policy positions to those of the target actors. We therefore formulate two simple alternative estimates actors make for the likelihood of success. The first estimate (denoted *Control Likelihood specification* (CL)) is based on a comparison of the actor's resources with those of the target actor¹³; the second (denoted *Policy Likelihood specification* (PL)) on a comparison of their policy positions.¹⁴ In both models, we assume that actors are able to *learn through experience*. If an access attempt by actor *i* to actor *j* is not accepted by actor *j*, actor *i* will reduce his estimate in subsequent iterations by 0.1 until the lower bound of 0.1.

13. Actor *i* estimates the likelihood of acceptance of an access request by actor *j* at time $t = 0$, p_{ij}^0 , as follows

$$\begin{aligned} r_i - r_j &\geq 0 \rightarrow p_{ij}^0 = 1 \\ -.9 < r_i - r_j < 0 &\rightarrow p_{ij}^0 = 0.1[10(r_j - r_i)] \\ r_i - r_j &\leq -.9 \rightarrow p_{ij}^0 = 0.1 \end{aligned}$$

The symbol [] denotes the value rounded to its nearest integer.

14. Actor *i* estimates the likelihood of acceptance of an access request by actor *j* at time $t = 0$, p_{ij}^0 , as follows:

$$\begin{aligned} p_{ij}^0 &= 0.1[10(1/m \sum_a (1 - (|x_{ia} - x_{ja}|)))] \\ 1/m \sum_a (1 - (|x_{ia} - x_{ja}|)) &< 0.1 \rightarrow p_{ij}^0 = 0.1 \end{aligned}$$

3.5. *Summary: The Dynamic Access Models*

On the basis of the three main elements we are able to describe the alternative models in a compact way.

The CM model is based on:

- utility estimates of requests based on power (CR);
- estimates of likelihood of success of requests based on resource comparison (CL);
- acceptance of requests from actors with the largest resources (CA).

The PM model is based on:

- utility estimates of requests based on effects on decision outcomes (PR);
- estimates of likelihood of success of requests based on policy position comparison (PL);
- acceptance of requests from actors with close policy positions (PA).

These two models are seen as two basic models as they differ in all three elements.

4. Two Policy Domains and Ten Issues

From the Berveling (1994) study we selected ten decisions taken by the City Council on eight issues in two contrasting policy domains. In the following section we will briefly introduce these domains and issues.

4.1. *'Urban Development': The IJ-Shores Project*

In the early 1990s the City of Amsterdam was facing a major new urban development which was meant to counterbalance the upcoming high-tech area in the south-east of the city. This 'IJ-Shores Project' will change the spatial and functional structure of the city. The project encompasses the city's waterfront, an area just behind the Central Railway Station, at the edge of the historic city center. This area is the central part of the project and therefore called 'IJ-Central'. It was expected that within approximately 10 years, the waterfront area would contain (relative to Dutch standards) huge office buildings, a shopping center, recreational facilities and housing. In this domain the following six controversial issues were selected:

1. *Pedestrian/bicycle bridge (Foetsbrug)*. To (re)develop the northern part of the IJ-Shores project a bridge was said to be necessary. Some favored the idea (although the support was rather symbolic in nature), others strongly opposed it.

2. *Wagons Lits hotel and office.* The hotel and office was the first project (near the Central Railway Station) to be realized within the IJ-Shores framework. The project was realized before a plan for the area as a whole, laid down in the 'Major Points of Departure', was developed. For this reason some actors opposed the building project.

3. *'Quality' of the central IJ area.* This issue had three strongly related aspects. The first aspect was the *density* of development in the area. Investors and developers wanted as much office space as possible to make their investments more profitable. Other actors feared a 'Manhattanization' of the project. In the second place there was the distribution of *functions*. Investors and developers favored commercial functions (offices, convention centers) over housing and public functions (shopping centers, museums). Others wanted a mix of functions with special attention to the public functions. The third aspect was the *building height* in the Central IJ area. Developers seemed to favor a building height of 85–100 m. Several grassroots organizations strongly opposed this idea.

4. *Shopping center.* A huge shopping center of 30,000 m² was planned near the Central Station. The mall would mean competition for the shops in the inner city of Amsterdam. Instead of 30,000 m² the inner city shop owners wanted no more than 8000 or 9000 m² to be built.

5. *IJ boulevard.* To make the new building projects accessible, a new road along the waterway was necessary. There was a dispute about the number of driving lanes that were needed. The road that was originally planned had two lanes. The investors and developers wanted to double this: at least four lanes were said to be needed. Opponents pointed to the contribution the four-lane road would make to air pollution.

6. *KNSM island.* This island is used for housing facilities. Three plans based on different points of departure competed. A redevelopment plan for the island drawn up by squatters (one of the three alternatives) was finally rejected.

4.2. 'Minority Policy': (Un)Employment and Affirmative Action

In the Minority Policy domain we focus on the subdomain '(un)employment and affirmative action'. The minorities in Amsterdam, mainly people from Surinam, Morocco and Turkey, face problems finding a place in the labor market and have a low level of educational attainment. One of the most important policy aims is to help the ethnic minorities get back to work. The following controversial issues were selected in the Minority Policy domain:

1. *Registration of ethnicity.* To know whether affirmative action is effective, some groups suggested that it was necessary to know who belonged to what kind of ethnic group. The proponents claim that

registration is necessary to see whether minorities really profit from policy measures. The opponents disagree. Given the role of some of the local official departments during the Second World War they distrust the policy measure.¹⁵

2. '*Eastern Market*' issue. A businessman asked for permission to move a large indoor market for immigrants to an abandoned automobile factory in Amsterdam. His proposal was rejected by the Mayor and Aldermen. One of the main reasons for not allowing the transfer was that the factory was surrounded by industry (transshipment of dangerous goods) that would not go along with the many visitors to the market.

5. Operationalization of the Model Elements

We tried to interview all 287 actors who seemed to be involved in the selected issues. An overview of the selected issues was presented to representatives of the organizations. They were asked to indicate the issues in which their organization was involved. Forty-two of the 287 actors indicated that they were not involved in any of the issues. Of the remaining 245 organizations 204 agreed to be interviewed. This response rate of 83 percent seems reasonable. The interviews delivered the following data on the model elements.

First, the respondents were asked directly to indicate the *salience* of the decisions for their organization on a scale from zero (no salience) to 100 (extremely important). Second, we asked for their *policy positions* on the decisions. For pro/con decisions (like the Foetsbrug decision), the respondents could indicate whether their organization was in favor (+1) or opposed to (-1) a decision. For decisions with discrete alternatives (like the IJ boulevard) they could indicate the alternative they preferred. For continuous decisions (like the building height) they indicated the value on the numeric scale. In the next step, the element *access* was determined. We presented a list with organizations in the policy domain to the respondents and asked them from which organizations they received information and advice. The marked organizations were considered to have access to the interviewed organization. Fourth, data on *resources* were collected. We presented a list with eight power resources.¹⁶ They had to indicate the applicable resources for organizations they considered powerful. The allocated resources of each organization were combined into one score on resources. Finally, the *voting power* was determined independently of the

15. Some departments collaborated with the Germans to register Jewish people.

16. These eight resources are based on Laumann and Pappi (1976). They have been used in other studies as well (Marsden and Laumann, 1977; Pappi and Kappelhoff, 1984; Laumann and Knoke, 1987).

interviews. The voting powers of the factions in the City Council depend on the decision rule (in this case simple majority of votes) and the number of seats in the Council. Voting power indicates how often an actor belongs to the majority in yes/no votes under all permutations of preferences (Stokman and Van den Bos, 1992). Thanks to its large number of seats, the Labor faction PvdA received the largest voting power. All these data made it possible to predict the outcomes of the selected decisions through computer simulation.

6. Results

In Section 6.1 we compare the predictions on the decision outcomes of the two models with the real outcomes. The comparisons of the generated networks with the empirical network are given in Section 6.2. We are not interested in the exact reproduction but in the similarity of structures.

6.1. *The Real and Predicted Outcomes of Policy Processes*

Table 1 contains the real and predicted outcomes of the ten decisions in the two domains described earlier. In the last column of Table 1 the real outcomes are listed. For a number of decisions only two outcomes are possible, namely 'accepted' or 'rejected'. For this type of decisions, the last column contains '+' if the decision is accepted and '-' if it is rejected. For the building height and the shopping center the number of meters is predicted. For the other decisions the alternatives are indicated with numerical values. The other columns of Table 1 contain the predictions of the TS model and the two dynamic models. The latter predictions are based on 100 simulations, each consisting of five iterations. For the accepted/rejected decisions the models generate a value between +1 and -1. If the value is positive, the model predicts that the decision will be accepted. If the value is negative, then it will be rejected. The deviance from zero indicates how certain the prediction is. With the building height and the shopping center the models directly generate the outcome. For the decisions with different alternatives the prediction is the alternative with the closest numerical value.

It is quite clear from Table 1 that the policy-oriented model (the PM model) consistently gives better predictions than the power-oriented model (the CM model). The CM model gives only five good predictions, i.e. on half of the decisions. The PM model gives seven good predictions out of ten. Even in comparison with the TS model the predicted outcomes of the PM model are closer to the real ones. For an interpretation of these results we should keep in mind that the predictions of the TS model are also based on the network between organizations as obtained from the interviews. In

the two dynamic access models the empirical network does not play a role. The network data are, as it were, thrown away and the actors gradually build a new network from scratch. This implies that the dynamic access models need much less empirical data than the TS model. Nevertheless, the PM model gives predictions at least as good as the TS model.

The PM model gives wrong predictions for three decisions. With a predicted outcome of 2.40 for the substantive decision on the registration of ethnic minorities the prediction is just under the border of 2.50. For the Eastern Market a negative outcome is predicted with a likelihood of .26 whereas the decision was positive. Just in the opposite direction, the PM model predicts a positive outcome for the Foetsbrug (+.27), whereas the real outcome was negative. (These two decisions are wrongly predicted by all models.) In the TS model and the CM model the decisions are not linked with one another. This implies that the prediction remains the same, irrespective of whether we are dealing with one or more decisions. In the policy-oriented model, actors take the expected outcomes, the saliences and policy positions of all decisions into account when they optimize access relations. These models can therefore generate fundamentally different

Table 1. Predictions of Outcomes of Council Decisions (SD between brackets)

Decision	Predicted Outcome			Real Outcomes
	TS Model	CM Model	PM Model	
<i>Issue Domain: IJ-shores</i>				
Foetsbrug (10 Jan., 1990)	+.00	+.61 (.15)	+.27 (.14)	—
Wagon Lits (19 April, 1989)	+.17	+.73 (.05)	+.52 (.12)	+
Building height (m), (10 Jan., 1990)	74	72 (.48)	74 (.75)	75
Shopping centre (m ²) (10 Jan., 1990)	23,906	24,002 (333)	26,101 (766)	30,000
IJ-boulevard alt. (10 Jan., 1990)	4.45	4.08 (.23)	4.64 (.33)	5
KNSM island alt. (20 Sept., 1989)	1.28	1.05 (.02)	1.37 (.14)	1.5
<i>Issue Domain: Minority Policy Domain</i>				
Registr. ethnic. (1 June, 1988)	+ .74	+.88 (.03)	+.88 (.08)	+
Registr. ethnic. altern. (1 June, 1988)	2.52	2.26 (.05)	2.40 (.12)	3
Registr. Obj./subj. (1 June, 1988)	+.70	+.98 (.02)	+.96 (.06)	+
Eastern Market (26 Febr., 1988)	— .28	— .47 (.11)	— .26 (.22)	+

predictions of decisions if we link decisions with each other. As the registration decisions dealt with one issue and were closely linked with each other, we based our predictions on these decisions in Table 1 on a groupwise analysis of the three decisions. The results of all other decisions in Table 1 are obtained through separate simulations. One may wonder whether this is justified for the first two IJ-Shores decisions. The debate on the Foetsbrug and the hotel Wagon Lits near the Central Station started simultaneously. If we link the two decisions in the dynamic models, the predictions for the Foetsbrug change fundamentally in the PM model (see Table 2). The PM model now predicts a negative outcome with a probability of no less than .29. The prediction for Wagon Lits remains positive and is even strengthened (from .52 in Table 1 to .61 in Table 2). There exists a fundamental interaction effect between the two decisions. This is a strong indication that the support for the Foetsbrug was more symbolic than real. Some actors made a remark in this direction in their interview.

Based on these results, we conclude that the policy-oriented model, the PM model, performs very well, even in comparison with the TS model. Important elements in this comparison are that this model gives better predictions for extreme outcomes than the TS model and that it is sensitive to decision-linking. Another important advantage is that it needs much fewer empirical data. In particular the network data are empirically difficult to collect and they are no longer required. The CM model clearly performs worse. This was found in other studies as well (Stokman and Zeggelink, 1996). The difference between the power- and policy-oriented models is even under-estimated here because many actors have an unknown policy position on a number of decisions. In this case the policy-oriented models also assume that these actors optimize only on power. With fewer missing data the results are likely to be even more different.

6.2. The Network Structure

In this section we focus on the network structures generated by the basic dynamic models for two decisions, Foetsbrug and Wagon Lits. We compare the networks of the linked decisions solution (Table 2) of the two basic dynamic models with the empirical network. Subsequently, we compare

Table 2. Predictions for Foetsbrug and Wagon Lits as Linked Decisions

Decision	PM Model (SD)	Real Outcomes
Foetsbrug (10 Jan., 1990)	-.29 (.15)	-
Wagon Lits (19 April, 1989)	+.61 (.07)	+

the networks of the PM models for the linked decisions and Foetsbrug alone, because they generated such strongly different predictions for the Foetsbrug. The networks of the dynamic models are obtained by taking the average control for each ordered pair of actors over 100 simulations. As not all directed lines are generated in each simulation, these networks are substantively denser than the ones generated in each separate simulation (see also Stokman and Zeggelink, 1996). We think that this is justified because the empirical network is obtained for the whole policy domain of urban development (IJ-Shores). The relations in the empirical network consequently also indicate a certain likelihood that such a relation is used for influence, not that it will be present in each influence process in the domain.

In Table 3 we give two network parameters for the empirical network and the basic dynamic model solutions for the linked decisions. The density is based on the number of directed lines in the network and expressed as a fraction of all ordered pairs of actors in the network. The index H of heterogeneity is based on the variance of the degrees of the points. The larger the variance is, the more hierarchical the structure of the network is. In that case there are both a number of actors linked with many other actors and a number of actors with only a small number of relations. The index H is the sole measure by which the hierarchical structure of networks with different numbers of lines and points can be compared (Snijders, 1981).

The data in Table 3 indicate that the density of the PM model is not much lower than the density of the empirical network, in sharp contrast with the density of the CM model. The introduction of policy positions clearly results in much richer networks than simple power-based models. Both models, however, generate networks that are too hierarchical. They do not generate sufficient relations among the less powerful private actors. Apparently, in real politics private actors use other private actors as brokers more often than in the simulation models.

Interestingly enough, the dynamic access models generate the primary

Table 3. Network Density and Heterogeneity

Issue Domain	Network	Density	Heterogeneity (H)
Wagon Lits/Foetsbrug ($n = 43$)	Empirical network	.35	.31
	CM network	0.07	0.37
	PM network	0.26	.49

responsible alderman Van der Vlis (Urban Development) as the most powerful actor, although he has no voting power. The amount of control of the actors over the other actors is highly correlated for the three networks. The correlation between the empirical network and the PM model is $r = .84$, between the empirical network and the CM model $r = .94$, between the PM model and CM model $r = .91$.

The network generated by the PM model for the Foetsbrug alone shows remarkable differences from the combined Wagon Lits/Foetsbrug network. Now, the two Council factions in favor of the Foetsbrug are the most central actors, not the responsible alderman Van der Vlis. Another remarkable difference is the Department of Physical Planning, which is the third central actor for the linked decisions and very marginal for the Foetsbrug alone. Indeed, the structure of the network for the Foetsbrug alone shows the highly symbolic and political nature of the decision. Another indicator of this conclusion is the very low correlation between the control sums of the actors in the empirical network and the Foetsbrug PM network. It is only $r = .48$.

7. Conclusion

In the preceding sections we presented three models of collective decision-making and applied them to decision-making in Amsterdam. In all models decision-making is seen as an iterative process consisting of two stages. In the second stage final decision-makers vote according to their adapted preferences. These preferences are adapted in the first stage through an influence process between actors. The first model is based on an empirically determined influence network, obtained by interviewing actors. In the other models the emergence of access relations in the influence network is simulated by the computer. Actors gradually build their influence network as far as they are able to. In the simplest model, actors try to get access to the most powerful actors, without taking into account the effects on outcomes of decisions. In the more complicated policy-oriented models they explicitly take these possible effects into account.

The models are applied to ten decisions in two domains in Amsterdam. The policy-oriented models give very good predictions and generate networks that are more diverse than the control-oriented models. Moreover, the policy-oriented models gave very interesting results by linking decisions to one another and show how effective such linking may be in obtaining a certain outcome.

The results confirm the earlier results of Stokman and Zeggelink (1996) and strongly support a very specific view on the political process. This view can be described as follows.

Trying to establish influence relations with other actors in policy networks, actors are confronted with two counteracting forces. On the one hand they realize that powerful actors with distant and opposite views are most attractive as targets. If successful, such a relation will greatly affect the outcomes of decisions. On the other hand, actors realize that these actors are less likely to accept access requests than more proximate actors. Actors realize that other actors act like they do, giving high priority to influence from other like-minded actors. Only if such actors are not present, are they willing to accept influence from more distant actors. Actors therefore select influence purposively to 'bolster' their own position. This prevents them from changing their own preferences while trying to influence other actors to do so.

These results indicate that the greatest problems in democratic decision-making lie in the unwillingness of powerful actors to accommodate the diverging preferences of other actors. The main problem does not lie in insufficient opportunities to request access and influence, but in the refusal of powerful actors to accept such requests. One may wonder, therefore, whether hearings and access of important actors through permanent advice committees are an effective means of incorporating diverging interests in political decisions. These procedures only guarantee the possibility of making requests but not of them being accepted. The bolstering effect can make political authorities quite alienated from societal interests. This has recently been demonstrated in the Rotterdam and Amsterdam referenda on the division of these cities into several municipalities. Overwhelming large majorities rejected the intended divisions, to the great surprise of the political authorities. In our opinion, democratic systems should be more innovative in developing procedures to prevent the bolstering effect among political authorities.

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